

M1 - Relationship in Household

Introduction

Unit of analysis: the 'relationship'

For most Census questions analysed in this series of reports, the unit of analysis is the household or person, restricted as required, to the households or persons appropriate to the question. For example, for the question on landlord, households were restricted to those that rented or were living rent free. For the relationship question the unit of analysis is the relationship between two people. A one-person household has no relationship. In a two-person household there is one relationship for collection on the Census form. In a three-person household, there are three relationships, four persons have 6 relationships, and so on.

However, once the data has been processed, each relationship is treated as a two-way relationship and not only the relationship collected on the form is recorded but also the inverse relationship. For example, for a household with Persons 1 and 2 respectively a mother and her daughter, the relationships recorded in the database are that of Person 2 to Person 1 "son or daughter" - as collected on the form - and Person 1 to Person 2 "mother or father" - generated during processing. For a three person household, there will be two times the three relationships given on the form ie six. For a four-person household, two times six ie 12. A five-person household will have 20.

The Household form had room for only five persons. Households with more than 5 persons had also to complete a continuation form which required, for Person 6 onwards, the identification of relationships with three other members of the household. So, the number of relationships collected or generated increased by 6 for every additional person in the household beyond 5.

The relationship has not been included in its own right in Census output. The data has been used to assign individuals in household to families, and output has been based on the family or on the household classified according to the families it contained. A graph showing the incidence of the various categories of relationship and where they were entered on the Census form is given at Annex A. In the graph and elsewhere in this report, the relationship of Person A to Person B is denoted 'A->B'.

Scope of analysis: residents and all persons in household

Relationships were collected for enumerated persons, and corrected or imputed where necessary. Relationships were imputed for persons added to enumerated households. Households wholly added by the ONC process have the relationships of the donor household. Enumerated people who were students with term-time address were excluded from the algorithm that grouped individuals within households into families.

They were counted as 'non-resident' and generally excluded from output and, in particular, from the classifications of household composition used in statistical tables. Each of the tables and graphs that follow will use the most appropriate base in the following

Base	Households with at least one person	Persons in households	Two-way relationships
Residents	2,192,246	4,976,005	9,568,902
All persons	2,192,594	5,012,305	9,764,738

Minor errors and discrepancies in data used

Relationships that are amended by correction or imputation will be distinguished in a number of ways (see next section). For the resident base, it is not possible easily to count amended relationships precisely in the same way as the base used for comparison. This is because it is not straightforward to identify each two-way relationship for non-residents. This slight mis-match should not greatly affect the calculated rates of imputation, etc. Occasionally, a one-resident household (or no resident household) that should have no relationships nevertheless has amended relationships attributed to it because it has one or more non-resident.

Another data problem is that there are very occasionally errors in the data so that the relationship of one person to another is recorded as 'same person'. Such cases have been excluded from the constituent rows of a table but not from the total row.

Finally, disclosure control by exchanging the main data records of pairs of households may cause problems because the audit records in which the correction and imputation information is stored have not been exchanged to match. Hence for example, the correction by reversing the relationship (see item a in next section) would be recorded in the audit database for the other of the exchanged pair.

Relationships not as on form

Relationships that are not as collected on the Census form can be classified as

- a. Corrected by swapping: the original value supplied by the form-filler has been corrected by replacing the value (and that of the inverse relationship) automatically with another value. This action was taken for parent-child relationships that were not consistent with the persons' ages. In such cases the

relationships were reversed; if then consistent with age, the reversal was retained. Where the reversed relationships are still inconsistent with age they are marked for subsequent imputation and counted in b below.

- b. Corrected by imputation: original value supplied by form-filler was found inconsistent with other variables and corrected by imputation
- c. Missing value imputed: no value supplied by form-filler so was imputed.
- d. Person imputed: the relationship is for a person added by the ONC process to an enumerated household.
- e. Household imputed: the whole household was added by the ONC process

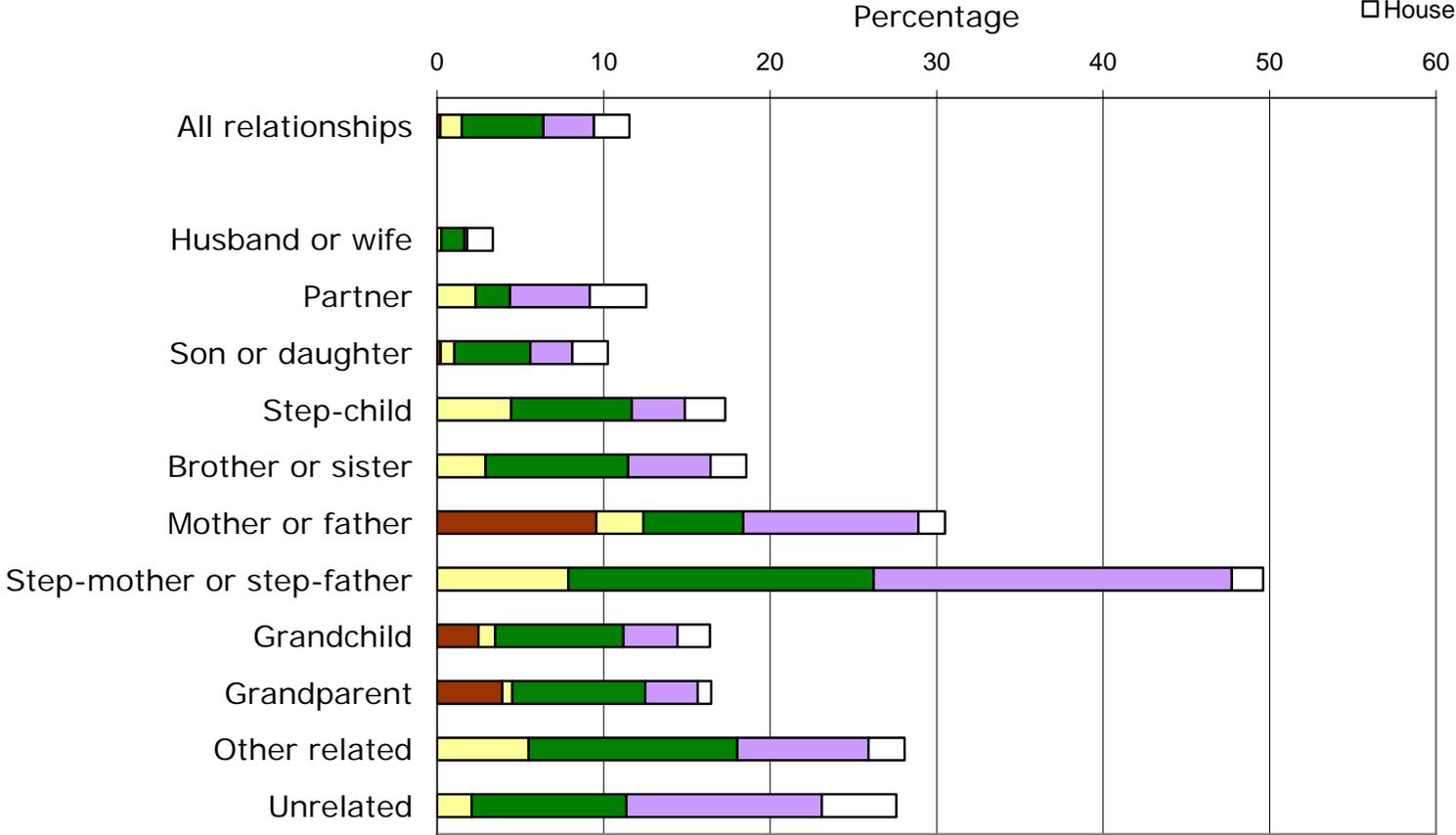
All persons

Individual relationship categories

This section looks at the response to the categories of relationship on the Census form. Since the form-filler only had to record each relationship one way, the section follows suit and looks at relationships between a person and each other person entered earlier. The persons covered here are those associated with enumerated persons in the household (including students with term-time address elsewhere) and persons added to enumerated households by the ONC process, and persons in households wholly added by ONC. The base is therefore half of 9,764,738 ie 4,882,369.

M6 Relationships not as on form

- Corrected by swapping
- Corrected by imputation
- Missing value imputed
- Person imputed by ONC
- Household imputed by ONC



Relationship	Numbers						Percentages				
	'One-way' relationships	Corrected by swapping	Corrected by imputation	Missing value imputed	Person imputed by ONC	Household imputed by ONC	Corrected by swapping	Corrected by imputation	Missing value imputed	Person imputed by ONC	Household imputed by ONC
All relationships	4,882,369	9,636	62,885	238,956	148,204	104,314	0.2	1.29	4.89	3.04	2.14
Husband or wife	998,583		2,458	13,714	1,801	15,400	0	0.25	1.37	0.18	1.54
Partner	161,006		3,726	3321	7,705	5,492	0	2.31	2.06	4.79	3.41
Son or daughter	2,465,442	5,395	20,015	112,525	62,331	52,515	0.22	0.81	4.56	2.53	2.13
Step-child	67,615		3,013	4,887	2,163	1,636	0	4.46	7.23	3.2	2.42
Brother or sister	865,243		25,228	74,020	42,943	18,431	0	2.92	8.55	4.96	2.13
Mother or father	29,146	2,788	824	1,748	3,062	471	9.57	2.83	6	10.51	1.62
Step-mother or step-father	3,086		243	566	664	58	0	7.87	18.34	21.52	1.88
Grandchild	45,927	1,139	465	3,536	1,491	900	2.48	1.01	7.7	3.25	1.96
Grandparent	8,017	314	49	638	254	65	3.92	0.61	7.96	3.17	0.81
Other related	56,393		3,104	7,067	4,444	1,218	0	5.5	12.53	7.88	2.16
Unrelated	181,911		3,760	16,934	21,346	8,128	0	2.07	9.31	11.73	4.47

The categories of relationship to have been corrected by swapping were, as might be expected, those involving a parent and child or a grandparent and grandchild. Almost 10 percent of the relationships of 'mother or father' were determined having swapped the relationship as given on the form. The corresponding rate for 'grandparent' was almost 4 percent. There was a wider spread among relationship categories for corrections by imputation to values provided on the form. Almost 8 percent of step-parents were given by 'correction by imputation', with high rates also among 'stepchildren' (4.5 percent) and 'other related' (5.5 percent).

The same three relationship categories also had high rates of missing values imputed with over 18 percent of step-parents determined by this means. There were also high rates of missing value imputed among siblings (8.6 percent) and 'unrelated' (9.3 percent).

Persons imputed fell relatively frequently into the parent and step-parent relationships and into 'unrelated'. Persons in wholly imputed households were more evenly spread among relationships with a slight preponderance of 'partners' and 'unrelated'.

Taking all data corrections, etc, together, almost half of the relationships of step-parent were not as recorded on the form. A large proportion of these were for persons added to enumerated households by the ONC. Other types of relationship with overall high rates of correction, etc, were parent and the two 'other' categories: 'other related' and 'unrelated'.

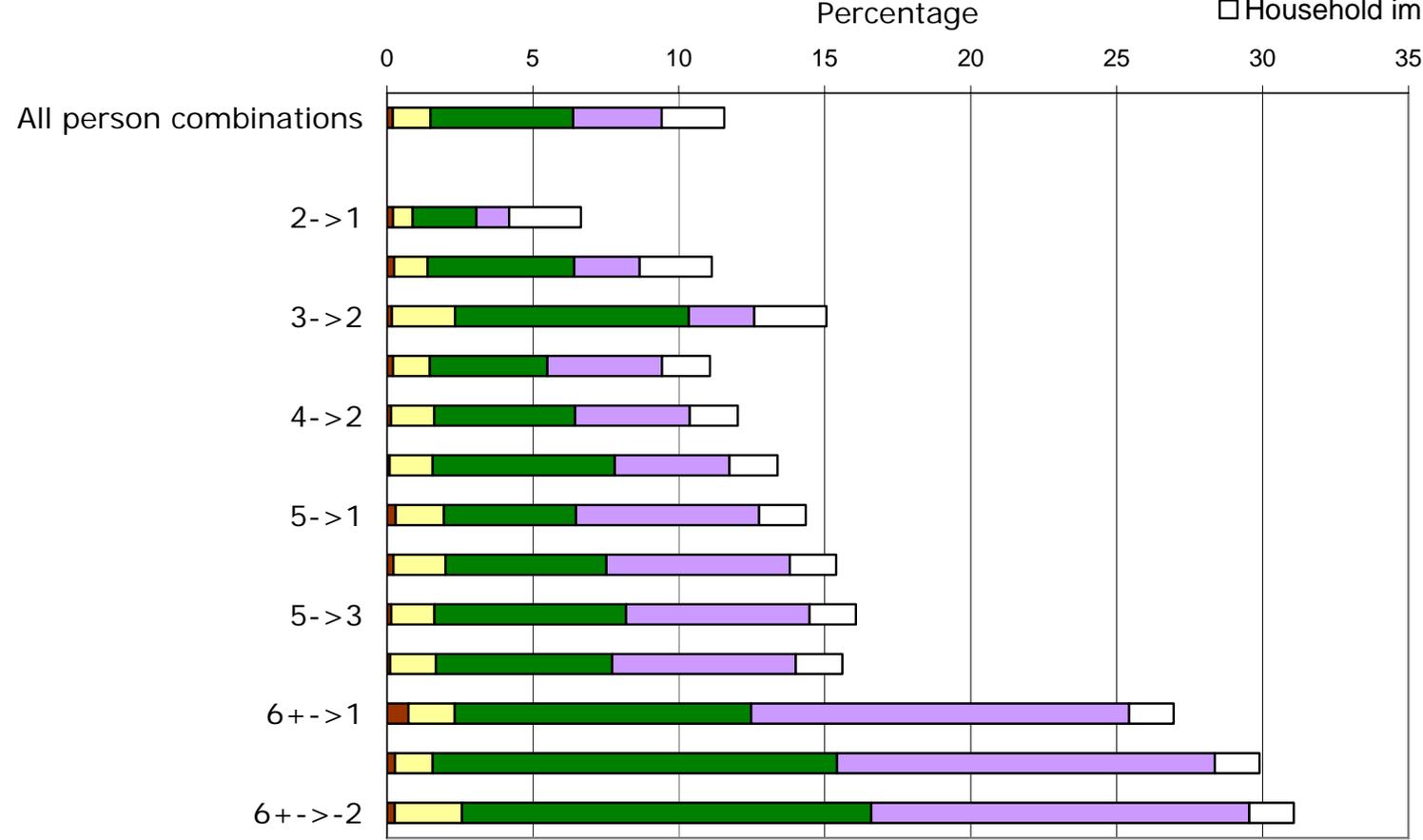
Further work would be needed to check why there were high rates of imputation for some categories of relationship such as step-parent. This work will probably need to investigate individual households affected. Presumably 'step-parent' of a household member was the only option available for a person either enumerated or added by ONC whose relationships were not provided on the form. This choice of relationship would be curtailed by the relationships among other members of the household and their relative ages, and at the point relationships were checked the option of changing other variables was not available (even if this may have given a better result).

Person combinations

The following graph and table analyse relationships according to the pair of persons (according to number on form). '2->1' denotes that the relationship is that of Person 2 to Person 1. The combinations are as on the Census form. Combinations involving people on continuation form (or imputed equivalents) have been grouped into three categories: relationship of Person numbered 6 and higher with Person 1, and relationship of Person numbered 6 and higher with the previous two Persons.

M7 Relationships by person combination percentage not as on form

- Corrected by swapping
- Corrected by imputation
- Missing value imputed
- Person imputed by ONC
- Household imputed by ONC



Person combination	Numbers						Percentage of total relationships				
	Total relationships	Corrected by swapping	Corrected by imputation	Missing value imputed	Person imputed by ONC	Household imputed by ONC	Corrected by swapping	Corrected by imputation	Missing value imputed	Person imputed by ONC	Household imputed by ONC
All person combinations	4,882,369	9,636	62,885	238,956	148,204	104,314	0.2	1.29	4.89	3.04	2.14
2->1	1,473,881	3,057	9,885	32,293	16,524	36,215	0.21	0.67	2.19	1.12	2.46
3->1	757,587	1,909	8,638	38,039	17,045	18,678	0.25	1.14	5.02	2.25	2.47
3->2	757,587	1,302	16,320	60,710	17,045	18,678	0.17	2.15	8.01	2.25	2.47
4->1	418,667	885	5,251	16,850	16,446	6,894	0.21	1.25	4.02	3.93	1.65
4->2	418,667	594	6,154	20,243	16,446	6,894	0.14	1.47	4.84	3.93	1.65
4->3	418,667	382	6,160	26,117	16,446	6,894	0.09	1.47	6.24	3.93	1.65
5->1	128,585	379	2,139	5,804	8,082	2,045	0.29	1.66	4.51	6.29	1.59
5->2	128,585	276	2,304	7,089	8,082	2,045	0.21	1.79	5.51	6.29	1.59
5->3	128,585	191	1,895	8,448	8,082	2,045	0.15	1.47	6.57	6.29	1.59
5->4	128,585	138	2,017	7,772	8,082	2,045	0.11	1.57	6.04	6.29	1.59
6+-->1	40,991	300	652	4,163	5,308	627	0.73	1.59	10.16	12.95	1.53
6+-->-1	40,991	112	530	5,678	5,308	627	0.27	1.29	13.85	12.95	1.53
6+-->-2	40,991	111	940	5,750	5,308	627	0.27	2.29	14.03	12.95	1.53

There are low rates for relationships corrected by swapping generally. The highest rate is for 6+ ->1 which may be because the form-filler's concentration lapses slightly as the task of completing the relationship matrix moves on to the continuation form. Corrections by imputation were also generally low. In comparison, missing values were imputed more often with higher rates the higher the Person number of both the first and second of the pair involved in the relationship. There are a few departures from this general trend. For example, the rate for 3->1 (5 percent) is higher than that for 4->1 (4 percent). Also, the rate for 3->2 is the highest any combination on the 5 person Household Form.

The ONC process of adding a person to an enumerated household does so by giving the added person the next Person number available in the household. Hence there is a bias to the higher Person numbers - as we see in the graph and table. Conversely perhaps, the ONC process of adding households adds households that are smaller than average (more likely to have been missed in enumeration); hence the trend is the reverse of that for added people.

The overall effect of these amendments to person combinations is that over a quarter of relationships involving Person 6 onwards was not as on a Census form. The rate is around 15 or less for Persons 1 to 5, but there is a relatively high rate of amendment for 3->2.

Households with Residents

The relationship variable was not directly used in Census output. The information was used, with that on age and marital status, to group individuals in households into families. Information on families was used to create a classification of household composition. There was also a classification of households that did not use relationship but simply the age and sex of residents. Generally, persons counted in tables excluded students with term-time address elsewhere.

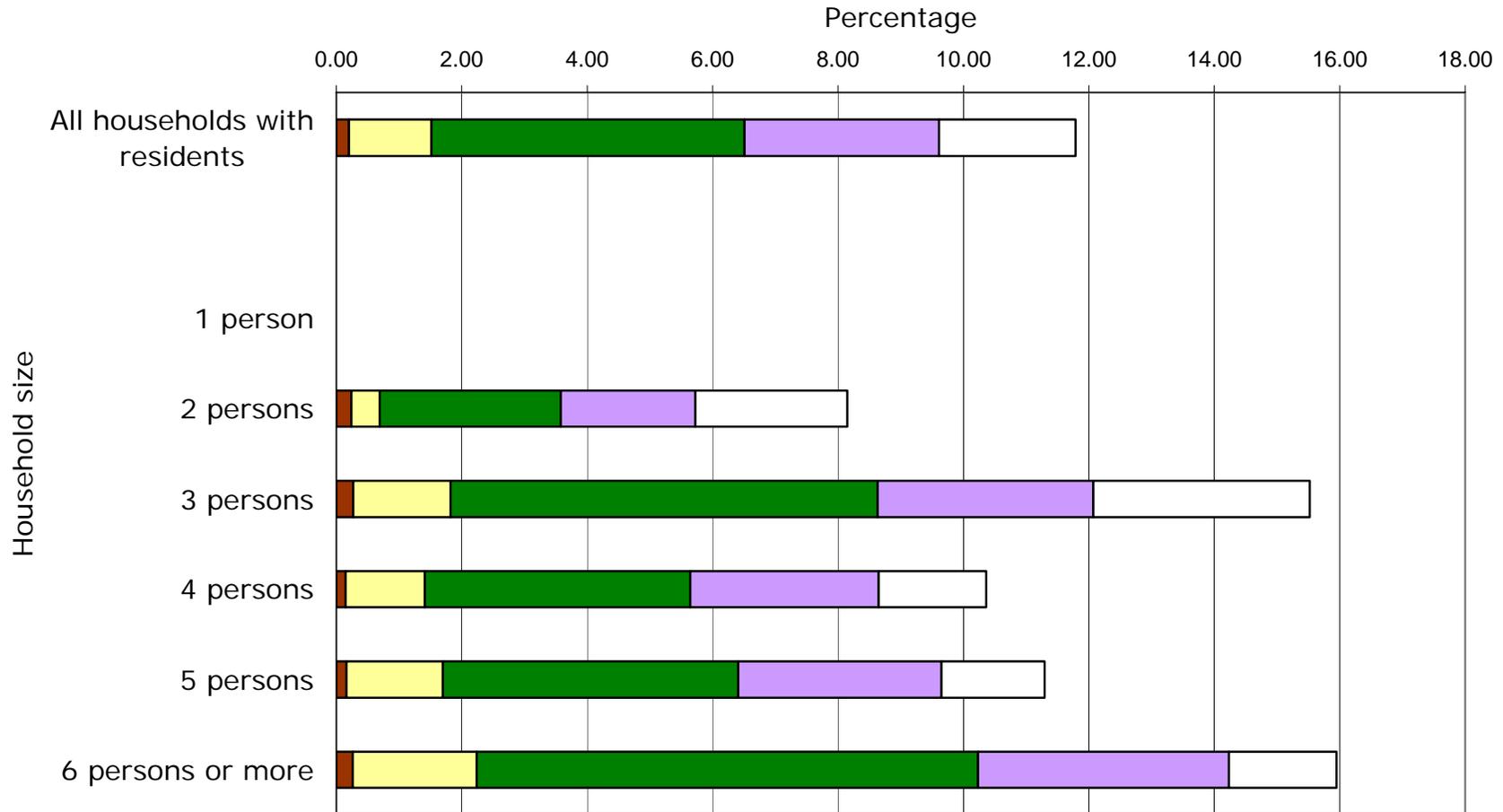
The following graphs and tables compare numbers of amended relationships with the base for residents rather than all persons. However, the numbers of amended relationships includes those of students with term-time address elsewhere which cannot easily be excluded, but the conclusions should not be greatly affected. There are a few anomalies such as that fact that one-resident households contain some relationships that were amended; these will be because the household also includes one or more non-residents (students with term-time address elsewhere). There are also a few households with no residents that nevertheless have amended relationships for non-residents.

Household size

Before presenting tables and graphs on the effect of amendments to relationships on the two household classification, we first present results showing this effect by number of residents in the household. These results reflect those for person combinations above, where, in particular, errors were found relatively often for relationships of Person 3 with Persons 1 and 2.

M3 Relationships by household size percentage not as on form

- Corrected by swapping
- Corrected by imputation
- Missing value imputed
- Person imputed by ONC
- Household imputed by ONC



Household size	Numbers							Percentage of relationships				
	Households	Number of relationships	Corrected by swapping	Corrected by imputation	Missing value imputed	Person imputed by ONC	Household imputed by ONC	Corrected by swapping	Corrected by imputation	Missing value imputed	Person imputed by ONC	Household imputed by ONC
All households	2,192,246	9,568,902	19,272	125,770	477,912	296,408	208,628	0.2	1.31	4.99	3.1	2.18
1 person	720,830	0	26	100	414	20	0	-	-	-	-	-
2 persons	725,197	1,450,394	3,476	6,574	41,878	31,130	35,074	0.24	0.45	2.89	2.15	2.42
3 persons	341,424	2,048,544	5,570	31,698	139,510	70,476	70,704	0.27	1.55	6.81	3.44	3.45
4 persons	282,570	3,390,840	5,060	42,720	143,554	101,880	58,188	0.15	1.26	4.23	3	1.72
5 persons	93,845	1,876,900	3,034	28,832	88,426	60,786	30,920	0.16	1.54	4.71	3.24	1.65
6 persons or more	28,380	802,224	2,106	15,846	64,130	32,116	13,742	0.26	1.98	7.99	4	1.71

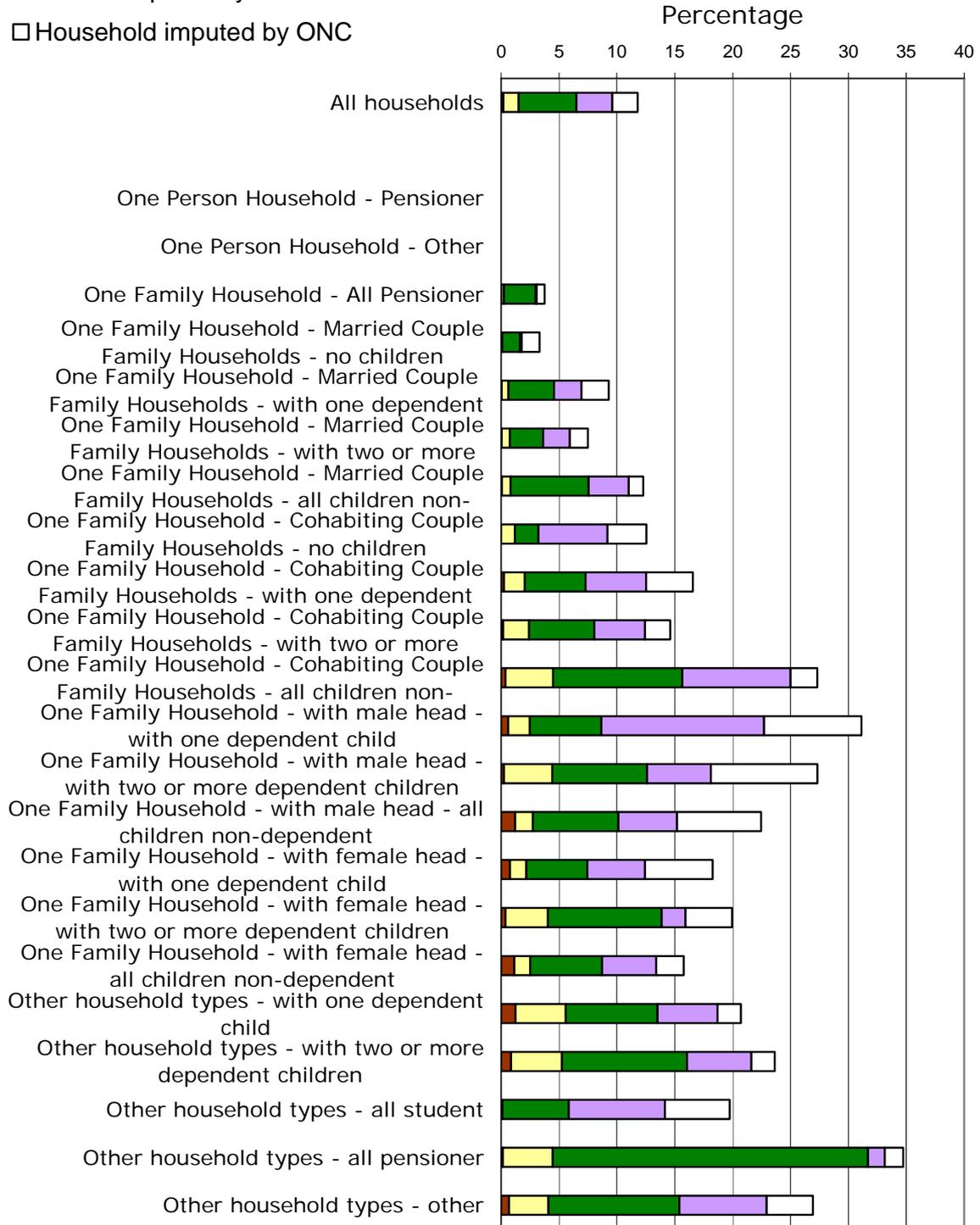
The overall rate of correction by swapping was low at 0.2 percent. Households with 4 or 5 persons were less susceptible to needing this process than households of other sizes. Correction by imputation generally was more prevalent the larger the household, except for 4-person households where 1.3 percent of relationships were corrected by imputation - slightly less (to 2 decimal places) than the rate for all household sizes. Where the form-filler did not provide a relationship and one had to be supplied by imputation, again, as for correction by swapping, larger households were generally more affected. Against the trend was the high rate of imputation for 3-person households. For persons imputed into enumerated households by the ONC process, proportionately more relationships were added to 3-person households and households with 6 or more persons than into households of other sizes - against a general trend of increasing imputation with household size. For relationships added by the imputation of whole households, it was generally smaller households that saw relatively most additional relationships. The overall imputation rate of 2.2 was exceeded only by rates for households with 2 or 3 persons.

Household composition

The next graph shows the same analysis but for the standard classification of household composition (using the relationship data) instead of household size.

M4 Relationships by household composition percentage not as on form

- Corrected by swapping
- Corrected by imputation
- Missing value imputed
- Person imputed by ONC
- Household imputed by ONC



Category		Numbers							Percentage of relationships					
		House-holds	Relation-ships	Corrected by swapping	Corrected by imputation	Missing value imputed	Person imputed by ONC	House-hold imputed by ONC	Corrected by swapping	Corrected by imputation	Missing value imputed	Person imputed by ONC	House-hold imputed by ONC	
All households		2,192,246	9,568,902	19,272	125,770	477,912	296,408	208,628	0.2	1.31	4.99	3.1	2.18	
One Person Household		Pensioner	328,448	0	6	2	20	0	0	-	-	-	-	-
		Other	392,382	0	20	98	362	20	0	-	-	-	-	-
One Family Household	All pensioner		175,115	350,556	114	726	9,594	328	2,434	0.03	0.21	2.74	0.09	0.69
	Married Couple	no children	281,657	563,314	40	432	8,674	876	8,608	0.01	0.08	1.54	0.16	1.53
		with one dependent child	142,116	1,147,972	584	6,714	45,178	27,172	27,042	0.05	0.58	3.94	2.37	2.36
		with two or more dependent children	225,277	3,403,830	1,152	23,976	98,058	78,470	53,110	0.03	0.7	2.88	2.31	1.56
		all children non-dependent	142,171	1,124,334	730	8,286	75,860	39,174	14,012	0.06	0.74	6.75	3.48	1.25
		Cohabiting Couple	no children	84,370	168,740	12	1,998	3,432	10,052	5,662	0.01	1.18	2.03	5.96
	with one dependent child		31,386	206,552	492	3,738	10,850	10,778	8,342	0.24	1.81	5.25	5.22	4.04
	with two or more dependent children		28,060	429,018	764	9,646	24,064	18,834	9,378	0.18	2.25	5.61	4.39	2.19
	all children non-dependent		6,666	49,864	190	2,048	5,568	4,656	1,152	0.38	4.11	11.17	9.34	2.31

Category			Numbers							Percentage of relationships				
			House-holds	Relation-ships	Corrected by swapping	Corrected by imputation	Missing value imputed	Person imputed by ONC	House-hold imputed by ONC	Corrected by swapping	Corrected by imputation	Missing value imputed	Person imputed by ONC	House-hold imputed by ONC
One Family Household	Lone parent family with male head	with one dependent child	8,854	24,702	154	458	1,526	3,472	2,078	0.62	1.85	6.18	14.06	8.41
		with two or more dependent children	3,902	32,304	80	1,346	2,646	1,780	2,978	0.25	4.17	8.19	5.51	9.22
		all children non-dependent	16,604	45,242	548	694	3,336	2,298	3,276	1.21	1.53	7.37	5.08	7.24
	Lone parent family with female head	with one dependent child	77,624	208,096	1,578	2,958	10,952	10,378	12,170	0.76	1.42	5.26	4.99	5.85
		with two or more dependent children	61,072	536,454	2,042	19,680	52,616	11,150	21,484	0.38	3.67	9.81	2.08	4
		all children non-dependent	62,203	173,958	1,974	2,386	10,826	8,110	4,144	1.13	1.37	6.22	4.66	2.38
Other household types	with one dependent child	20,448	243,546	3,070	10,532	19,286	12,664	4,906	1.26	4.32	7.92	5.2	2.01	
	with two or more dependent children	18,544	374,246	3,206	16,474	40,424	20,764	7,608	0.86	4.4	10.8	5.55	2.03	
	all student	12,312	97,498	0	104	5,586	8,104	5,462	0	0.11	5.73	8.31	5.6	
	all pensioner	11,129	31,584	52	1,354	8,606	454	500	0.16	4.29	27.25	1.44	1.58	
	other	61,906	357,092	2,464	12,120	40,416	26,874	14,282	0.69	3.39	11.32	7.53	4	

The highest rates of correction by swapping (above 1 percent) were seen in lone male parent family households with all children non-dependent, the equivalent female lone parent households, and 'other' households (ie those with more than one person or one family) with one dependent child.

The highest rates of correction by imputation (above 4 percent) were seen in a variety of types of household: cohabiting couples with all children non-dependent, male lone parent with two or more dependent children, 'other' households with dependent children (one or two or more), and 'other' all-pensioner households.

Missing relationships were imputed relatively most often (over 10 percent of cases) in households with cohabiting couples and all children non-dependent, 'other' households with two or more dependent children, 'other' all-pensioner households (with over a quarter imputed - the highest rate), and 'other' households.

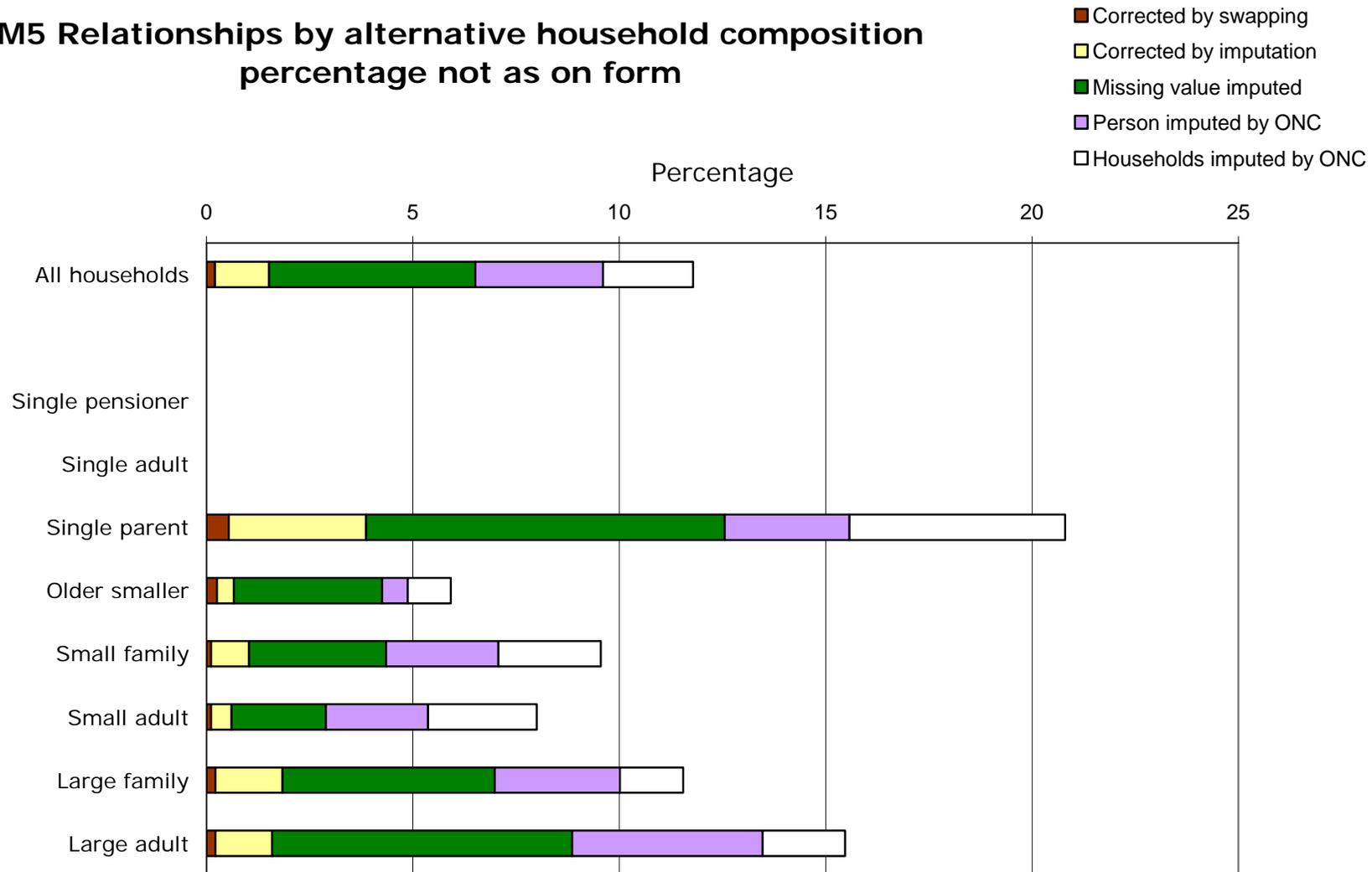
Relationships for persons imputed into enumerated households were relatively most common (almost 10 percent) in cohabiting couples with all children non-dependent, and lone male parents with one dependent child (with one in seven relationships imputed). The same category also had 8.4 percent of relationships through the addition of households in the ONC process. An even higher rate (9.2 percent) was seen for lone male parents with two or more children.

Taking all types of amendment together, over one-third of relationships were not as on the form in 'other' all-pensioner households. There were rates of over a quarter also in cohabiting couple family households with all children non-dependent, male lone parent households with two or more dependent children and in the residual 'other' category in the 'other' households group.

Alternative household composition

The following graph shows the same analysis by the alternative classification of household composition. An explanation of the terms used in the classification is at Annex B.

M5 Relationships by alternative household composition percentage not as on form



Category	Numbers							Percentage of relationships				
	Number of households	Number of relationships	Corrected by swapping	Corrected by imputation	Missing value imputed	Person imputed by ONC	Household imputed by ONC	Corrected by swapping	Corrected by imputation	Missing value imputed	Person imputed by ONC	Household imputed by ONC
All households	2,192,246	9,568,902	19,272	125,770	477,912	296,408	208,628	0.2	1.31	4.99	3.1	2.18
Single pensioner	328,448	0	6	2	20	0	0	-	-	-	-	-
Single adult	392,382	0	20	98	362	20	0	-	-	-	-	-
Single parent	122,556	577,436	3,120	19,224	50,152	17,446	30,196	0.54	3.33	8.69	3.02	5.23
Older smaller	285,988	571,976	1,454	2,316	20,598	3,518	5,958	0.25	0.4	3.6	0.62	1.04
Small family	292,551	2,697,636	3,018	24,880	89,526	73,370	66,894	0.11	0.92	3.32	2.72	2.48
Small adult	370,310	740,620	846	3,620	16,956	18,364	19,494	0.11	0.49	2.29	2.48	2.63
Large family	154,685	2,912,432	6,306	47,252	149,782	88,284	44,738	0.22	1.62	5.14	3.03	1.54
Large adult	245,326	2,068,802	4,502	28,378	150,484	95,406	41,348	0.22	1.37	7.27	4.61	2

Relationships corrected by swapping were relatively most prevalent (0.5 percent) in 'single parent' households. Such households also showed the highest rate of relationships corrected by imputation (3.3 percent) and of missing values imputed (8.7 percent). Missing values were also imputed relatively often in 'large adult' households (7.3 percent). Such households had the highest proportion of relationships created (4.6 percent) when persons were added to enumerated households by the ONC process. This process also added 3.0 percent of relationships in 'single parent' households. When relationships added by the imputation of whole households were added, this type of household saw an overall percentage of amended relationships of over 20 percent.

Annex B

Alternative household composition: Explanation of terms

Category	Description
Single pensioner	1 adult of pensionable age
Single adult	1 adult of non-pensionable age
Single parent	1 adult of any age and 1 or more children
Older smaller	1 adult of non-pensionable age and 1 of pensionable age and no children or 2 adults of pensionable age and no children
Small family	2 adults and 1 or 2 children
Small adult	2 adults of non-pensionable age and no children
Large family	2 adults and 3 or more children or 3 or more adults and 1 or more children
Large adult	3 or more adults and no children
Communal establishment	Communal establishment
Unoccupied household spaces	Unoccupied household spaces