

5 The Census–LS link

5.1 THE 1981 CENSUS–LS LINK

Planning for the addition and linkage of 1981 Census data to the Longitudinal Study (LS) began in 1978. The work of extracting data for LS members from the census, matching and linking it with the existing LS data took place between 1982 and 1985. OPCS was involved in the exercise for LS members and their households enumerated in England and Wales, and the General Register Office, Edinburgh in the exercise for LS members enumerated in Scotland.

A data cleaning exercise was undertaken before starting the Census–LS link. This involved adding late notifications of events occurring to LS members between 1971 and 1981, and deleting event records where an incorrect match was found to have been made with an LS member by the National Health Service Central Register (NHSCR). After the data had been cleaned, the LS had to be updated with all entry and exit events (new births, immigrations, deaths and emigrations) that had occurred after 31 December 1980 but prior to Census day 1981. This was to ensure that the ‘rolled forward’ LS population could be correctly matched with the LS extract from the 1981 Census.

5.1.1 The 1981 Census extract

The first stage in the 1981 Census–LS link involved extracting data from the 1981 GB Census Households File for potential LS members and their households. Every person enumerated as usually resident in England and Wales, or in Scotland, at the 1981 Census who was recorded as being born on one of the four LS dates of birth was considered a potential LS member and was allocated a 1981 LS number. The extract program produced three outputs, an extracted 1981 LS households file, a listing of all LS members included in the file, and a set of computer printed 1981 LS index cards. The listings were cross-checked with the index cards to confirm the consistency of the data. The data printed on the cards included the following:

- * Local authority code
- * Ward identifier
- * Enumeration district
- * Census form number
- * Person number on the census form
- Present or absent resident flag
- # Sex
- # Marital status
- # Country of birth
- One year migrant indicator
- Year of birth + 1981 LS serial number + check digit
- # 1981 Census-quoted year of birth.

The listings were used to locate the census schedules for each household containing an LS member. Those items marked * in the above list were used to locate the correct census form, and those marked # were then used to find the correct person(s).

Once the census schedules had been identified and extracted, the surname and forename(s) in full, address of usual residence and enumeration address (if different from the address of usual residence) of the potential LS member(s) were added to the index cards.

Any discrepancies that were discovered between the index cards and listings, or between the index cards and the information held on the census schedules, were dealt with as follows:

1. If an entry on the listing existed, and when checked, proved to be for an LS member, but no index card had been printed, then a card was produced manually.
2. If an index card existed, and when checked proved to be for an LS member, but there was no entry given on the listing, then the listing was updated with the entry.
3. If the index card specified a person with an LS date of birth who could not be found on the census schedules, or whose surname was missing, then the index card was destroyed. The listing was also annotated to indicate that the entry should be deleted from the 1981 sample.
4. If two identical index cards and two identical entries in the listing existed for one person, then one copy of the index card was destroyed and the listing was annotated for deletion of the duplicate entry. This type of duplication was not associated with usual census night residence/absence pairs where the address of enumeration and the address of residence were different.
5. Where minor discrepancies between the index card and the census schedule were found, extra data were added to the card to assist with linkage at NHSCR. These discrepancies included differences in date of birth, sex, marital status, country of birth and year of entry into the UK.
6. If, however, an LS date of birth had been keyed in by mistake and the census schedule did not show an LS date of birth the card was destroyed.

Once the index cards and listings had been checked for any discrepancies the cards were sent to NHSCR for matching against the LS index. The census schedules were boxed and sent to Census processing for additional coding of 'hard-to-code' items.

5.1.2 Additional coding of census schedules

At census only a 10 per cent sample of schedules are fully coded (including the 'hard-to-code' items such as occupation and educational qualifications). However, because the LS was originally set up to examine occupational mortality in England and Wales,¹ and has subsequently been used to examine mortality and additional data in the light of social class and other socio-demographic variables (see Chapter 2), all data on the schedules for LS members and their households need to be coded to the 100 per cent level. As a result, those schedules which were originally not included in the census 10 per cent sample were extracted for the additional coding of the 'hard-to-code' items. It should be noted that in 1981 it was not considered cost effective for 'journey to work' and 'address of place of work' to be coded for the LS, and 'educational qualifications' were only coded for the highest qualification level. Once coding was completed and the additional information was validated using the census validation programs (see Chapter 4), the data was transferred onto magnetic tape. These data were then used to update the 1981 Census-LS households extract file.

5.1.3 The matching process

The 1981 LS index cards were divided into two sets: those whose serial numbers identified them as potential England and Wales LS members and those whose numbers identified them as potential members of the Scottish LS. The Scottish 1981 LS index cards were then sent to the Central Register at the General Register Office (GRO) Edinburgh.

The 1981 England and Wales LS index cards were dispatched to NHSCR in batches of 50,000. Each index card was checked against the LS Live Index, which included those members recorded in the 1971 Census plus new births and immigrants who had entered the study after the 1971 Census but prior to Census day 1981. If no match was found it was checked against the LS Dead file (deaths since Census day 1981). If a match was still not found, tracing was undertaken (see section 5.1.3.2).

In Scotland the 1981 LS index cards were matched against the Scottish LS Index, and if matched, the 1971 Scottish LS number was added to the 1981 card. Matched 1981 cards were then coded. It should be noted that a person enumerated in Scotland in 1981 could be a 1971 English LS member. As such they could not be matched to the 1971 Scottish LS and were returned to NHSCR for processing. The processing of unmatched Scottish cards was done utilising both GRO and NHSCR and is covered in section 5.1.3.3.

5.1.3.1 Matched England and Wales sample index cards

If a 1981 LS index card matched a 1971 LS index card or a first decade new birth or immigrant index card in the LS index, then the earlier LS number was entered onto the 1981 index card. The 1971 (or first decade new birth or immigrant) LS index card was marked to show that a match had been achieved. Each batch of matched cards (the 1981 cards updated with the earlier LS numbers) was sent to OPCS for further processing. Figure 5.1 shows an LS index card at each stage of the matching process.

If the matched cards proved to be examples of double enumerations (that is, a second or third 1981 card matching the same 1971 index card), then the 1981 index cards were marked with the 1971 number but were sent in separate batches from the normal matched cards.

5.1.3.2 Unmatched index cards - England and Wales

If the 1981 card could not be matched with an existing card in the LS index, a number of different avenues were employed to process the card through NHSCR (tracing).

- (i) If the card had a Scottish LS number, but the birthplace of the member was given as in England and Wales, the card was sent to Scotland for matching. Other types of unmatched England and Wales LS index cards were also sent to Scotland. These included cards where the birthplace of the member was shown as Scotland; cards where the one year migration indicator showed residence in Scotland one year before census; and, those where the Central Register showed either Scottish postings or that the NHS number for the member was Scottish (see section 5.1.3.3 for further details).
- (ii) For cards that had LS numbers originating in England and Wales, the first step was to search in the Central Register for an NHS number and any LS flag. If the name in the Central Register differed from that shown in the main alphabetical index (e.g. a woman who had married after the 1971 Census and who entered the LS in 1971 under her maiden name), then the original name was used to search the 1971 LS index for a match. It should be noted that the new name would only be held in the registers if a change of name had been notified to NHSCR by the LS member's FPC. The only two occasions on which that was likely to occur were either as a result of an FPC move or notification of a change of name received by the FPC from that woman's GP. If a match was found, the card was returned to OPCS once it had been marked with the 1971 number.
- (iii) Where a 1981 index card was found to have an NHS number in the Central Register, but there was no trace of the member in the LS index, and no LS flag was entered in the Central Register, the Central Register was flagged 'LS81' to indicate that the member had been found at the 1981 Census. The index card was processed as a new LS member.

Figure 5.1 LS index cards showing the process of linking data from the 1971 and 1981 Censuses

LAWPED FORM PERSON P S M BP V										1971 SERIAL CD				YB 1981 SERIAL CD				NHS	
SAEF30 160 0064 P F D 64 1														32 60000010 16					
SURNAME										COOB				NHS NO.					
SURNAME CHANGE										DD MM 19YY									
FORENAME(S)										BLUE/GREEN CARD SENT				SSI					
UR ADDRESS										1				2					
POSTCODE AB1 1CD										5				6					
EN ADDRESS										9				10					
POSTCODE WX1 1YZ										13				14					
										POSTINGS				15					
														16					

(1) Card printed by GRO Scotland

LAWPED FORM PERSON P S M BP V										1971 SERIAL CD				YB 1981 SERIAL CD				NHS	
SAEF30 160 0064 P F D 64 1														32 60000010 16					
SURNAME OTHER										COOB				NHS NO.					
SURNAME CHANGE										DD MM 19YY									
FORENAME(S) JOANNA PRISCILLA										BLUE/GREEN CARD SENT				SSI					
UR ADDRESS 47, GARDEN WAY, ENFIELD										1				2					
POSTCODE AB1 1CD										5				6					
EN ADDRESS 14, WEST ST. PLYMOUTH										9				10					
POSTCODE WX1 1YZ										13				14					
										POSTINGS				15					
														16					

(2) Name and address added by Census Processing Office

LAWPED FORM PERSON P S M BP V										1971 SERIAL CD				YB 1981 SERIAL CD				NHS	
SAEF30 160 0064 P F D 64 1										1234567803				32 60000010 16				ABC	
SURNAME OTHER										COOB				NHS NO.					
SURNAME CHANGE										DD MM 19YY				ABCD 50.5					
FORENAME(S) JOANNA PRISCILLA										BLUE/GREEN CARD SENT				SSI					
UR ADDRESS 47, GARDEN WAY, ENFIELD										1				2					
POSTCODE AB1 1CD										5				6					
EN ADDRESS 14, WEST ST. PLYMOUTH										9				10					
POSTCODE WX1 1YZ										13				14					
										POSTINGS				15					
														16					

(3) LS number and NHS number added by NHSCR

- (iv) If no NHS number was found in the alphabetical index the relevant FPC was asked to provide this information. Initially, this was the FPC covering the address of usual residence as given on the 1981 index card. If that did not result in an NHS number being found, an enquiry was sent to the FPC covering the enumeration address if it differed from the address of usual residence. If an NHS number was successfully found, the Central Register was checked and the index card was either matched with the 1971 LS index or was found to be a new entrant at the 1981 Census and treated as (iii) above.
- (v) Any remaining cards were referred to the 1971 LS no trace index. Cards residing in this index normally have no NHS number associated with them. However, in some cases an NHS number was subsequently identified in the Central Register and written on the card. Where this happened and a 1981 LS index card matched the 1971 card, the 1981 card was annotated with the 1971 serial number and treated as a matched and late traced card. The 1971 card was then left in the no trace index until after the linkage exercise was complete, when it was moved to the traced index. If no NHS number was given and the 1981 index card matched the 1971 no trace index card, the 1971 card was marked as matched. The 1981 card was not annotated with the 1971 number but was identified as 'matched but not traced' before being sent for further processing. After processing these cards were returned to NHSCR where they were placed in the LS no trace index together with the 1971 card.
- (vi) If the 1981 index cards were not matched with either the LS index or the no trace index and no NHS number could be located, their details were checked against the original census schedules. If the information on the cards was originally transcribed incorrectly, it was corrected and the cards were returned to NHSCR to be put through the matching process again. If there was still no match, the card was processed as a no trace LS member (as in (v)).

5.1.3.3 Unmatched index cards — Scotland

The Scottish LS index cards were divided into three types:

- (a) those where both the country of enumeration and the country of usual residence was Scotland;
- (b) those where the country of enumeration was Scotland but the country of usual residence was England and Wales; and
- (c) those where the country of enumeration was England and Wales but the country of usual residence was Scotland.

Where these cards were initially unmatched with the 1971 Scottish LS index a number of different methods were employed to attempt to match them later.

If the 1981 Scottish LS index cards were of type (a) three methods of attempting a match were tried.

- (i) If the birthplace of the LS member was not England and Wales the registers were searched for a change of name. If this was found the Scottish LS index was then rechecked for a match.
- (ii) If the birthplace of the LS member was found to be England and Wales and no match had been achieved with the Scottish index then the card was sent to NHSCR for matching and tracing.
- (iii) If neither method (i) nor method (ii) achieved a match then the member was originally planned to be treated as a new Scottish LS member entering at the 1981 Census. However, the Scottish LS was discontinued in 1981 and new Scottish entries were not added to it.

If the 1981 index cards were of type (b) two methods of attempting a match were used.

- (i) If the birthplace of the member was given as Scotland the NHSCR index was checked to see if the NHS entry was flagged 'LS/E'. The presence of this flag indicated that the member was in the England and Wales LS sample and the card was sent on to NHSCR. If no flag was shown, and there was evidence of a change of name then the Scottish LS index was rechecked. If the card was still unmatched then the NHSCR index was flagged 'LS/E/81', the NHS number was added to the card and it was sent to NHSCR.
- (ii) If the birthplace of the member was other than Scotland then the card was sent to NHSCR for matching and inclusion in the England and Wales LS sample.

Where the cards were of type (c) the same methods for attempting matching were used as for type (a) cards.

5.1.3.4 Corrections — the verification process

When cards were returned for verification or correction of details the most common transcription errors were found to be:

- (a) the details of the wrong person had been copied from the Census form;
- (b) spelling errors in surname and/or forename(s);
- (c) forename(s) missing;
- (d) errors in address(es) or wrong address(es).

If these errors had occurred then the cards were corrected and returned to NHSCR.

If the details on the card were found to be correct when the Census form was checked, additional details to aid in tracing were added to the card. These included name and date of birth of spouse, parent(s), child(ren), and address one year ago of the LS member. The cards were then returned to NHSCR for attempted matching. If they still could not be matched (or the NHS number traced), a search of the 1981 and 1982 Electoral Registers and the Marriage Indexes was made to attempt to trace any alternative names. After this the cards were returned to NHSCR for processing. Any cards that remained untraced were returned to be processed as LS no trace members.

5.1.4 Match and trace categories — tracing history indicators

When NHSCR undertook the matching and tracing exercise for the 1981 Census–LS link they initially categorised the different types of matching and tracing as follows:

1. **1981 matched and traced cases** A 1971 entry already existed for these LS members in the LS index and they had an NHS number. (Two other subsets of 1981 matched and traced cases exist. These are new births on LS dates occurring before the 1981 Census but after the 1971 Census, and immigrants who were not present at the 1971 Census but who entered the LS before Census day 1981 via registration with a GP).
2. **1981 traced only cases** No previous entry existed in the LS index but their NHS number was traced in the Central Register where they were flagged 'LS81'. These were new entrants at the 1981 Census.
3. **1981 untraced and unmatched cases** There was no entry in the LS index, no entry in the 1971 no trace index and no NHS number could be traced. These were new entrants into the LS no trace index in 1981.
4. **1971/1981 unmatched but linked cases** There was no entry in the LS index for 1971 but there was an entry in the LS no trace index. These cases could be either:
 - (a) traced (NHS number found for the 1981 entry); or
 - (b) untraced (NHS number not found).
5. **1971 no trace cases** These cases had no 1981 card and no NHS number, but had been identified at the 1971 Census as LS members.
6. **1971 traced but unmatched cases** An entry in the LS index existed but there was no corresponding 1981 LS index card. (It should be noted that this category includes cases who had died intercensally, emigrants before the 1981 Census and persons who missed the 1981 Census but who might still be present in the country. As

such this group is not relevant to the 1981 Census, but members still alive and resident in England and Wales are relevant to events occurring after 1981 and to any following censuses).

These categories were later expanded to allow different subsets of the LS population to be identified and extracted from the sample for analysis. The categories, known as tracing history indicators, were coded and added to the LS members' records in the 1981 LS personal file. A detailed account of the LS tracing history indicators is given in Appendix XIII.

5.1.5 Final processing and creation of the 1981 LS files

Once the 1981 index cards had gone through the matching and tracing process at NHSCR they were returned to OPCS for data processing. Information on whether the 1981 LS sample matched (or did not match) the 1971 LS sample had to be added to the 1981 LS household file so that the link between the 1971 and 1981 Censuses could be achieved. The data used for matching the entries on the cards with the entries in the LS households file depended on the matching/tracing history of the 1981 cards. There were five subgroups of 1981 cards:

- (a) matched to a card in the existing LS;
- (b) not matched to the existing LS but NHS number traced — (new) 1981 entrant;
- (c) not matched to the existing LS, NHS number not traced — new 1981 entrant (no trace);
- (d) matched to an existing LS no trace index card either (i) with an NHS number, or (ii) without an NHS number; or
- (e) matched but double enumeration.

If the cards were of type (a), then the 1981 and 1971 LS numbers (or the 1981 and existing new birth or immigrant LS number) and check digits together with the year of birth of the member were keyed into the computer. For type (b) cards, the 1971 LS number and check digit were entered as '—' followed by a series of blanks. The 1981 LS number, check digit and year of birth were then entered as for type (a). The data on type (c) cards were also keyed as for type (b), but the 1971 LS number and check digit were entered as '\$' followed by a series of blanks. The data on type (d) (i) cards were keyed as for type (a). Type (d) (ii) cards were keyed with '*' to show that the NHS number had not been found and the rest of the keying was as for type (a) cards. Data from the first card only of a double enumeration set (type (e) cards) were keyed.

As each batch of cards was processed, validation of the 1971 (or other existing LS number) and the 1981 LS numbers and check digits allowed any invalid or duplicate records to be identified and rejected. The validated file was then run against the LS households file to match against the 1981 LS number in order to add the 1971, or other existing LS number (if present) to the records.

Figure 5.2 Linkage between 1981 Census and LS

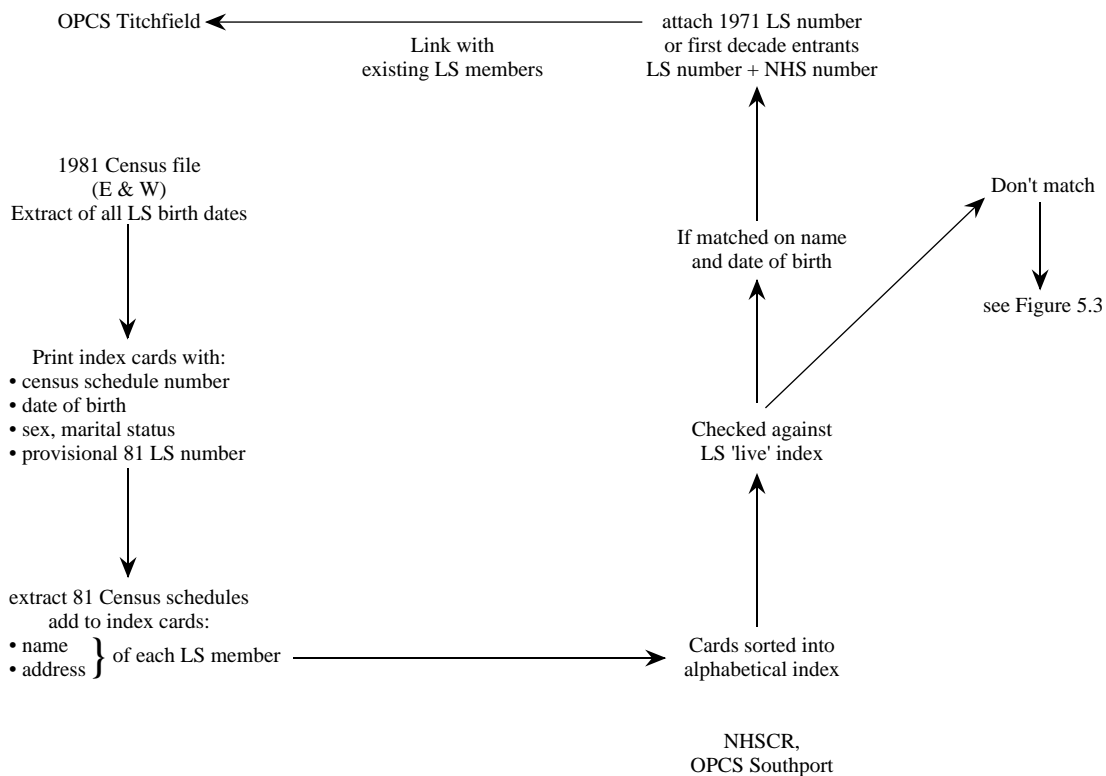
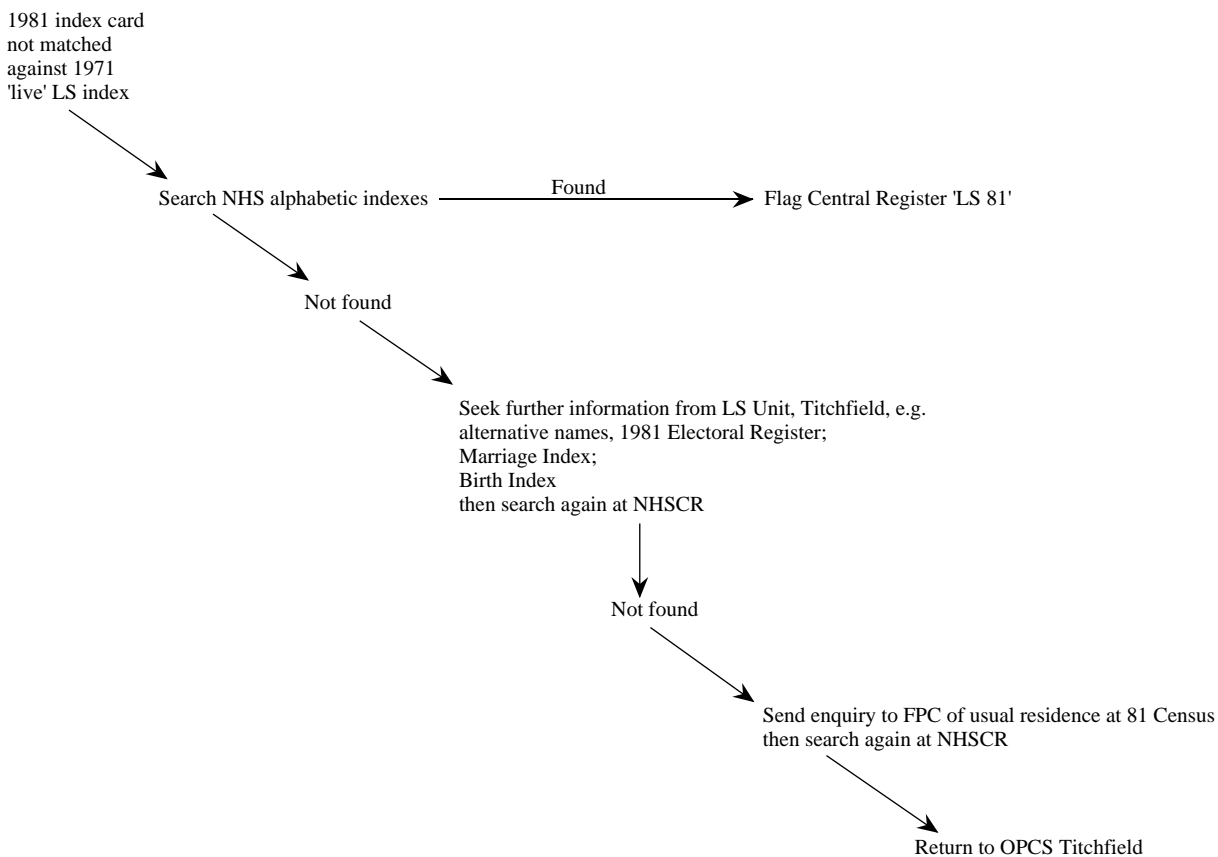


Figure 5.3 1981 Census-LS Link: 'no match' problems



The final process in the link was the creation of separate LS household and LS personal files from the 1981 household file. An outline of the processes involved in linking the 1981 Census into the LS are shown in Figures 5.2 and 5.3.

After the linkage exercise was complete the 1981 LS index cards were returned to NHSCR and were inserted into the LS index to replace 1971 cards (or later new birth or immigrant cards) where they existed. 1981 no trace cards which were linked to 1971 no trace cards (or to new birth or immigrant no trace cards) were filed next to the previous card — they did not replace them.

5.2 THE QUALITY OF THE 1971–1981 CENSUS LINKAGE

The original LS sample extracted from the 1971 Census population comprised 529,764 persons enumerated as resident in England and Wales at the 1971 Census. Of these persons 512,881 (96.8 per cent) were traced initially by NHSCR. In 1981 the Census sample selected by LS birth date was 536,243 persons of whom 528,310 (98.5 per cent) were traced. The change in the sample size at the 1981 Census was due to natural population change (births and deaths) together with migration occurring during the intercensal period. Exits and entrances from the sample can only be measured if these events can be successfully linked to the sample members experiencing them. Linking an exit or entry event to a member of the sample involves using the NHS number. If a sample member has no NHS number (is untraced), and thus has no entry in the Central Register, then no events can be linked to that person. Also if an event is not recorded, for example an emigration, it cannot be accounted for in any linkage exercise. As a result the measurement of the quality of the census link must take into account both the percentage of untraced members and the amount of population change attributable to intercensal exit and entry events.

The population which can be linked between two censuses is that which was present at the first census and was also present at the second. Therefore any persons who have

died or emigrated, or who have immigrated or been born into the sample between the two censuses cannot be included in the assessment of linkage rates between censuses.

Of the original 512,881 traced persons in the LS sample, 408,451 were found at the 1981 Census (see Figure 5.4). Of the traced LS members, 58,911 were known to have died during the intercensal period and 5,625 traced members were known to have left England and Wales before the 1981 Census. Among the 16,883 persons selected into the LS sample from the 1971 Census who were untraced at NHSCR at the beginning of the study, 6,550 were found at the 1981 Census. Only 1,153 of those 6,550 were still untraced at NHSCR in 1981. The total number of LS persons found in both the 1971 and 1981 Censuses was 415,001, of whom 413,848 were traced (99.7 per cent). A total of 39,894 traced persons present in 1971 (7.5 per cent of the original 1971 sample) were not found at the 1981 Census. These persons had no record of either an emigration or a death before the 1981 Census.²

5.2.1 Forward and backward linkage

Linkage between the censuses can be examined in two ways, forward (from the first census to the next census) or backward (from the second census back to the first census).³

Using forward linkage (1971 Census forward to the 1981 Census), the 1971 sample members who moved forward to the 1981 Census should comprise the original 1971 LS Census sample minus the deaths and emigrations that occurred in the intervening period. Using backward linkage (1981 Census back to the 1971 Census) the 1981 LS sample members present at the 1971 Census should be the 1981 sample minus the new births and immigrations that occurred after the 1971 Census. Logically the two methods of examining the linkage should result in an identical sample size. However, this cannot be the case due to differences in the quality of entry and exit information, which is shown in Table 5.1. Using forward linkage the sample of traced members expected to be in the 1981 Census was 448,345

Table 5.1 1971 and 1981 LS-Census samples: forward and backward linkage

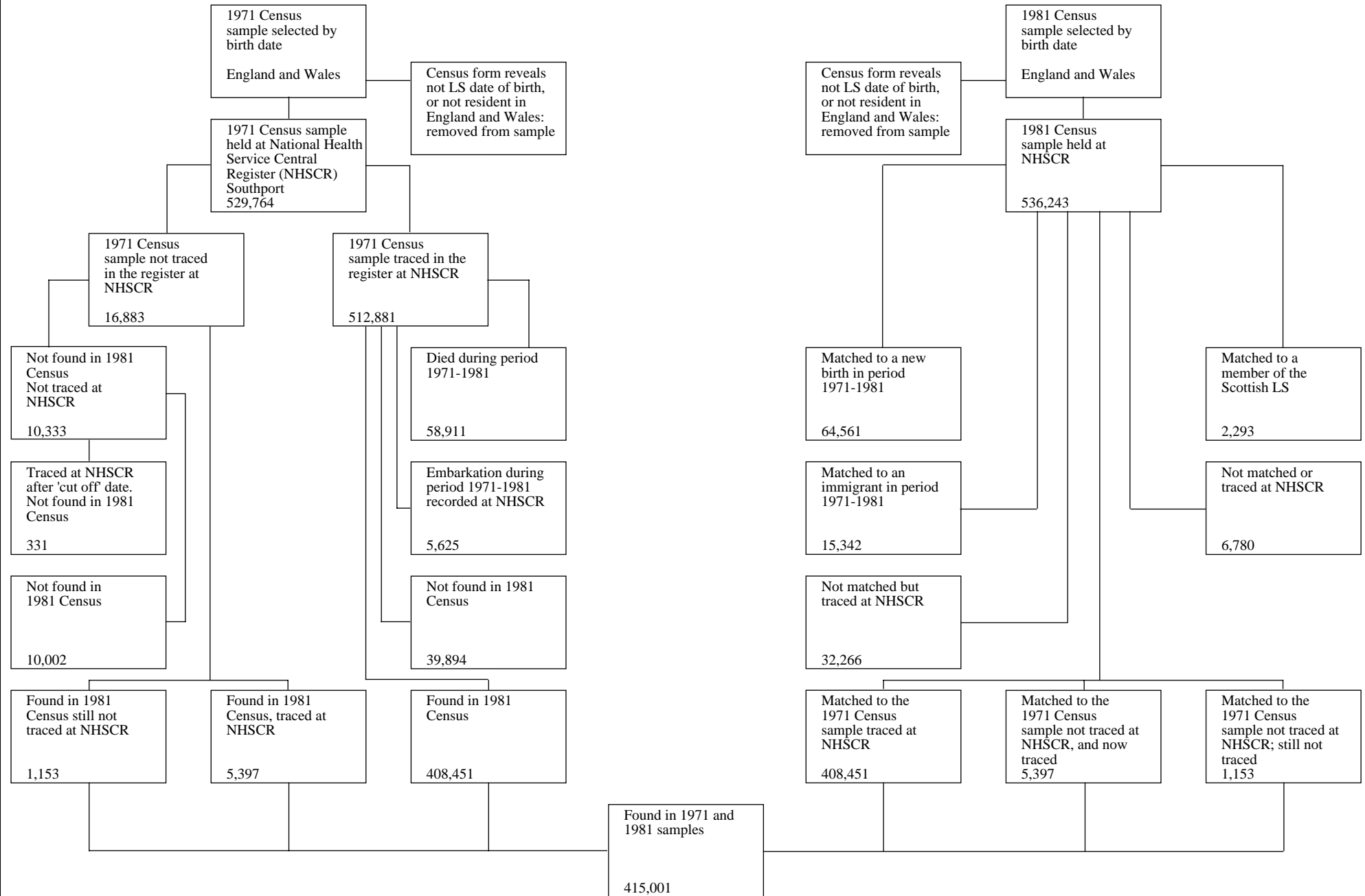
Forward Linkage	Number	Backward Linkage	Number
1971 Census sample*	512,881	1981 Census sample†	528,310
Died before 1981 Census	58,911	Born after 1971 Census	63,534
Embarked before 1981 Census	5,625	Immigrant after 1971 Census‡	13,773
		New birth entering via 1981 Census	1,027
		Immigrant entering via 1981 Census	3,862
Eligible to be in 1981 Census	448,345	Should have been in 1971 Census	446,114
Recorded in 1981 Census	408,451	Recorded in 1971 Census	413,848
Forward linkage rate	91.1%	Backward linkage rate	92.8%

* Traced at NHSCR prior to 1981 Census.

† Traced at NHSCR.

‡ Immigrant to England and Wales, includes persons resident in Scotland in 1971.

Figure 5.4 Component parts of the Longitudinal Study population, 1981 Census - LS link



but the sample recorded by this method as actually present was 408,451, a forward linkage rate of 91.1 per cent. Of the 39,894 LS members who were missing from the 1981 sample, approximately 37 per cent were due to discrepant dates of birth being given at either of the two Censuses. A further 38 per cent were persons who were not enumerated (or whose households were not enumerated) at the usual address (see section 5.2.4).

Backward linkage resulted in the identification of a sample of 446,114 traced LS members in 1981 who should have originated from the 1971 Census. Only 413,848 of them were actually recorded in the 1971 Census (a backward linkage rate of 92.8 per cent). The 32,266 persons present in the 1981 Census who should have been present in the 1971 sample but were not, resulted mainly from date of birth discrepancies. These people gave an LS date of birth at the 1981 Census but not at the 1971 Census.

5.2.2 Linkage rates

Tables 5.2 to 5.10 show the forward linkage rates for initially traced members of the LS sample between the 1971 and 1981 Censuses. It should be noted that the linkage success rate is based on those members who were known to be still alive, and who were not recorded as having emigrated during the intercensal period. The overall linkage success rate for the sample was 91 per cent.

The 1971–1981 linkage rates have been examined in detail for both demographic and social characteristics and show

which subgroups of the LS population are more prone to ‘loss to follow-up’ than others. When using this data for research it is essential to take into consideration that some groups in the population (for example, the very old, persons living in communal establishments, those whose country of birth was outside of England and Wales, etc.) show much lower linkage rates between the two censuses than other groups.

The linkage rates by sex, age, marital status, household composition, tenure, household size, country of birth, economic activity and social class for the sample are summarised below.

5.2.2.1 Sex

The 1971 LS sample of 512,881 traced members was made up of 250,483 males and 262,398 females. Seventy-nine per cent of these males and 80 per cent of females were also present at the 1981 Census. The linkage success rates (after excluding deaths and emigrations) were 91.4 per cent for females and 90.7 per cent for males.

5.2.2.2 Age

Table 5.2 shows the forward linkage rates for traced members of the LS sample by five-year age groups (as at 1971 Census). In 1971 the traced sample was made up of 122,284 persons aged under 15, 322,764 aged between 15 and 65, and 67,833 aged 65 years or over. In the oldest age group 1,045 LS members were aged 90 or above in 1971.

Table 5.2 Linkage rates between 1971 and 1981 Censuses - sample members traced at NHSCR following the 1971 Census by age at 1971 Census

Age-group at 1971	Members present in 1971	Position in 1981 (per cent)				Linkage success rate per cent*
		Linked at 1981 Census	Died before Census	Embarked before Census	Not linked	
0-4	41,097	89.8	0.4	1.6	8.2	91.6
5-9	42,647	90.8	0.3	0.9	8.0	91.6
10-14	38,540	88.4	0.3	0.7	8.0	91.9
15-19	34,784	86.9	0.7	1.8	10.6	89.1
20-24	38,146	87.3	0.6	2.3	9.8	89.9
25-29	33,094	88.3	0.8	2.1	8.7	91.0
30-34	30,147	88.4	1.2	1.8	8.6	91.1
35-39	29,516	89.4	2.1	1.2	7.3	92.5
40-44	30,906	88.6	3.8	0.8	6.8	92.9
45-49	33,167	86.8	6.7	0.4	6.6	92.8
50-54	30,759	82.1	10.5	0.4	7.0	92.1
55-59	32,475	73.8	16.6	0.7	8.9	89.2
60-64	29,770	68.5	25.2	0.7	5.6	92.4
65-69	25,513	56.9	37.3	0.4	5.4	91.4
70-74	18,539	43.6	51.3	0.4	4.6	90.4
75-79	12,257	28.6	67.1	0.3	4.0	87.8
80-84	7,270	15.1	81.8	0.1	3.0	83.9
85-89	3,209	6.3	91.9	<0.1	1.7	78.4
90+	1,045	2.2	95.5	-	2.3	48.9
All	512,881	79.6	11.5	1.1	7.8	91.1

* The denominator for the percentage linkage success rate is those members present at the 1971 Census minus deaths and embarkations from the sample before the 1981 Census.

Among persons aged under 10 in 1971 (aged 10 – 19 in 1981), 89.8 per cent of 0–4 year olds, and 90.8 per cent of 5–9 year olds were found at the 1981 Census. Less than 1 per cent of each age group had died and less than 2 per cent had emigrated during the intercensal period. Over 91 per cent of these two age groups were successfully forward linked.

In the next three age groups, 10–14, 15–19 and 20–24 (aged 20–34 in 1981), the percentages enumerated at the 1981 Census were 88.4 per cent for those aged 10–14, 86.9 per cent for those aged 15–19 and 87.3 per cent for those aged 20–24 in 1971. These age groups comprised the younger, mobile working population and had the highest rates of non-linkage (9.8 per cent to 10.6 per cent) among the LS population. The percentage emigrating between the Censuses was also higher than most other age groups. Successful forward linkage rates ranged from 89.1 to 89.9 per cent.

Among the elderly (75 and over in 1971) deaths occurring intercensally accounted for much of the loss in this section of the sample by 1981. Only 28.6 per cent of the 75–79 age group, 15.1 per cent of the 80–84 age group, 6.3 per cent of the 85–89 age group and 2.2 per cent of those aged

90 and over in 1971 were found at the 1981 Census. Losses due to deaths ranged from 67.1 per cent of 75–79 year olds to 95.5 per cent of those aged 90+. However, the success rate for forward linkage dropped quite substantially and fell as low as 48.9 per cent for the very old (90+ in 1971, 100+ in 1981). In this group 2.3 per cent were not linked. This suggests that approximately 2 per cent of deaths among the very old were missed probably due to inconsistent reporting of dates of birth.²

5.2.2.3 Marital status

In 1971, out of the sample of 512,881 traced persons 41 per cent were single, 51 per cent were married, 7 per cent were widowed and 1 per cent divorced (see Table 5.3). In 1981, 85.7 per cent of those single in 1971 were found at Census. Among those who were married in 1971, 79.4 per cent were enumerated at the 1981 Census. Out of the total number of persons who were widows and widowers in 1971, 48 per cent had died before 1981 and a further 46.5 per cent of them were found in 1981. Of those whose marital status was given as divorced at the 1971 Census, 76 per cent were found in the 1981 Census. Forward linkage success rates were highest among the married (92.1 per cent) and lowest among the divorced (88.2 per cent).

Table 5.3 Forward linkage rates between 1971 and 1981 Censuses - sample members traced at NHSCR by marital status at the 1971 Census

Marital status in 1971	Members present in 1971	Position in 1981 (per cent)				Linkage success rate per cent*
		Linked at 1981 Census	Died before Census	Embarked before Census	Not linked	
Single	207,953	85.7	3.5	1.4	9.4	90.1
Married	264,218	79.4	12.8	1.0	6.8	92.1
Widowed	35,834	46.5	48.0	0.5	5.1	90.2
Divorced	3,705	76.0	12.8	1.0	10.2	88.2
All	512,881	79.6	11.5	1.1	7.8	91.1

* The denominator for the percentage linkage success rate is those members present at the 1971 Census minus deaths and embarkations from the sample before the 1981 Census.

Table 5.4 Forward linkage rates between 1971 and 1981 Censuses - sample members traced at NHSCR by household composition at the 1971 Census

Household composition in 1971	Members present in 1971	Position in 1981 (per cent)				Linkage success rate per cent*
		Linked at 1981 Census	Died before Census	Embarked before Census	Not linked	
Living in private household	495,211	80.3	11.0	1.1	7.6	91.4
Living in communal establishment	7,672	49.8	34.3	2.5	13.5	78.7
Visitor	9,998	67.5	17.7	2.0	12.9	84.0
All	512,881	79.6	11.5	1.1	7.8	91.1

* The denominator for the percentage linkage success rate is those members present at the 1971 Census minus deaths and embarkations from the sample before the 1981 Census.

5.2.2.4 Household composition

In the 1971 traced LS sample 495,211 persons were enumerated as living in private households where they were usually resident, 7,672 in communal establishments and the remaining 9,998 were visitors either to private households or to communal establishments. Table 5.4 shows that 80.3 per cent of 1971 LS members living in private households, 49.8 per cent of those living in communal establishments, and 67.5 per cent of visitors were enumerated in the 1981 Census. The forward linkage rate for those living in private households in 1971 was 91.4 per cent compared with the far less successful linkage rate of 78.7 per cent for those living in communal establishments.

5.2.2.5 Position of LS members in the household

Table 5.5 shows the forward linkage rates for LS members by their position in the household in 1971. The highest successful forward linkage rates between the 1971 and 1981 Censuses were found among married couples, both with and without children. The rates ranged from 91.9 per cent for a wife in a married couple without dependent children to 92.8 per cent for husbands and wives in married couples with dependent children. The lowest forward linkage success rate (86.5 per cent) was found among children living with lone fathers.

5.2.2.6 Tenure

The linkage success rate for traced LS members by tenure in 1971, ranged from 92 per cent among local authority

tenants to 79 per cent among those in furnished rented accommodation. Persons in furnished rented accommodation had the highest rates of non-linkage between the two censuses at 18.9 per cent (see Table 5.6).

5.2.2.7 Household size

Table 5.7 shows the linkage rates for LS members by household size in 1971. The highest forward linkage rates were found among households whose size was between 3 and 6 persons in 1971 (mainly families with children) and among 2 person households (91.9 per cent and 91.5 per cent respectively). The lowest forward linkage rate at 87.1 per cent was found among households containing 7 or more persons.

5.2.2.8 Country of birth

Successful forward linkage rates by country of birth of LS member as stated at 1971 Census ranged between 92.3 per cent and 60.5 per cent (see Table 5.8). LS members who stated their country of birth as England or Wales had the highest forward linkage rates (92.3 and 91.8 per cent respectively). The lowest forward linkage rates were found among members who had stated their country of birth as the USA (60.5 per cent), the Caribbean Commonwealth (69 per cent), the Old Commonwealth (71 per cent), the Irish Republic (71 per cent) and Ireland — part not stated (72.6 per cent). The number of LS members who did not state their country of birth in the 1971 Census was 2,009.

Table 5.5 Forward linkage rates between 1971 and 1981 Censuses - sample members traced at NHSCR by position of LS member in the household at the 1971 Census

Position in household in 1971	Members present in 1971	Position in 1981 (per cent)				Linkage success rate per cent*
		Linked at 1981 Census	Died before Census	Embarked before Census	Not linked	
Husband in married couple with dependent children	60,570	87.2	4.6	1.3	6.8	92.8
Husband in married couple without dependent children	65,765	66.5	27.3	0.7	5.6	92.3
Wife in married couple with dependent children	59,535	90.1	1.9	1.0	7.0	92.8
Wife in married couple without dependent children	65,355	77.7	14.8	0.6	6.8	91.9
Lone Father	1,049	78.7	9.3	1.0	10.0	87.8
Lone Mother	4,558	85.7	3.8	1.1	9.4	90.1
Children in married couple family	119,532	90.0	0.4	1.2	8.4	91.5
Children with lone father	1,684	85.3	0.4	0.9	13.4	86.5
Children with lone mother	8,122	85.8	0.5	1.0	12.8	87.0
Others	109,041	69.8	20.3	1.3	8.6	89.1
All	512,881	79.6	11.5	1.1	7.8	91.1

* The denominator for the percentage linkage success rate is those members present at the 1971 Census minus deaths and embarkations from the sample before the 1981 Census.

Table 5.6 Forward linkage rates between 1971 and 1981 Censuses - sample members traced at NHSCR by tenure at the 1971 Census

Tenure in 1971	Members present in 1971	Position in 1981 (per cent)				Linkage success rate per cent†
		Linked at 1981 Census	Died before Census	Embarked before Census	Not linked	
Owner-occupied	257,900	81.4	10.3	1.2	7.2	91.9
Local authority	153,030	81.4	10.9	0.6	7.1	92.0
Rented furnished	16,052	71.2	5.2	4.7	18.9	79.0
Rented unfurnished	72,942	76.0	15.3	0.9	7.8	90.7
All*	499,924	80.3	11.0	1.1	7.6	91.3

* Excludes 12,828 persons who were resident in non-private establishments in 1971; 128 persons were also excluded as they did not state tenure.

† The denominator for the percentage linkage success rate is those members present at the 1971 Census minus deaths and embarkations from the sample before the 1981 Census.

Table 5.7 Forward linkage rates between 1971 and 1981 Censuses - sample members traced at NHSCR by household size at the 1971 Census

Household size in 1971	Members present in 1971	Position in 1981 (per cent)				Linkage success rate per cent†
		Linked at 1981 Census	Died before Census	Embarked before Census	Not linked	
1	31,357	56.0	35.5	0.9	7.6	88.0
2	111,323	69.8	22.9	0.8	6.5	91.5
3 - 6	325,357	85.9	5.4	1.1	7.5	91.9
7+	31,528	83.7	2.7	1.3	12.4	87.1
All*	499,514	80.3	11.0	1.1	7.6	91.3

* Excludes 13,154 persons not enumerated as in households. Of these 12,828 were resident in communal establishments and a further 538 were either domestic servants or were in temporarily rented accommodation such as holiday flats which are listed as with no known usual residents.

† The denominator for the percentage linkage success rate is those members present at the 1971 Census minus deaths and embarkations from the sample before the 1981 Census.

5.2.2.9 Economic activity

Forward linkage rates by economic activity are shown in Table 5.9. The overall forward linkage rate for LS members by economic activity as stated in 1971 was 91.1 per cent. Successful forward linkage rates ranged from a high of 91.8 per cent for housewives and those of independent means, to a low of 85.9 per cent for the unemployed.

5.2.2.10 Social class

The social class of a member of the LS sample is based on 'own' social class. Only those aged over 15 in the 1971 sample were given a social classification. Children (aged less than 15 and economically inactive in 1971) were classified as 'not applicable'. For a description of the social class definitions used, and the changes to those definitions between censuses, see Chapter 4, section 4.4.5.

Details of an individual LS member's social class are only available for 71 per cent of those present at the 1971 Census.

The remaining 29 per cent were either 'inadequately described' or the social class classification was deemed 'not applicable'. The 118,849 LS members who were classified as 'not applicable' (aged under 15 and economically inactive in 1971) are excluded from Table 5.10 which shows linkage rates by social class in 1971.

Among those LS members traced at NHSCR in 1971, with either a social class given or defined as 'students, housewives, permanently sick or those with independent means', the successful forward linkage rates ranged between 81.5 per cent and 92.6 per cent. Forward linkage was most successful for members classed as IIIN (92.6 per cent) and II (90.6 per cent). It was least successful for those classified as 'armed forces' (81.5 per cent) or as Social Class V (89 per cent). Where the social class of LS members was 'inadequately described' only 88.2 per cent could be forward linked. Of this group only 49.4 per cent were present at the 1981 Census, 43.4 per cent of them having died in the intercensal period.

Table 5.8 Forward linkage rates between 1971 and 1981 Censuses - sample members traced at NHSCR following the 1971 Census by country of birth

Country of birth as given at 1971	Members present in 1971	Position in 1981 (per cent)				Linkage success rate per cent*
		Linked at 1981 Census	Died before Census	Embarked before Census	Not linked	
England	439,176	80.9	11.6	0.8	6.7	92.3
Wales	30,388	79.9	12.5	0.5	7.2	91.8
Scotland	7,702	76.5	12.4	1.0	10.1	88.4
N. Ireland	2,163	70.5	11.7	3.0	14.8	82.7
Other UK	295	73.2	12.2	2.4	12.2	85.7
Irish Republic	6,261	63.2	13.2	3.7	19.9	71.0
Ireland (part not stated)	947	61.1	8.3	5.5	25.0	72.6
Europe (including USSR)	7,780	65.6	11.7	4.6	18.1	78.3
Mediterranean Commonwealth	1,410	66.6	5.2	3.0	25.1	72.6
African Commonwealth	1,678	67.0	2.0	4.4	26.5	71.7
Far Eastern Commonwealth	810	68.4	2.3	6.0	23.2	74.7
Caribbean Commonwealth	3,075	63.5	3.4	4.7	28.5	69.0
Pakistan & Bangladesh	1,920	64.2	2.2	9.6	23.9	72.9
India	4,192	70.9	5.9	4.3	18.9	78.9
Rest of New Commonwealth	162	69.8	6.8	2.5	21.0	76.9
Old Commonwealth	1,267	58.5	7.9	9.7	23.9	71.0
USA	637	45.7	8.3	16.2	29.8	60.5
Rest of the World	1,009	62.4	11.5	6.6	19.4	76.3
Not Stated	2,009	58.9	19.1	4.1	17.9	76.7
All	512,881	79.6	11.5	1.1	7.8	91.1

* The denominator for the percentage linkage success rate is those members present at the 1971 Census minus deaths and embarkations from the sample before the 1981 Census.

Table 5.9 Forward linkage rates between 1971 and 1981 Censuses - sample members traced at NHSCR following the 1971 Census by economic activity in 1971

Economic activity in 1971	Members present in 1971	Position in 1981 (per cent)				Linkage success rate per cent†
		Linked at 1981 Census	Died before Census	Embarked before Census	Not linked	
In employment	229,152	83.9	7.1	1.2	7.7	91.6
Out of employment - short term sick	2,744	64.0	26.0	0.8	9.2	87.5
Out of employment - other	8,861	77.2	8.7	1.4	12.6	85.9
Retired	51,417	41.1	54.1	0.4	4.4	90.2
Permanently sick	4,453	52.1	40.3	0.2	7.4	87.6
Student	17,781	83.8	0.6	2.6	13.0	86.6
Other inactive (housewives & those of independent means)	79,624	78.4	13.7	0.8	7.0	91.8
All*	394,032	76.6	14.8	1.1	7.5	91.1

* Excludes 118,849 LS members who were economically inactive and aged under 15 in 1971.

† The denominator for the percentage linkage success rate is those members present at the 1971 Census minus deaths and embarkations from the sample before the 1981 Census.

Table 5.10 Forward linkage rates between 1971 and 1981 Censuses - sample members traced at NHSCR following the 1971 Census by social class in 1971

Social class in 1971	Members present in 1971	Position in 1981 (per cent)				Linkage success rate per cent†
		Linked at 1981 Census	Died before Census	Embarked before Census	Not linked	
I	9,406	80.4	8.9	2.8	8.0	91.0
II	45,918	79.0	12.5	1.3	7.3	91.6
IIIN	54,662	83.7	8.6	1.1	6.7	92.6
IIIM	73,865	79.1	12.9	1.1	6.8	92.0
IV	54,204	77.5	13.7	1.0	7.8	90.9
V	20,888	72.0	18.2	0.9	8.9	89.0
Armed Forces	2,087	76.4	4.8	1.5	17.3	81.5
Students, housewives, the permanently sick & those with independent means	101,867	78.2	12.6	1.1	8.1	90.6
Inadequate description	31,135	49.4	43.4	0.6	6.6	88.2
All*	394,032	76.6	14.8	1.1	7.5	91.1

* Excludes 118,849 LS members present in 1971 where the Social Class was recorded as 'not applicable' (economically inactive and aged under 15 in 1971)

† The denominator for the percentage linkage success rate is those members present at the 1971 Census minus deaths and embarkations from the sample before the 1981 Census.

5.2.3 Inconsistencies and double enumerations

Among the 415,001 LS members who were found in both the 1971 and 1981 Censuses both inconsistencies of response to census questions and some cases of double enumeration occurred. The three variables which would be expected to remain constant between two censuses are date of birth, sex and country of birth. As Table 5.11 shows, 14,232 LS members quoted dates of birth with inconsistencies large enough to change their ages in completed years, 1,360 members had recorded a different sex at each census and 1,764 members had discrepancies in their country of birth. There appear to be three reasons for these discrepancies, census form completion error, punching error or an error when the census auto-edit routines were applied to impute missing values (in 1981 only).

Some cases of an impossible change in marital status were also found at the 1981 Census, with 1,229 LS members reverting to single in 1981 when they had been recorded as married, widowed or divorced in 1971.²

The 1981 Census recorded both visitors to households and absent residents, unlike the 1971 Census where absent residents had not been enumerated (see Chapter 4, section 4.4.2 for a discussion of the differences in population coverage). As a result, in 1981 a person could be counted twice, first at their address of enumeration and second at their address of usual residence. In the 1981 Census, 4,300 LS members were returned as enumerated at two addresses. Double enumerations of LS members in the 1971, 1981 and 1991 Censuses are described in detail in Appendix XIV.

Table 5.11 Inconsistencies between the 1971 and 1981 Censuses

Characteristics in 1971 Census	Characteristic in 1981 Census		Per cent with discrepancy
	Consistent with 1971	Inconsistent with 1971	
Sex			
Persons	413,641	1,360	0.3
Male	199,226	578	0.3
Female	214,415	782	0.4
Country of birth			
All countries	413,237	1,764	0.4
England	359,303	294	0.1
Wales	24,669	24	0.1
Scotland	6,056	24	0.4
Northern Ireland	1,452	132	8.3
Irish Republic	3,962	244	5.8
India	3,025	184	5.7
Pakistan & Bangladesh	1,277	104	7.6
Caribbean Commonwealth	1,993	113	5.4
African Commonwealth	1,118	96	7.9
Age			
All ages	400,769	14,232	3.4
Under 10	73,880	2,314	3.0
10-24	96,389	2,515	2.5
25-59	184,937	6,477	3.4
60-74	41,345	2,228	5.1
75+	4,218	698	14.2

Source: OPCS Census 1971-1981, *The Longitudinal Study: linked census data, England and Wales*. OPCS Series CEN 81 LS, HMSO (London 1988).

5.2.4 Linkage failures

As shown in Figure 5.4, 39,894 LS members who were enumerated in the 1971 Census and traced at NHSCR were not found in the 1981 Census. No record of either a death or emigration in the intercensal period existed for these people. A further 278 persons were found after the completion of the 1981 Census-LS link, reducing linkage failures to 39,616.

Although all these people were recorded in the 1971 Census with an LS date of birth, 9,700 of them were subsequently discovered to have a different date of birth in the NHS Central Register. The remaining 29,916 unmatched cases that did not have a date of birth discrepancy were

Table 5.12 Unmatched cases: postings at NHSCR

All unmatched cases with no date of birth discrepancy	Sample number 397	Grossed-up number 29,916
Status at NHS Central Register		
Death since 1981 Census	24	1,800
Cancelled cipher	14	1,100
No postings	7	500
Under service medical care	6	400
Northern Ireland	3	200
Isle of Man	1	100
No visible explanation at NHSCR	342	25,800

Source: OPCS. *Census 1971–1981, The Longitudinal Study: linked census data, England and Wales*. OPCS Series CEN 81 LS, HMSO (London 1988).

Table 5.13 Investigations of 1981 Census forms for addresses relating to unmatched cards

Total queries referred to 1981 Census form	1971 Census	
	Sample number 342	Census grossed-up 25,800
Not LS date of birth on 1981 Census form	60	4,500
LS date of birth on 1981 Census form but not selected; probable keying error	33	2,500
Date of birth not given on Census form - or incomplete	11	800
LS date of birth on 1981 Census form but failed match (including change of name)	10	700
Dummy form with LS person's surname	17	1,300
Dummy form with someone else's name or no name given	26	2,000
Person not on form	154	11,600
LS member mentioned on Panel B but not on form	2	200
Census form not found	21	1,600
No address from FPC	8	600

Source: OPCS. *Census 1971–1981, The Longitudinal Study: linked census data, England and Wales* OPCS Series CEN 81 LS, HMSO (London 1988).

investigated at NHSCR. A sample of 397 records was taken from the 29,916 (1.3 per cent) and examined using NHSCR postings data.² Six per cent (24) of the cases were found to belong to members who had died following Census day, 8 per cent (31) to cases who had left the NHS either by emigration or by enlisting in the armed services, and the remaining 86 per cent (342 cases) required further investigation (see Table 5.12). NHSCR wrote to the relevant FPCs for the remaining 342 cases requesting their address at the time of the 1981 Census. The 1981 Census schedules for those addresses were then examined for reasons for the linkage failures. The results of this investigation are shown in Table 5.13.

In approximately 20 per cent of cases the date of birth given on the 1981 Census form was found either not to be an LS date of birth, to be missing or incomplete. Ten per cent of cases that had an LS date of birth were not selected into the 1981 LS sample probably due to inaccurate punching of the date of birth information at 1981 Census. In 45 per cent of cases the LS person was not included on the 1981 Census form at all. Twelve per cent of cases were found on dummy forms which were issued when a household's census schedule was not returned. Dummy forms were completed by the census enumerators when they could not find any members of a household present and could not obtain a completed schedule. The information on these forms was of the most basic kind and only included the name of the householder (if known), address of the dwelling and the number of rooms. The enumerator collected this data from other local informants (such as neighbours).

A summary of the results is given in Table 5.14. The most common reason for linkage failure is inconsistent reporting of date of birth (found in 37 per cent of linkage failures).

Table 5.14 Reasons for linkage failure

Reasons for linkage failure	1971 Census sample traced at NHSCR
Number believed to be still in sample in 1981 and not found in Census	39,616
Date of birth discrepancy between 1971 Census and NHSCR	9,700 (24%)
Date of birth discrepancy between 1971 Census and 1981 Census	5,300 (13%)
NHSCR postings indicate person no longer resident in England and Wales	2,300 (6%)
Household at person's usual address not enumerated in the 1981 Census	3,000 (8%)
Person not on form at usual address at 1981 Census	11,800 (30%)
Clerical or linkage error	3,200 (8%)
Still unexplained	4,000 (10%)

Source: OPCS. *Census 1971–1981, The Longitudinal Study: linked census data, England and Wales*. OPCS Series CEN 81 LS, HMSO (London 1988).

5.3 THE 1991 CENSUS–LS LINK

Government approval for the 1991 Census–LS link was obtained in July 1988. The planning of the link started in December of that year and work on the link itself in late 1991.

Initially two options were considered for performing the link, one manual, the other a computer-based system taking advantage of the CHRIS database at NHSCR. It was decided to proceed with the manual system (as was done for the 1981 Census–LS link) rather than use a computerised linkage system which would have posed problems of confidentiality.

As with the 1981 Census–LS link, listings of the 1991 Census schedules containing persons with LS dates of birth were produced. The relevant schedules were extracted and 100 per cent coding of ‘hard-to-code’ items was undertaken. Unlike 1981 all ‘hard-to-code’ items were fully coded.

5.3.1 The 1991 Census extract

The first stage of the 1991 Census extract involved extracting data from the 1991 GB Census households file for each household containing an LS member. Every person who was enumerated as usually resident in England and Wales (but not Scotland) at the 1991 Census and who gave an LS date of birth on the census form was considered a potential LS member and was allocated a 1991 LS number. It should be noted that though the potential LS member could not be ‘usually resident’ in Scotland they could have been enumerated there. As in 1981, the extract program produced three outputs, an extracted 1991 LS households file, a listing of all LS members included in that file and a set of 1991 LS index cards pre-printed with census schedule identification details. The cards were used to identify the relevant census schedules, and once they had been extracted, the name and address of the potential LS members were added to the index cards.

Once the index cards and listings had been cross-checked for any discrepancies the index cards were sent to NHSCR for matching and tracing. This part of the exercise was much faster and more efficient than the corresponding work that had been carried out for the 1981 Census–LS link. It was no longer necessary to pre-sort the cards into alphabetical order as they were checked against the CHRIS database, rather than against the clerical LS index and alphabetic registers used in 1981. The extracted census forms were then used by Census Division for coding of the ‘hard-to-code’ items.

5.3.2 Additional coding of 1991 Census schedules

As in 1981, all census schedules for LS members and their households which had not been included in the Census 10 per cent sample were extracted. The ‘hard-to-code items’ were then coded to the 100 per cent level. The items that

required this additional coding in 1991 were ‘relationship to head of household’, ‘hours worked’, ‘occupation’, ‘industry’, ‘workplace’, ‘journey to work’ and ‘higher qualifications’.

5.3.3 The matching process — the effect of computerisation at NHSCR

The introduction of the CHRIS system at NHSCR both simplified and improved the rate of matching the 1991 LS index cards. Before computerisation the basic procedures for matching and tracing for the 1981 Census–LS link were manual. The 1981 LS index cards had been matched against the LS live (and dead) index cards and traced using both the alphabetical index and the Central Register. After computerisation both initial matching and tracing could be done using CHRIS.

In the 1991 Census–LS link the procedures used for matching and tracing were as follows. Each LS index card was checked against the computerised Central Index to see if there was an entry for that particular LS member. The LS member’s NHS number was then transcribed onto the card together with any pre–1991 LS number shown on the CHRIS entry. If no previous LS number existed, or if there was no entry on CHRIS, the old LS index and the main clerical alphabetical indexes and registers were searched for a match and/or trace. If the problems still could not be resolved then the cards were checked against the 1991 Census schedules for possible transcription errors. If additional information was found the corrected cards were sent back to NHSCR for further attempts at tracing.

5.3.3.1 Matched 1991 England and Wales sample index cards

Out of the initial 553,722 cards sent to NHSCR, 511,780 (92.4 per cent) were matched with an existing LS number. Each batch of matched cards was returned to OPCS for further processing.

5.3.3.2 Unmatched 1991 England and Wales sample index cards

If the 1991 LS index card could not be matched with an existing LS number then, as in 1981, a number of different methods were used to attempt to match and trace the card.

- (i) If the card was for a potential LS member who was either born after the 1981 Census or immigrated after that date, their entry on the CHRIS system should have been flagged as ‘LS’. However, some new births and immigrants are missed from the intercensal updating of events and eventually become part of the new entrant intake at a census. There were 17,890 members (3.23 per cent) who were new entrants to the LS with 1991 LS numbers and had to be flagged as such on the NHSCR database. It should be noted that all these members had NHS numbers and were therefore traced. These cards were then processed as new LS members.

- (ii) Where the 1991 LS index cards could not be matched with any entry on the CHRIS system, the manual LS indexes were used. In some cases the cards were matched to pre-1991 cards in the LS no trace index and their 1971 and/or 1981 LS numbers were added to the cards. On further investigation 213 were found to have an NHS number and were added to the matched and traced set of LS members. Another 273 cards were also matched in the LS no trace index but no NHS number could be found for these members. Once a match had been found and the cards annotated with their earlier numbers they were returned to OPCS.
- (iii) Where 1991 index cards could not be matched and the NHS number could not be traced they were returned to OPCS for investigation. The unmatched and untraced category stood at 8,968 cards (1.65 per cent of the total).

5.3.3.3 Corrections — the verification process

In 1991, as in 1981, when cards were returned to OPCS for verification the most common errors were found to be errors in the names and addresses. Additional information was added to the cards giving the previous name (if there had been any change), address one year previously, details of other family members, correct spelling of names and date of birth. Once the additional information had been added, the cards were returned to NHSCR for attempted matching against entries on the CHRIS system.

Multiple enumerations were identified and simple Absent Usual Resident/Visitor pairs were resolved. Complex multiple enumerations were resolved into primary LS member records and secondary records by reference to the appropriate census forms and with the assistance of NHSCR. Complex multiple enumerations are discussed in detail in Appendix XIV.

5.3.3.4 Final processing and the addition of the 1991 LS sample to the Model 204 LS database

When the processing of the extracted census 100 per cent coded variables was complete, the now fully coded 10 per cent variables, derived area codes and country of birth codes were added to the file. The extract file was then loaded into the four 1991 Census files in the LS database. These files were the 1991 Census–LS members file, the 1991 Census–LS members households file (containing details of non-LS members in the households), the 1991 Census–LS absent members file and finally a file holding details of the absent members households.

5.4 MATCH AND TRACE CATEGORIES

In 1981 the match and trace categories, known as tracing history indicators, were fairly simple, consisting of 17 separate codes. After the 1991 Census the codes had to be

expanded to include LS members present at the 1991 Census who may, or may not, have been present at the previous censuses. Twenty two codes were defined for 1991 which were then combined with the 1981 codes to give full tracing histories. The valid combined codes totalled 114 in number and are given, together with a full description of their meanings, in Appendix XIII.

5.5 THE QUALITY OF THE 1981–1991 CENSUS–LS LINKAGE

At the time of the 1981 Census 536,243 LS members were enumerated as resident in England and Wales. Cleaning before and during the creation of the LS database reduced this figure to 535,862 LS members. At the 1991 Census a sample of 543,884 LS members were enumerated. A total of 98.8 per cent of the 1981 LS sample and 98.3 per cent of the 1991 LS sample had been traced at NHSCR by the time of the 1991 Census–LS link. Intercensal population change due to deaths, emigrations, immigrations and new births affected the size of the LS sample in 1991. Figure 5.5 shows the components of the Longitudinal Study population at the 1991 Census–LS link.

Of the 530,248 traced LS members present at the 1981 Census, 420,267 were found and linked at the 1991 Census. A further 225 untraced LS members were linked in 1991 giving the total number of members who were found in both censuses as 420,492. Intercensally 58,931 traced LS members had died, and 4,398 were known to have emigrated from England and Wales. Of the traced LS members who had been present at the 1981 Census, 46,652 (8.8 per cent) were not found at the 1991 Census. There was no record of a death or emigration occurring before the 1991 Census for these persons.

5.5.1 Forward and backward linkage (1981-1991)

Forward and backward linkage have been used to examine the quality of entry and exit information. Both forward linkage (from the 1981 Census forward to the 1991 Census) and backward linkage (from the 1991 Census backward to the 1981 Census) should logically give the same sample size but differences in the accuracy of recording deaths, emigrations, immigrations and new births ensure that this is not so. Table 5.15 shows both forward and backward linkage of the 1981 and 1991 Census–LS samples.

Among the sample of 530,248 LS members present at the 1981 Census who were traced by 1991, 466,918 persons were eligible to be forward linked into the 1991 Census sample. Only 90 per cent (420,267) of those eligible were in fact linked. Using backward linkage, the 1991 Census sample of 534,647 traced persons was reduced to 460,984 LS members after the subtraction of intercensal births and immigrations into the sample. However, only 420,267 of those members had been recorded in the 1981 Census giving a backward linkage rate of 91.2 per cent.

Figure 5.5 Component parts of the Longitudinal Study population, 1991 Census - LS link

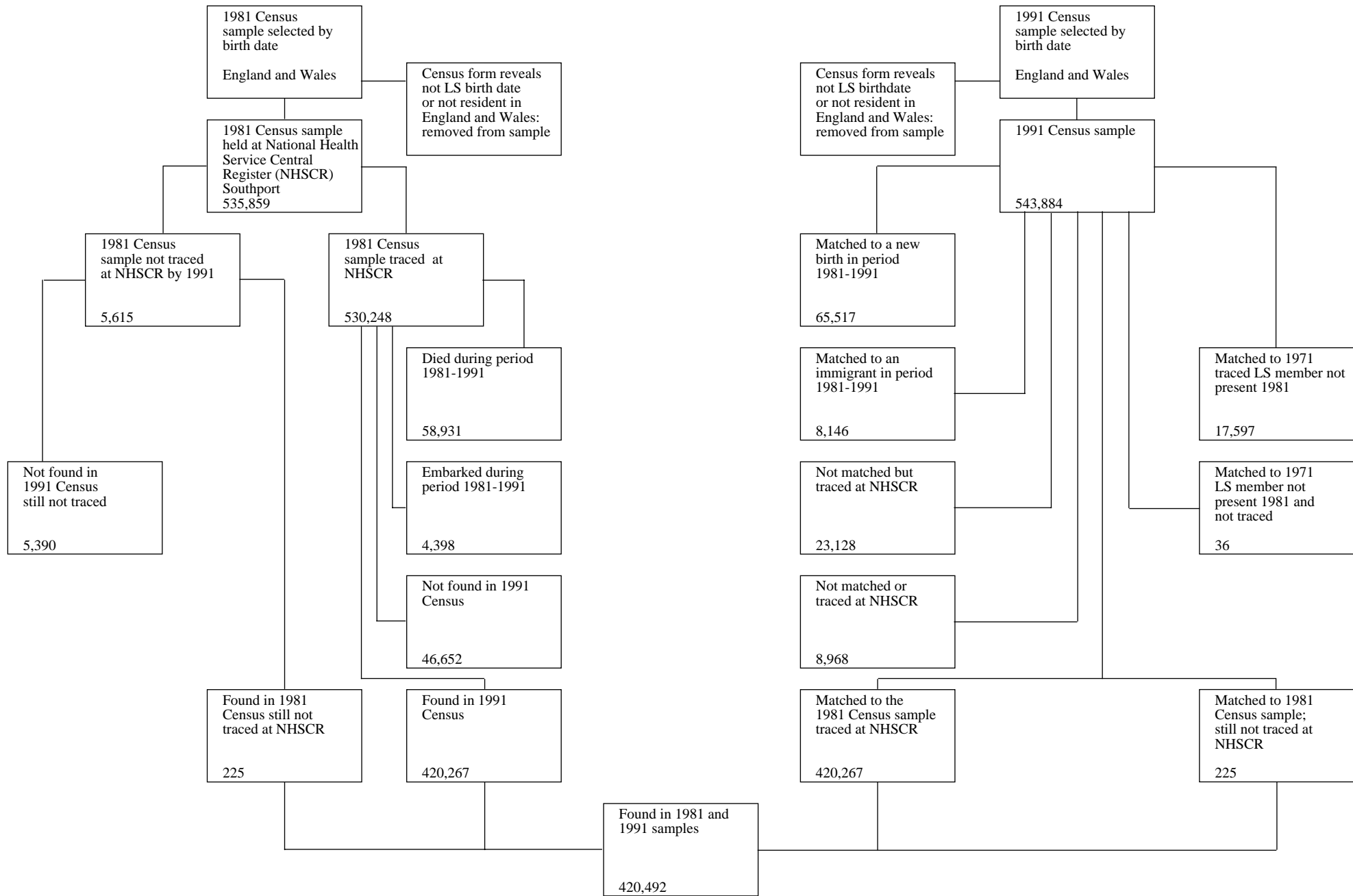


Table 5.15 1981 and 1991 LS-Census samples: forward and backward linkage

Forward Linkage	Number	Backward Linkage	Number
1981 Census sample*	530,248	1991 Census sample†	534,647
Died before 1991 Census	58,931	Born after 1981 Census	65,517
Embarked before 1991 Census	4,399	Immigrant after 1981 Census‡	8,146
Eligible to be in 1991 Census	466,918	Should have been in 1981 Census	460,984
Recorded in 1991 Census	420,267	Recorded in 1981 Census	420,267
Forward linkage rate	90.0%	Backward linkage rate	91.2%

* Traced at NHSCR prior to 1991 Census

† Traced at NHSCR.

‡ Immigrant to England and Wales, includes persons resident in Scotland in 1971.

Table 5.16 Forward linkage rates between 1981 and 1991 Censuses - sample members traced at NHSCR following the 1981 Census by sex in 1981

Sex in 1981	Members present in 1981	Position in 1991 (per cent)				Linkage success rate per cent*
		Linked at 1991 Census	Died before Census	Embarked before Census	Not linked	
Male	258,010	78.1	11.2	0.8	9.8	88.8
Female	272,238	80.3	11.0	0.8	7.8	91.1
All	530,248	79.3	11.1	0.8	8.8	90.0

* The denominator for the percentage linkage success rate is those members present at the 1981 Census minus deaths and embarkations from the sample before the 1991 Census.

The inability to link 46,652 traced members from the 1981 sample in 1991, may be partially explained by census under-enumeration, unreported intercensal emigrations and discrepancies in the recording of LS member's birthdates in the 1991 Census. It is not possible to measure the contribution of each factor to the loss. However, it is believed that approximately two thirds of emigrations from England and Wales by LS members were missed between 1981 and 1991. This is discussed further in Chapter 7.

Among the 40,725 LS members found in 1991 who should have been in the 1981 Census but were not, 17,597 had been present in 1971, missed the 1981 Census and were sampled again in 1991. The remaining 23,128 were either genuine new entrants who had not been present at the 1971 and 1981 Censuses and were not second decade new births or immigrants, or were examples of discrepant recording of birthdates.

5.5.2 Linkage rates

Tables 5.16 to 5.25 show forward linkage rates for traced members of the 1981 LS sample at the 1991 Census. The linkage success rate is based on those members who were known to have neither died nor emigrated during the intercensal period. The overall linkage success rate for the sample was 89 per cent. This was slightly lower than the 91 per cent linkage success rate found for the 1971 sample at the 1981 Census.

The 1981–1991 forward linkage rates are examined in some detail below. As with the 1981 Census-LS link, certain groups show more 'loss to follow-up' than others. These groups include LS members in the younger age groups (aged 10-19 in 1981, 20-29 in 1991), those who were single in 1981, persons living in communal establishments or in furnished accommodation in 1981, students and those whose birthplace was given as outside England and Wales.

The forward linkage rates for the traced LS sample for 1981–1991 are summarised below. They are examined by sex, age, marital status, household composition, tenure, household size, country of birth, economic activity and social class. Eight records were excluded from Tables 5.17, 5.18, 5.19 and 5.23 as they were known to be incomplete and did not contain a full set of Census variables.

5.5.2.1 Sex

The 1981 sample of 530,248 traced LS members was made up of 258,010 males and 272,238 females (see Table 5.16). Seventy-eight per cent of the males and 80 per cent of the females in the 1981 sample were also found at the 1991 Census. After excluding losses from deaths and emigrations in the intercensal period, the forward linkage rate was 88.8 per cent for males and 91.1 per cent for females.

Table 5.17 Forward linkage rates between 1981 and 1991 Censuses - sample members traced at NHSCR by age at the 1981 Census

Age-group at 1981	Members present in 1981	Position in 1991 (per cent)				Linkage success rate per cent*
		Linked at	Died before 1991 Census	Embarked Census	Not linked before Census	
0-4	31,855	90.5	0.2	1.2	8.1	91.8
5-9	35,101	89.2	0.2	1.0	9.5	90.4
10-14	41,240	83.8	0.4	0.7	15.0	84.8
15-19	43,450	83.7	0.6	0.8	14.9	84.9
20-24	39,421	85.8	0.6	1.1	12.5	87.3
25-29	36,274	87.2	0.7	1.2	10.8	89.0
30-34	39,824	89.1	1.0	1.2	8.6	91.2
35-39	34,013	89.3	1.6	1.0	8.0	91.7
40-44	30,575	88.5	2.9	0.7	7.8	91.9
45-49	29,771	87.4	4.9	0.5	7.1	92.5
50-54	30,474	84.3	9.0	0.6	6.1	93.3
55-59	31,272	79.1	14.7	0.7	5.6	93.4
60-64	27,688	72.0	22.2	0.7	5.1	93.4
65-69	26,955	60.5	32.5	0.6	6.3	90.5
70-74	22,231	48.3	47.0	0.4	4.2	92.0
75-79	15,835	33.0	63.1	0.3	3.6	90.3
80-84	8,878	19.0	78.1	0.2	2.7	87.5
85-89	3,865	8.2	90.0	0.1	1.7	83.0
90+	1,518	3.6	94.8	0.3	1.4	72.0
All	530,240	79.3	11.1	0.8	8.8	90.0

* The denominator for the percentage linkage success rate is those members present at the 1981 Census minus deaths and embarkations from the sample before the 1991 Census.

5.5.2.2 Age

Table 5.17 shows the forward linkage rates for the sample by five-year age groups (as at the 1981 Census). At the 1981 Census the traced sample contained 108,196 persons aged under 15, 342,762 persons aged between 15 and 64 and 79,282 persons aged 65 or over. Among the very old LS members in the 1981 sample population, 1,518 were aged 90 or more.

The highest proportions of the 1981 sample members who were subsequently enumerated at the 1991 Census were those aged 9 and under in 1981 (10–19 in 1991), with 90.5 per cent of those aged between 0–4 years and 89.2 per cent of those aged 5–9 found in 1991. Less than 1 per cent of members in these age groups had died and less than 2 per cent were known to have emigrated intercentally. Successful forward linkage occurred in over 90 per cent of these two age groups. The percentages of members in the next three age groups (10–14, 15–19 and 20–24 in 1981) enumerated at the 1991 Census ranged from 83.8 per cent for the youngest group to 85.8 per cent for those aged 30

to 34. Loss to link between the two censuses was particularly high for these age groups, ranging from 12.5 per cent for those aged 20–24 in 1981 to 15 per cent for those aged 10–14 (20–24 in 1991). At the previous Census–LS link, loss to linkage was also found to be particularly high in these age groups (around 10 per cent).

Among the elderly population (aged 75 and over in 1981) only 33 per cent of the 75–79 age group, 19 per cent of the 80–84 age group, 8.2 per cent of the 85–89 age group and 3.6 per cent of those aged 90 or over in 1981 were enumerated at the 1991 Census. Deaths caused the most losses intercentally. By the 1991 Census 63.1 per cent of those aged 75–79 in 1981 had died, rising to 94.8 per cent of those who had been aged 90 or over in 1981. There was little loss to linkage in these age groups (between 1.4 and 3.6 per cent) but the linkage success rates dropped from over 87 per cent for the 75–79 age group to 72 per cent for those aged 90+. As the proportions of the very elderly emigrating intercentally were extremely small (less than 0.3 per cent), this suggests that some deaths may have been missed due to inconsistent reporting of birthdates.

5.5.2.3 Marital status

Out of the sample of 530,240 traced LS members at the 1981 Census, 40 per cent were single, 50 per cent married, 3 per cent divorced and 7 per cent widowed (see Table 5.18). The numbers found at the 1991 Census are as follows: 83.6 per cent of those LS members who were single in 1981, 80.5 per cent of those who were married, 78.5 per cent of those who were divorced and 46.6 per cent of those who were widowed. Among the group who were recorded as widow(er)s in 1981, 48.4 per cent had died intercensally. As at the 1981 Census–LS link, the highest forward linkage success rates were found among those who were married (92.3 per cent) and the lowest among those who were single in 1981 (87.3 per cent).

5.5.2.4 Household composition

Table 5.19 shows forward linkage rates for the traced LS sample by type of household. At the 1981 Census 512,377 LS members were enumerated as usually resident in private households, 7,318 in communal establishments and 10,545 as visitors to either private households or communal establishments. Eighty per cent of those resident in private households, 45.5 per cent in communal establishments and

68.4 per cent of visitors in 1981 were enumerated in the 1991 Census. The forward linkage success rate for those living in private households in 1981 was 90.3 per cent, far higher than the 76.1 per cent for those living in communal establishments.

5.5.2.5 Position of LS members in the household

Forward linkage rates for LS members by their position in the household in 1981 are shown in Table 5.20. As at the 1981 Census–LS link, the highest forward linkage success rates were found among married couples, both with and without children. These ranged from 93.5 per cent for married men with no dependent children in 1981 to 91.9 per cent for those (married men) with children. The lowest forward linkage rates were found among LS members living in communal establishments in 1981, shown as ‘other’ in the table, and children living in one parent families where the parent was the father.

5.5.2.6 Tenure

Table 5.21 shows the linkage success rate for traced LS members by their tenure in 1981. In 1991 those persons in

Table 5.18 Forward linkage rates between 1981 and 1991 Censuses - sample members traced at NHSCR by marital status at the 1981 Census

Marital status in 1981	Members present in 1981	Position in 1991 (per cent)				Linkage success rate per cent*
		Linked at 1991 Census	Died before Census	Embarked before Census	Not linked	
Single	211,977	83.6	3.3	0.9	12.1	87.3
Married	265,303	80.5	12.0	0.8	6.7	92.3
Widowed	38,178	46.6	48.4	0.3	4.7	90.9
Divorced	14,782	78.5	10.3	0.9	10.3	88.4
All	530,240	79.3	11.1	0.8	8.8	90.0

* The denominator for the percentage linkage success rate is those members present at the 1981 Census minus deaths and embarkations from the sample before the 1991 Census.

Table 5.19 Forward linkage rates between 1981 and 1991 Censuses - sample members traced at NHSCR by household composition at the 1981 Census

Household composition in 1981	Members present in 1981	Position in 1991 (per cent)				Linkage success rate per cent*
		Linked at 1991 Census	Died before Census	Embarked before Census	Not linked	
Living in private household	512,377	80.0	10.6	0.8	8.6	90.3
Living in communal establishment	7,318	45.5	39.0	1.2	14.3	76.1
Visitor	10,545	68.4	16.3	1.5	13.4	83.6
All	530,240	79.3	11.1	0.8	8.8	90.0

* The denominator for the percentage linkage success rate is those members present at the 1981 Census minus deaths and embarkations from the sample before the 1991 Census.

the sample who were owner-occupiers in 1981 had the highest forward linkage rates (91.3 per cent) and those in rented furnished accommodation the lowest (76.1 per cent). Loss to linkage between the 1981 and 1991 Censuses was highest among those in rented furnished accommodation (21.7 per cent).

5.5.2.7 Household size

Table 5.22 shows the forward linkage rates for LS members in 1991 by household size in 1981. It should be noted that 12,520 persons were excluded from this table as they were either resident in communal establishments or in temporary accommodation in 1981. The highest forward linkage rates were found among households consisting of two persons or between three and six persons in 1981 (91.7 and 90.3 per cent respectively). The lowest forward linkage rate

was found for households with 7 or more members (81.2 per cent).

5.5.2.8 Country of birth

Forward linkage rates by country of birth as stated at the 1981 Census are shown in Table 5.23. Successful forward linkage rates in 1991 ranged from 91.6 per cent for members who had given their country of birth as England to 65.5 per cent for those who had stated it as the USA. The lowest rates were found among those born in the USA (65.5 per cent), the Far Eastern Commonwealth (67.6 per cent) and the Rest of the World (67.4 per cent). This showed a change from the forward linkage rates in 1981 where the lowest rates were found amongst those born in the USA, the Caribbean Commonwealth and the Old Commonwealth.

Table 5.20 Forward linkage rates between 1981 and 1991 Censuses - sample members traced at NHSCR by position of the LS member in the household at the 1981 Census

Position in household in 1981	Members present in 1981	Position in 1991 (per cent)				Linkage success rate per cent*
		Linked at 1991 Census	Died before Census	Embarked before Census	Not linked	
Husband in married couple with dependent children	60,068	87.8	3.7	0.9	7.7	91.9
Husband in married couple without dependent children	65,362	68.2	26.1	0.7	5.0	93.5
Wife in married couple with dependent children	59,917	90.6	1.6	0.9	6.8	93.0
Wife in married couple without dependent children	66,138	78.8	14.4	0.7	6.1	92.8
Lone father	2,320	80.4	5.3	0.7	13.5	85.6
Lone mother	7,639	87.3	2.4	0.8	9.4	90.2
Children in married couple family	108,486	87.8	0.3	1.0	10.9	89.0
Children with lone father	3,512	80.4	0.5	0.7	18.4	81.4
Children with lone mother	12,536	82.1	0.4	0.8	16.7	83.1
Others	144,211	69.0	19.7	0.8	10.4	79.5
All	530,240	79.3	11.1	0.8	8.8	90.0

* The denominator for the percentage linkage success rate is those members present at the 1981 Census minus deaths and embarkations from the sample before the 1991 Census.

Table 5.21 Forward linkage rates between 1981 and 1991 Censuses - sample members traced at NHSCR by tenure at 1981 Census

Tenure in 1981	Members present in 1981	Position in 1991 (per cent)				Linkage success rate per cent†
		Linked at 1991 Census	Died before Census	Embarked before Census	Not linked	
Owner-occupied	317,033	82.3	9.0	0.9	7.8	91.3
Local authority	146,693	77.3	12.9	0.5	9.3	89.3
Rented furnished	10,715	69.1	6.0	3.2	21.7	76.1
Rented unfurnished	44,262	73.9	15.3	1.0	9.8	88.2
All*	518,703	79.9	10.6	0.8	8.7	90.2

* Excludes 11,545 persons who were resident in non-private establishments in 1981.

† The denominator for the percentage linkage success rate is those members present at the 1981 Census minus deaths and embarkations from the sample before the 1991 Census.

Table 5.22 Forward linkage rates between 1981 and 1991 Censuses - sample members traced at NHSCR in 1981 by household size

Household size in 1981	Members present in 1981	Position in 1991 (per cent)				Linkage success rate per cent†
		Linked at 1991 Census	Died before Census	Embarked before Census	Not linked	
1	41,928	57.0	35.3	0.6	7.0	89.0
2	123,057	71.6	21.1	0.8	6.5	91.7
3 - 6	334,996	85.8	4.1	0.9	9.2	90.3
7+	17,747	78.3	2.6	0.8	18.2	81.2
All*	517,728	79.9	10.6	0.8	8.7	90.2

* Excludes 12,520 persons not enumerated as in households. Of these 11,545 were resident in communal establishments and a further 975 were either domestic servants or were in temporarily rented accommodations such as holiday flats which are listed as with no known usual residents.

† The denominator for the percentage linkage success rate is those members present at the 1981 Census minus deaths and embarkations from the sample before the 1991 Census.

Table 5.23 Linkage rates between 1981 and 1991 Censuses - sample members traced at NHSCR following the 1981 Census by country of birth

Country of birth as given at 1981	Members present in 1981	Position in 1991 (per cent)				Linkage success rate per cent*
		Linked at 1991 Census	Died before Census	Embarked before Census	Not linked	
England	448,349	80.7	11.3	0.6	7.4	91.6
Wales	29,814	80.0	12.5	0.5	7.0	91.9
Scotland	8,261	61.0	12.2	4.0	22.9	72.7
N. Ireland	2,278	70.0	11.8	4.6	13.5	83.8
Other UK	328	70.4	14.9	2.7	11.9	85.6
Irish Republic	6,446	65.6	14.4	1.7	18.3	78.2
Ireland (part not stated)	12	50.0	5.0	0.0	8.3	85.7
Europe (including USSR)	7,825	67.0	12.6	3.0	17.8	79.0
Mediterranean Commonwealth	1,668	67.5	6.1	2.0	24.5	73.4
African Commonwealth	3,084	72.9	1.9	1.1	24.1	75.2
Far Eastern Commonwealth	1,431	63.9	2.0	3.3	30.8	67.4
Caribbean Commonwealth	3,251	67.2	4.7	2.1	26.0	72.1
Pakistan & Bangladesh	3,977	67.9	2.4	1.2	28.5	70.4
India	6,269	73.5	6.5	1.2	18.8	79.7
Rest of New Commonwealth	658	70.5	4.1	2.3	23.1	75.3
Old Commonwealth	1,462	62.0	7.4	5.7	24.8	71.4
USA	704	54.7	7.2	9.2	28.8	65.5
Rest of the World	3,165	60.1	5.9	5.2	28.7	67.6
Not Stated	898	64.3	18.8	1.1	15.7	80.4
All	530,240	79.3	11.1	0.8	8.8	90.0

* The denominator for the percentage linkage success rate is those members present at the 1981 Census minus deaths and embarkations from the sample before the 1991 Census.

5.5.2.9 Economic activity

Table 5.24 shows the forward linkage rates for traced LS members by economic activity recorded at the 1981 Census. Those aged under 16 in 1981 are excluded from this table as no economic activity could be ascribed to them.

The overall forward linkage success rate stood at 90.6 per cent at the 1991 Census, with the highest rates for those LS members who were in employment in 1981 (91.6 per cent) and the lowest for students (80.8 per cent). Students also showed the greatest loss to linkage between 1981 and 1991 (18.8 per cent).

5.5.2.10 Social class

Table 5.25 shows forward linkage rates by LS members 'own' social class as defined in 1981. Social class was only available for 73 per cent of LS members present in 1981. Children (aged under 16 and economically inactive in 1981) were classified as 'not applicable' and are excluded from the table. The remainder of those who had no social class were classified as 'inadequately described'. Changes in the definitions of social class are given in Chapter 4, section 4.4.5.

Table 5.24 Linkage rates between 1981 and 1991 Censuses - sample members traced at NHSCR following the 1981 Census by economic activity in 1981

Economic activity in 1981	Members present in 1981	Position in 1991 (per cent)				Linkage success rate per cent†
		Linked at 1991 Census	Died before Census	Embarked before Census	Not linked	
In employment	228,130	86.4	4.8	0.8	7.9	91.6
Out of employment - short term sick	2,437	70.6	17.6	1.0	10.7	86.8
Out of employment - other	21,967	78.5	5.6	0.8	15.0	83.9
Retired	47,005	42.2	52.9	0.5	4.5	90.4
Permanently sick	8,347	50.8	43.2	0.4	5.6	90.0
Student	16,354	79.1	0.5	1.6	18.8	80.8
Other inactive (housewives & those of independent means)	89,086	73.4	19.4	0.7	6.5	91.9
All*	413,326	77.0	14.2	0.8	8.0	90.6

* Excludes 116,922 LS members who were economically inactive and aged under 16 in 1981.

† The denominator for the percentage linkage success rate is those members present at the 1981 Census minus deaths and embarkations from the sample before the 1991 Census.

Table 5.25 Forward linkage rates between 1981 and 1991 Censuses - sample members traced at NHSCR following the 1981 Census by social class in 1981

Social class in 1981	Members present in 1981	Position in 1991 (per cent)				Linkage success rate per cent†
		Linked at 1991 Census	Died before Census	Embarked before Census	Not linked	
I	10,626	82.2	7.6	1.9	8.2	90.9
II	60,664	81.8	9.8	1.2	7.3	91.8
IIIN	61,804	84.9	7.5	0.8	6.7	92.6
IIIM	70,687	79.9	12.0	0.5	7.6	91.3
IV	54,216	78.3	13.0	0.6	8.2	90.5
V	18,879	74.2	15.9	0.5	9.4	88.8
Armed forces	2,534	70.3	4.7	1.3	23.7	74.8
Students, housewives, the permanently sick & those with independent means	109,869	73.2	17.7	0.8	8.3	89.8
Inadequate description	24,001	51.8	37.8	0.6	9.8	84.1
All*	413,280	77.0	14.2	0.8	8.0	90.6

* Excludes 116,968 LS members present in 1981 where the Social Class was recorded as 'not applicable' (economically inactive and aged under 16 in 1981).

† The denominator for the percentage linkage success rate is those members present at the 1981 Census minus deaths and embarkations from the sample before the 1991 Census.

The forward linkage success rates for traced LS members by social class ranged from 92.6 per cent to 74.8 per cent. The highest linkage rates were found among those in Social Class IIIN (92.6 per cent) and in Class II (91.8 per cent). LS members in the armed forces in 1981 showed the lowest forward linkage rates (74.8 per cent). Those LS members classed as 'inadequately described' in 1981 also showed low rates of forward linkage (84.1 per cent).

5.5.3 Inconsistencies and double enumerations

The total number of traced and untraced LS members found in both the 1981 and 1991 LS-Census samples was 420,492. Cases of inconsistency in these LS members' responses to census questions were found for sex, date of birth and country of birth between the 1981 and 1991 Censuses (see Table 5.26). Inconsistent responses had also been found for these questions between the 1971 and 1981 Censuses (discussed in section 5.2.3 of this chapter).

At the 1991 Census, 11,577 LS members quoted dates of birth which were inconsistent by one year or more with those they had quoted in 1981. This was particularly noticeable among the elderly (those aged 60 and over in 1981, 70 and over in 1991). A total of 1,358 LS members were found to have stated a sex in 1991 opposite to the one they had quoted in 1981, while 6,104 persons stated a different country of birth in 1991 from that stated at the previous census. The highest proportion of these

Table 5.26 Inconsistencies between the 1981 and 1991 Censuses

Characteristics in 1981 Census	Characteristic in 1991 Census		Per cent with discrepancy
	Consistent with 1981	Inconsistent with 1981	
Sex			
Persons	418,874	1,358	0.3
Male	200,990	503	0.3
Female	217,884	855	0.4
Country of birth			
All countries	414,148	6,104	1.4
England	359,947	1,864	0.5
Wales	22,948	913	3.8
Scotland	4,650	608	11.6
Northern Ireland	1,411	184	11.5
Irish Republic	3,901	332	7.8
India	4,298	310	6.7
Pakistan & Bangladesh	2,477	224	8.3
Caribbean Commonwealth	2,040	144	6.6
African Commonwealth	2,049	200	8.9
Age			
All ages	408,675	11,577	2.7
Under 10	58,423	1,705	2.8
10-24	102,233	2,526	2.4
25-59	195,650	5,422	2.7
60-74	45,532	1,474	3.1
75+	6,837	450	6.2

inconsistencies came from persons who had stated their country of birth in 1981 as Scotland and Northern Ireland.

As in 1981, some cases of an 'impossible' change in marital status were recorded. There were 960 LS members who reverted from a marital status of married, widowed or divorced in 1981 to single in 1991. It should be noted, however, that it is common for many persons to describe themselves as single following a divorce.

In the 1981 Census both visitors and absent usual residents had been recorded for the first time. This was continued in the 1991 Census and allowed the counting of a person twice, as a visitor at their address of enumeration and as an absent usual resident at their address of usual residence. However, 3,795 LS members were enumerated at two addresses at the 1991 Census as other than absent resident/visitor pairs. These multiple enumerations are discussed in further detail in Appendix XIV.

5.5.4 Linkage failures

As shown in Figure 5.5, 46,652 traced and 5,390 untraced LS members who had been enumerated in 1981 were not found at the 1991 Census. A sample of 571 cases (approximately 1 per cent) of all LS members who had been lost to the study since the 1971 Census was sent to NHSCR for investigation. The FHSA postings data held on the CHRIS database were used to try to find an explanation for the non-linkage. Table 5.27 shows the results grossed up for the 46,652 traced members lost to linkage in 1991 and Table 5.28 shows the results for all LS members lost to linkage since the study began (excluding those lost to linkage in 1981 who subsequently rejoined the study).

Among the traced members lost to link in 1991 (Table 5.27), 61 per cent were registered at NHSCR but not enumerated at census, 21 per cent had a date of birth discrepancy between the date of birth quoted on their census schedule and that held at NHSCR, and 9 per cent had a cancelled NHS registration with no further details of their

Table 5.27 Reasons for linkage failure between the 1981 and 1991 Census

Reasons for linkage failure	1981 Census sample traced at NHSCR
Number believed to be still in sample in 1991 and not found in Census	46,652
Date of birth discrepancy between 1991 Census and NHSCR	9,903 (21%)
Cancelled NHS registration - whereabouts unknown	4,004 (9%)
Missed event (emigration or death)	1,401 (3%)
Gone to Scotland	458 (1%)
In armed services	421 (1%)
Not known	2,220 (5%)
Currently registered at NHSCR - but not enumerated	28,245 (61%)

whereabouts. One per cent were found to have moved to Scotland where they would have been enumerated at census but not included in the England and Wales census returns. It is probable that some of the 3 per cent of members lost to link who were reported by NHSCR to have ‘missed events’ were also movers to Scotland.

Since the LS began, 92,580 LS members (both traced and untraced) have been lost to link. This number includes 13,403 LS members who entered the study as first decade new births or immigrants and who have never been enumerated at a census. Table 5.28 shows that though the most common finding was that these members were registered at NHSCR at the time of the 1991 Census (44 per cent), the number of members about whom nothing was known since they joined the study rose from 2,224 to 16,867 when those lost to link in 1981 were included. This suggests that these LS members were not enumerated at either the 1981 or 1991 Censuses, or that they were enumerated at both censuses with a date of birth that was not an LS date. The number of cancellations of NHS registrations also rose dramatically when earlier losses to link were included. As cancellations from GPs’ lists tend to occur if a person has not been seen for over two years, this suggests that emigrations are occurring that have not been reported. This is supported by the fact that 73 per cent of these cancellations occurred to LS members who missed the 1981 Census as well as the 1991 Census.

References

1. Fox A J and Goldblatt P O. *Longitudinal Study: socio-demographic mortality differentials*. OPCS Series LS no. 1, HMSO (London 1982).

Table 5.28 Reasons for linkage failure for all LS members not linked at 1991*

Reasons for linkage failure	All LS members who failed to link by 1991 Census
Number believed to be still in sample in 1991 and not found in Census	92,580
Date of birth discrepancy between 1991 Census and NHSCR	16,406 (18%)
Cancelled NHS registration - where abouts unknown	14,788 (16%)
Missed event (emigration or death)	2,822 (3%)
Gone to Scotland	863 (1%)
In armed services	421 (<1%)
Not known	16,867 (18%)
Currently registered at NHSCR - but not enumerated	40,413 (44%)

* Includes members lost to link at 1981 and still not linked at 1991 plus those present in 1981 but lost to link in 1991. It excludes those LS members lost to link in 1981 who were subsequently found at the 1991 Census.

2. Office of Population Censuses and Surveys. *Census 1971–1981, The Longitudinal Study: linked census data, England and Wales*. OPCS Series CEN81 LS, HMSO (London 1988).
3. Macdonald Davies I. Data quality and the OPCS Longitudinal Study. In: *Symposium 92 Proceedings, Design and analysis of longitudinal surveys*. Statistics Canada, (Ottawa, Ontario 1993).