

1981 Census Evaluation Programme in England and Wales

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Abstract: Following the 1981 Census, various checks were carried out on the coverage and quality of the results in England and Wales. A post-enumeration survey was the main tool used, but for the evaluation of census coverage, this was augmented by a series of demographic checks against statistics from other administrative sources. The main conclusion from the coverage checks was that the census probably missed about 241 000 people net (about half of one per cent of the population) including some 36 000 children aged 0–4. At older ages than this, adults aged 16–44 were more likely to be missed than others and males rather more than females. Students

and people out of employment were also more likely to be missed than people in employment.

The quality of householders' responses to particular census questions was evaluated in a detailed post-enumeration interview survey. The results of this showed that the questions subject to most response error were those on rooms, various aspects of economic activity and the main means of travel to work. These results have been given in greater detail in Census Monitors available from OPCS (OPCS, CEN 82/3, 83/4, 84/1, and 84/3).

Key words: Census; population; evaluation.

1. Introduction and Background

The programme to evaluate the 1981 Census was the most extensive ever carried out on a census in England and Wales and the analysis was completed and reported on more quickly than was the case following earlier censuses.

The main element of the evaluation programme was the Post Enumeration Survey

(PES) carried out by the Social Survey Division of OPCS. This survey had three objectives:

- (a) to check whether everyone present on census night in a private household had been enumerated (the *coverage check*);
- (b) to verify the classification of unoccupied residential accommodation made by census enumerators (the *classification check*); and,
- (c) to assess the quality of replies given to census questions by form fillers (the *quality check*).

In order to achieve these objectives the PES comprised several interconnected samples which are illustrated in Fig. 1.

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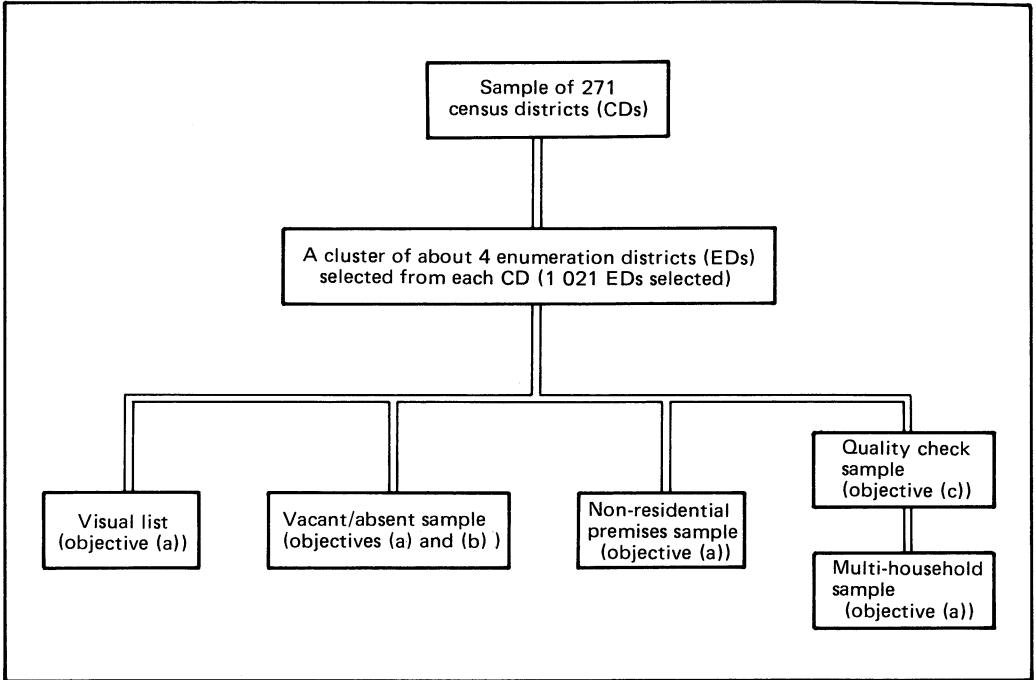


Fig. 1. Overview of samples comprising the 1981 PES

For the 1981 Census, the country was divided up into 108 767 enumeration districts (EDs), each containing about 180 households. These were grouped into 2 103 census districts (CDs). Where possible, enumeration districts were the same as for the 1971 Census; alterations only being made where changes in statutory boundaries, or fluctuations in numbers of households (estimated from local authority returns relating to demolition and new constructions) made this necessary. In each enumeration district an enumerator was appointed who was responsible for delivering the forms to each household and institution for completion, and for collecting and checking them after census day. In addition, enumerators were responsible for classifying and recording details of unoccupied accommodation. (See Thatcher (1984) and McAllister (1982) for more details.)

In the Post-Enumeration Survey, trained interviewers re-enumerated a sample of enumeration districts during the three months following the census, and compared their results with those collected by the census enumerators.

The PES samples were selected in three stages. The sample of 271 CDs was chosen with probability proportional to estimated size (p.p.e.s.). The sampling frame employed consisted of a list of all CDs stratified by region, area type (Metropolitan, Non-Metropolitan, Inner and Outer London) and the proportion of households living in 'graded' EDs (that is, EDs in areas with concentrations of characteristics likely to make enumeration difficult – multi-occupation of buildings, households headed by immigrants, non-residential premises, communal establishments). All CDs with at least 95 per cent

of households living in graded EDs were weighted by a factor of two.

At the second stage, EDs were arranged in blocks of normally four adjacent EDs and, using a randomised procedure, one block was selected from each chosen CD with p.p.e.s. (weighted), yielding 1 021 EDs. At the third stage, the five final samples were selected from entries in the enumerators' record books covering those ED blocks. For full details of the sample design see Britton and Birch (1985, Appendix B).

The PES coverage check was complemented by comparisons of census results with statistics from other administrative sources (the *demographic checks*). In addition, checks were carried out on the quality of the computer editing which was used for much of the census data for the first time in 1981, and the quality of the sampling method which was used to select the 10 per cent sample for the analysis of the 'hard to code' topics, principally occupation and industry.

2. Census Coverage

The basic method was to re-enumerate thoroughly the sample of 1 021 enumeration districts to check that all households were correctly enumerated in the census – and that

the number of people present on census night was accurately recorded.

The results of the coverage check (OPCS CEN 82/3) suggested that the population present on census night in private households in England and Wales had been under-enumerated by 0.45 per cent (215 000) net (that is, the difference between the numbers of people missed in the census and the numbers counted twice). However, a processing error was responsible for an offsetting overcount estimated to be around 0.2 per cent. This arose in transferring information from the census forms to magnetic tape and led to a number of residents who were absent on census night being treated as if they were present.

Later analysis from the PES suggested that there was a slight tendency for people actually absent from their usual residence on census night to have been wrongly recorded as present. As a result such persons may well have been counted as present twice in the census. The estimate of 0.45 per cent takes account of people counted twice but could nevertheless still be an underestimate due to the fact that there is a high probability that people missed in the census will be missed in a follow-up survey like the PES also.

Table 1 sets out the main results from the 1981 coverage check for both persons and households and for different types of area.

Table 1. 1981 Census: Net Under-enumeration by Area (England and Wales)

Area	Persons		
	Best estimate of net under-enumeration		95 per cent confidence interval
	Per cent	(1000)	
England and Wales	0.45	215	152–278
Inner London	2.46	58	39– 77
Outer London	1.01	42	20– 64
Other metropolitan areas	0.24	27	2– 52
Non-metropolitan areas	0.29	87	39– 135

(cont.)

Table 1 (cont.). 1981 Census: Net Under-enumeration by Area (England and Wales)

Area	Households		
	Best estimate of net under-enumeration		95 per cent confidence interval
	Per cent	(1000)	
		(1000)	
England and Wales	0.50	88	69–107
Inner London	2.75	27	18– 36
Outer London	0.42	6	2– 10
Other metropolitan areas	0.37	15	8– 22
Non-metropolitan areas	0.36	40	29– 51

Table 2. Census: Under-enumeration by Cause (England and Wales)

	Persons		
	Best estimate of under-enumeration		95 per cent confidence interval
	Per cent	(1000)	
Households misclassified as absent by enumerator	0.17	82	62–102
Household spaces misclassified as vacant by enumerator	0.09	41	27– 55
Property missed	0.05	25	14– 36
Persons missed in enumerated household	0.27	128	85–171
Gross under-enumeration*	0.62	297	244–350
Persons double-counted	0.17	82	47–117
Net under-enumeration	0.45	215	152–278

	Households		
	Best estimate of under-enumeration		95 per cent confidence interval
	Per cent	(1000)	
		(1000)	
Households misclassified as absent by enumerator	0.25	45	33– 57
Household spaces misclassified as vacant by enumerator	0.13	23	14– 32
Property missed	0.06	11	5– 17
Gross under-enumeration*	0.50	88	69–107
Net under-enumeration	0.50	88	69–107

* Includes causes not shown separately in the table.

It will be seen that there was a big difference between net under-enumeration in London – especially in Inner London – and the rest of the country. Under-enumeration of persons in the Inner London area was estimated to have been about 2.5 per cent compared with about a quarter of one per cent outside London, whereas under-enumeration in Outer London was estimated to be about 1 per cent. It is not necessarily the case that all inner cities are as difficult to enumerate fully in the census; there is some evidence that London poses a special problem. Areas graded by the Census Office as likely to be difficult to enumerate were considered separately and the coverage in these areas outside London was found to be no worse than in ungraded areas outside London. Although these graded areas did not relate specifically to inner cities one might have expected some difference if the problem in London was typical of all inner city areas. Reports from field supervisors indicated that the recruitment of enumerators was more difficult in London than in other metropolitan areas and this, coupled with the higher occurrence in Inner London of one-person households (which are more likely to be missed in a census than other households), suggests that serious under-enumeration was confined to Inner London.

The main reason for gross under-enumeration was that people were wrongly excluded from household forms although the numbers were partly offset by the numbers wrongly included – and therefore probably double counted. People may have been included as present on census night on two separate forms because of misunderstanding on the part of the form-filler; for example, a form may have been completed before census night but a member of the household who was expected to have been present on census night was not actually there when the day came. Another important cause of error was

when the enumerator classified a household as absent when someone was actually present on census night. This accounted for over one third of the total net under-enumeration identified by the coverage check. Table 2 sets out the results for the main causes of under-enumeration.

3. Demographic Comparisons

Coverage checks based on re-enumeration are considered inadequate in many countries because the errors in the re-enumeration are likely to be correlated with those in the main census. More reliance is often placed on comparisons between census results and population data available from administrative records. The coverage check was, therefore, supplemented by demographic comparisons. These were generally based on the usually resident population of England and Wales enumerated in the census, adjusted to produce figures most comparable (in terms of definition) with the source being used. The following comparisons were undertaken:

- (i) with birth registrations for children under one year of age (infant comparison);
- (ii) the numbers of UK-born children with estimates based on the previous 10 years' birth registration data adjusted for deaths and net migration (UK-born children comparison);
- (iii) the numbers of overseas-born children with estimates based on the previous 10 years' migration data adjusted for deaths (overseas-born children comparison);
- (iv) the numbers of school-aged children with Department of Education school roll statistics (school roll comparison);
- (v) the numbers of children aged under 16 with Department of Health and Social Security child benefit statistics based on 4 per cent of records (child benefit comparison); and,

(vi) the numbers of elderly persons with Department of Health and Social Security pensioner statistics based on 1 per cent of records (pensioner comparison).

In addition to these comparisons, the 1971 Census results for the UK-born and overseas-born populations adjusted for changes due to deaths and migration were compared for various age-groups with the 1981 UK-born and overseas-born populations aged over 10 years.

The main conclusion from these comparisons was about 36 000 children aged 0–4

could have been missed in the Census compared with a figure of 10 000 implied by the coverage check. It was therefore decided that in establishing a census base for the 1981 census-based mid-year population estimates, an allowance for under-enumeration of 241 000 (215 000–10 000 + 36 000) should be made. No other evidence emerged from the comparisons for changes to be made to the PES results on coverage shown in Table 1 (OPCS CEN 84/1). A summary of the results of the demographic checks is given in Table 3.

Table 3. Percentage¹ Difference Between 1981 Census Results and Other Sources (England and Wales)

Comparison	Age	0–4	5–9	10–16	70 and over
	Under 1				
Infant	–2.1				
UK-born children		– 2	– 2.5		
Overseas-born children		+ 55	+ 59		
School roll			– 1.1	– 0.2	
Child benefit records		– 1.0	– 1.3	+ 0.5	
Pensioner records					+ 0.4
PES		– 0.4	– 0.2		– 0.5

¹ 100 × (census-estimate)/census.

4. Comparison of Methods of Evaluation of Census Coverage

Both methods of evaluation used as a check on census coverage – the post-enumeration survey and the demographic checks – incorporate some weaknesses. On the whole, a post-enumeration survey is expected to obtain more accurate information than a census for a household, partly because it is carried out on a relatively small scale and attention can therefore be concentrated on those aspects of the census enumeration most likely to cause errors, and partly because more highly trained and experienced field staff can be employed on post-enumeration work than can be employed on census enumeration.

Nevertheless, because of the limited sample size the PES can only give broad indications of the extent of under-enumeration in the census. Moreover, it is possible that the PES suffered some of the same shortcomings as the census itself: in particular, problems of contacting some types of households and lack of co-operation from some types of households and individuals. (Nonresponse in the PES was worse in graded than in non-graded areas, and was bad for those reported in the census as seeking work, students, and those in accommodation with few rooms). To the extent that nonresponse in the PES occurs more often among households who evaded the census, or were otherwise difficult to

enumerate in the census and therefore liable to be missed, the true extent of under-enumeration in the census may be higher than indicated by the PES.

Although some of the comparisons made between the 1981 Census results and statistics from other sources do suggest that the level of under-enumeration obtained from the PES coverage check was too low, it was evident that the coverage of alternative sources was subject to considerable uncertainty in addition to sampling error. The adjustments and assumptions which had to be made in compiling alternative estimates to compare against 1981 Census statistics were often quite large compared to the level of under-enumeration being investigated. In particular many of the comparisons relied on estimates of net migration between 1971 and 1981. These figures were based on the International Passenger Survey (IPS) and the estimates of migration for the intercensal period are subject to relatively large margins of sampling error. In addition, the overseas-born children comparison suffers from differences in the definition of migrants between the census and the IPS, and the omission by the IPS of the migration of children born overseas to members of either the UK or foreign armed forces. It is thought that over one third of the difference shown in Table 2 for the overseas-born children comparison is accounted for by this (OPCS CEN 84/1).

The comparison for infants, based on birth registration data was probably the most robust of the checks since it depended to a lesser extent than other checks on adjustments for net migration. In view of the results of this check, and the supporting evidence about 0–4 year-olds from the other comparisons it was concluded that about 1.25 per cent of the population of England and Wales in the age-group 0–4 had been missed in the census. An article on the history of the underrecording of infants since 1861 appeared in *Population Trends* 38 (Werner (1984)).

Although the results of the demographic comparisons were largely inconclusive and contained very little additional insight into probable coverage errors in the 1981 Census, they were worthwhile exercises none the less, and confirmed that the levels of under-enumeration in 1981 were probably quite small even if they may have been slightly larger than actually measured by the PES coverage check.

5. Characteristics of Missed Persons and Households

The PES also provided some information on the characteristics of persons and households missed in the census. Table 4 compares the sex and age distribution, and economic position of people aged 16 and over, for the population counted as resident in private households on census night and people who were missed.

It should be noted that people aged 25–44 years were more likely to be missed in the census than children of school age, and that generally men were more likely to be missed than women. Among economically active men, those out of employment were more likely to be missed than men in employment. For women, the situation was somewhat different; those in employment were more likely to be missed by the census than women in the economically inactive categories, because many of the latter group were housewives and presumably more likely to be at home when the census enumerator called. One curious result was that more women students were probably counted twice than were missed in the census. About one half of all those missed by the census had a usual address one year before the census different from the address at which they should have been enumerated in the census. This compares with 9 per cent for the rest of the population. In summary, those people missed by

Table 4. Age, Sex and Economic Position of Persons Missed in the 1981 Census. Per cent (England and Wales)

	Census (resident in private households) (a)	PES (missed persons) (b)	Difference (a)–(b)
<i>Age</i>			
0– 4	6	5	+ 1
5–15	16	6	+10
16–24	14	17	– 3
25–44	27	36	– 9
45–64	23	20	+ 3
65 and over	15	15	0
<i>Sex</i>			
Male	49	59	–10
Female	51	41	+10
<i>Economic position</i>			
<i>Males</i>			
Economically active:			
In employment	69	52	+17
Out of employment	9	28	–19
Economically inactive:			
Student	5	2	+ 3
Other ¹	17	18	– 1
<i>Females</i>			
Economically active:			
In employment	42	60	–18
Out of employment	3	6	– 3
Economically inactive:			
Student	4	– 6	+10
Other ¹	50	40	+10

¹ Retired, housewives, permanently sick or disabled.

the census tended to be more mobile (as measured by change of usual address in the year before census date) than people who were counted; they were mainly young adults – in a job if women, unemployed if men or students – and generally were more likely to be men than women.

People counted twice had somewhat similar characteristics in that they tended to be young single adults, and included a higher proportion of students than in the population as a whole. Women counted twice, however, were more likely to be unemployed.

Table 5 shows that those entire households that were missed tended to be smaller in size on average than households properly enu-

merated. For example, 46 per cent of those households entirely missed comprised just one person. Understandably, such households are easier to miss than those containing five or more people, because it is more likely that no one will be at home when the census enumerator called. Missed households were more likely to occupy privately rented accommodation than other households (29 per cent compared with 9 per cent for all households in the census), with fewer rooms and poorer amenities (that is, a greater propensity to share an inside WC and bath). These results are consistent with the finding that under-enumeration was highest in Inner London.

Table 5. Size of Households Missed in the 1981 Census. Per cent (England and Wales)

Number of usually resident persons	Census (enumerated households)	PES (missed households)
1	22	46
2	32	28
3	17	14
4	18	8
5 or more	11	4
Average household size	2.7	1.9

6. Classification of Accommodation Unoccupied on Census Night

An important objective of the census evaluation programme was to check the accuracy of the enumerators' classification of household accommodation that was unoccupied on census night (OPCS CEN 83/4). For this purpose a sample of unoccupied accommodation was revisited after the census as part of PES. The results of this check showed that the number of absent households was overstated in the census results by as much as 20 per cent, that the number of second homes was probably understated (although the position is modified

if second residences are combined with holiday accommodation) and that the overall census results on vacant accommodation were about right, although enumerators did not distinguish well between the three specified categories of vacant accommodation: new houses and flats, those under improvement, and other vacancies. Table 6 compares the enumerators' classification of unoccupied accommodation with that obtained in the PES.

Table 6. Estimated Total Number of Household Spaces Recorded as Unoccupied by Type: 1981 Census Compared with PES. Thousands (England and Wales)

Post Enumeration Survey	1981 Census						Total (PES)
	Absent household	Second residence	Holiday accommodation	Vacant New	Under improvement	Other	
Household present	56	—	1	3	2	15	77
Absent household	448	9	2	1	3	26	489
Second residence	32	70	12	—	1	12	127
Holiday accommodation	2	—	40	—	1	5	48
Vacant (new)	1	—	—	36	—	8	46
Vacant (under improvement)	3	—	1	11	109	59	183
Vacant (other)	48	5	1	34	24	430	543
Non-residential/derelict	2	—	—	1	2	18	23
No information	28	1	—	—	1	14	44
Total (Census)	619	86	58	86	143	588	1 579
Agreement between census and PES (per cent)	72	82	69	42	76	73	

These results indicated that the enumerator classification of unoccupied accommodation was correct in about three out of four cases, with the exception of new vacant property, for which enumerators appear to have classified about one half as vacant but previously occupied. However, if the three vacant categories are grouped together, there was agreement in about nine out of ten cases. The problems of definition and identification on the border line between absent households, second homes and holiday accommodation suggest that holiday accommodation and second residences should be considered as

one category – or at least combined in published tables because of the high level of misclassification of second residences as holiday accommodation. The overall effect of misclassification is given in Table 7.

The PES showed that absent households tended to be smaller on average than households present on census night; a larger proportion of absent households consisted of just one person. Conversely, a significantly smaller proportion of absent households were likely to contain three or more adults compared with the census results.

Table 7. *Classification of Unoccupied Accommodation: 1981 Census Compared with the PES. Per cent (England and Wales)*

	Census	PES
Household present	–	5
Absent household	39	31
Second residence	5	8
Holiday accommodation	4	3
Vacant (new)	5	3
Vacant (under improvement)	9	12
Vacant (other)	37	34
Non-residential/derelict	–	1
No information – but most probably vacant	–	3
	100	100

7. Quality of Responses by Form-fillers

The results of the checks on the quality of response to census questions have been reported in Census Monitor CEN 84/3, and in greater detail by Britton and Birch (1985).

These checks showed that the census questions subject to the largest gross reporting errors in the 1981 Census were those on rooms (29 per cent), economic position (8 per cent), employment status (10 per cent) and means of travel to work (9 per cent). The derived categories of social class and socio-economic group (based on occupation, industry and employment status) had gross errors of 13

per cent and 16 per cent respectively. All other questions checked had a gross error rate of less than 5 per cent. These gross error rates mainly reflect errors made by the form-filler but they also take account of errors made in processing the results (for example in coding) which were not subsequently corrected by the editing process. Detailed results for the questions on rooms, economic position, employment status and travel to work are set out in Tables 8–11 on pages 525–527.

Table 8. Number of Rooms: Gross Percentage of Census Count Found by the PES (England and Wales)

Number of rooms recorded by the PES	Number of rooms recorded by the Census								Sample numbers
	1	2	3	4	5	6	7/8	9+	
1	72.0	1.8	0.3	0.1	—	—	0.3	—	60
2	22.7	55.0	4.3	0.2	—	0.1	—	0.5	132
3	5.3	40.4	62.3	4.5	0.7	0.1	—	—	367
4	—	2.6	28.3	74.1	7.6	1.0	0.3	0.5	872
5	—	0.3	3.9	19.0	78.4	18.5	5.3	1.0	1 388
6	—	—	0.6	1.9	12.6	72.8	21.4	3.0	939
7/8	—	—	0.3	0.2	0.6	7.3	68.9	14.4	352
9+	—	—	—	—	0.1	0.2	3.9	80.6	98
Base (= 100%)	75	171	392	874	1 294	925	376	100	
Nonresponse	10	26	38	83	109	88	30	10	
Net distributions									
Quality check (per cent)	1.4	3.1	8.7	20.7	33.0	22.3	8.4	2.3	
Census (PES) (per cent)	1.8	4.1	9.3	20.8	30.7	22.0	8.9	2.4	

Gross error: Agree 71.4 per cent; disagree 28.6 per cent
Sample size: 4 208 responding private households with usual residents

While gross errors may tend to cancel out in the net distributions for an item – or be removed entirely when results are grouped – particular categories may have been substantially under-recorded or over-recorded by the census. This was especially the case when most of the answers to a question were concentrated in one or two categories leaving a minority group or groups for which the relative error may have been high. The results on households lacking exclusive use of a bath or inside WC illustrate this. Overall gross error was low but what errors there were were concentrated in the minority of households lacking these amenities. For example, the gross error for use of an inside WC was only 1.3 per cent; but as Table 12 on page 527 shows the census probably under-stated the proportion of households without sole use by about 15 per cent and under-stated the proportion with shared use by nearly one third.

What conclusion should be drawn from such results? It is widely held that population characteristics from a full census must be more reliable than from a sample survey the

results of which are subject to sampling variation. This is certainly true for the total number of people and households counted in each small area of the country, and it is probably also true for the information collected in the census on age and sex, although the quality of these items were not investigated in 1981. Moreover, the Quality Check results showed that there were very low rates of error for important census categories such as marital status and tenure, or for the numbers economically active and in employment.

However, the Quality Check results also show that there are some census questions that are not answered well: for example, the questions on rooms, occupation and on the sharing of basic amenities. The results of the 1981 PES are consistent in this respect with similar but less detailed checks carried out following the 1961 Census, the 1966 Sample Census and the 1971 Census.

Some of the reasons for error are clear. Where correct answers to census questions depend on reading and understanding an unfamiliar definition, errors will arise if form-

Table 9. Economic Position (England and Wales)

	Economically active			Economically inactive		
	Working full time	Working part time	Seeking work	Temporarily sick	Permanently sick	Wholly retired
Men						
Quality check (per cent)	67.6	3.0	6.8	0.3	3.1	14.4
Census (PES) (per cent)	68.3	2.0	6.9	0.6	2.5	15.3
Women						
Quality check (per cent)	25.5	20.8	3.1	0.3	2.0	4.6
Census (PES) (per cent)	26.5	17.2	2.8	0.4	1.4	7.0
Gross errors:	Men: Agree 95.9 per cent; disagree 4.1 per cent					
	Women: Agree 88.8 per cent; disagree 11.2 per cent					
Sample sizes:	Men: 3 944 usual residents aged 16 or over in private households					
	Women: 4 384 usual residents aged 16 or over in private households					

Table 10. Employment Status ¹ (England and Wales)

	Apprentices and trainees		Managers	Foremen and supervisors	Other employees	Self-employed	
						Without employees	With employees
Quality check (per cent)	1.6	9.8		7.9	72.3	5.0	3.4
Census (PES) (per cent)	2.0	9.5		4.9	75.6	4.9	3.0

Gross error: Agree 90.2 per cent; disagree 9.8 per cent
Sample size: 5 227 usual residents aged 16–69 who were economically active, wholly retired or permanently sick; but excluding members of the Armed Forces

¹ The procedures for allocating people to an employment status were those used in the 10 per cent sample.

Table 11. Daily Journey to Work (England and Wales)

	Car pool	Car driver	Car passenger	Bus	BR train
Quality check (per cent)	1.7	43.5	9.5	14.5	3.5
Census (PES) (per cent)	4.0	40.4	8.5	15.4	3.6

	Under ground train	Motor cycle	Pedal cycle	On foot	Works at home/-other
Quality check (per cent)	1.8	2.9	4.2	15.0	3.3
Census (PES) (per cent)	2.0	3.1	4.2	14.6	4.2

Gross error: Agree 91.4 per cent; disagree 8.6 per cent
Sample size: 4 529 usual residents aged 16 or over and in employment

Table 12. Inside Flush Toilet (England and Wales)

	Sole use	Shared use	None
Quality check (per cent)	95.5	1.6	2.9
Census (PES) (per cent)	96.2	1.1	2.7

Gross error: Agree 98.7 per cent; disagree 1.3 per cent
Sample size: 4 207 responding private households with usual residents

fillers do not read the instructions, particularly if they have a pre-conceived view about the answer. The errors in the answers to the question on rooms were due largely to the fact that form-fillers did not always realise that a kitchen should only be counted as a room if it was over a certain size and that a bathroom did not count as a room at all. Similarly, the answer to the question on travel to work depended, to some extent, on whether the form-filler realised what a 'car pool' was; while for economic position the correct answer depended on their understanding the difference between being permanently sick and retired, or in the case of housewives, the difference between being a housewife and being retired. For some users of census data some of these errors may not matter if results are only required for an overall category, such as the economically inactive as a whole, which is a combination of other categories, and where error in the combined category is low. For the future, therefore, it may be

appropriate to publish less detail in census tables.

Another reason for error applies particularly to the replies to the occupation question: accurate allocation of occupations to the 350 operational categories in the official classification depends not only on form-fillers reading the notes about what description is required, but also in judging what is relevant to enter on the census form. It is impossible to condense the very detailed descriptions in the full classification, so that form-fillers recognise where key words like 'assistant' and 'supervisor' are essential, or where a fuller description of the task done, or material used, is needed to place someone in the right occupation category. Here again, users should note that the grouped classifications 'occupation orders', 'social class' and 'socio-economic group' eliminate some of the errors in the full results arising from inadequate descriptions in the census.

8. Computer Editing

The 1981 Census was the first in this country in which census information was controlled and corrected automatically; previously any correction of information between the stages of data input and tabulation had been controlled and executed by hand. The system used in 1981 was based on the editing and imputation methods described by Fellegi and Holt (1976). These methods give a scheme for choosing which items to alter when the data are inconsistent together with an imputation process (called a *hot deck* system) for inconsistent, invalid or missing items. Checks indicate that in the event the auto-editing scheme performed well, producing acceptable results for all items except employment status. However, since very few missing items seem to be affected by nonresponse bias, a method of apportioning values to missing data in direct proportion to the known item-distributions would have generally produced similar results. For the future it might be possible to simplify the auto-editing system without significantly affecting accuracy. This will be examined before the next census, together with the possibility of modifying the rules for imputing employment status. More details of the 1981 auto-edit system and the checks carried out on it are given by Brant and Chalk (1985).

9. The 10 Per Cent Sample

In the 1981 Census, as in previous censuses, questions that were particularly difficult or time consuming to code were processed only for a 10 per cent sample of the population. In 1981 this sample comprised all people in 10 per cent of private households and 10 per cent of the people in communal establishments (OPCS CEN 83/6 and 85/1).

Results of early checks (OPCS CEN 83/6) provided no evidence that the sample selec-

tion was biased and confirmed that it was appropriate to gross up the sample results by a factor of 10. More extensive statistical tests were carried out on 38 personal and five household characteristics from eight census questions included in the 100 per cent data; the results from these tests (OPCS CEN 85/1) confirmed earlier indications. However, the sampling distributions for those persons with relatively scarce characteristics which were also clustered within households were shown to be skewed, that is with medians less than their means; consequently there will be a tendency for small area counts to understate the numbers in minority groups.

Work was also carried out to assess the true sampling errors associated with the 10 per cent sample results and it was found that, with one or two exceptions, it could be assumed that the standard error of a 10 per cent count (n) is the square root of the number of observations (that is \sqrt{n}).

10. Publication of Results

In previous censuses the results of evaluation studies have been published as part of the General Report on the Census. This has inevitably delayed publication and accordingly reduced the usefulness of the results to users of census data.

For the 1981 Census it was decided to use the *Census Monitor* series, which had been devised primarily as a census newsletter, as a means of publishing summary results from the evaluation programme at the earliest possible opportunity and to the widest possible audience. The numerous references to *Census Monitors* listed at the end of this article indicate that this was in fact achieved for the vast majority of the programme.

It was not considered appropriate for the results from checks on the automatic editing system to be published in a *Census Monitor*

and a summary of these checks was therefore published in the Central Statistical Office's Journal, *Statistical News*. The early publication of summary results was not intended to replace the publication of more detailed results and the full report on the Post Enumeration Survey has been published recently (Britton and Birch (1985)).

11. Future Evaluation Programme

There are two main aims of an evaluation programme:

- (i) to allow users of census data to appreciate the broad limits to which that data can be put (and possibly to make corrections if the evaluation results are accurate enough); and,
- (ii) to give the Census Office some guidance on the topics and questions which may need attention in a future census.

The first of these aims can only be met adequately if the results of the programme are available at the same time as, or very shortly after, the main census results. The release of results from the 1981 evaluation programme was a great improvement on previous censuses. However, the Quality Check results are required within 18 months of census day; that is, some two years earlier than achieved for the 1981 programme. Delays were also experienced on the 10 per cent evaluation work because of a lack of computing resources.

The second aim is less dependent on the timing of the results, providing they are available three or four years before the next census. The main problem here is whether the results are of any value in shaping future census methodology. The questions identified by the Quality Check as having poor response in 1981 had also been poorly answered in previous censuses and it is not obvious that any improvement is possible to these questions. Nevertheless the aim must be to improve

these questions before the next census if at all possible. The Coverage Check results underline the difficulties in achieving full census coverage in Inner London and are helpful in showing the extent of the problem. Again, it is not clear how the coverage of Inner London could be improved at reasonable cost. More information about the reasons for people being missed would have helped in this respect. Nevertheless ways will be sought of improving census coverage for 1991.

12. References

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* OPCS Census Monitors are available from: Information Branch (M), Room 801, OPCS, St Catherine's House, 10 Kingsway, London WC2B 6JP.

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