

Population Estimates by Marital Status

Details and results of the internal review leading to changes in the methodology.

Introduction

ONS changed its methodology for producing Population Estimates by Marital Status in 2015. The new method uses the marital status distribution from the Labour Force Survey (LFS) constrained to the Annual Mid-year Population Estimates. Previously the Cohort Component method was used. ONS consulted users in 2014 about the change to the methodology and the estimates were published for the first time using the new methodology in July 2015 which included a consistent back series to 2002.

This paper outlines the results and the process that ONS undertook to review the methodology and data sources used to produce the Population Estimates by Marital Status.

Analysis and comparisons with 2011 Census data and other data sources are presented to help explain the strengths and limitations of the statistics and therefore the impact on their use for users. This paper will demonstrate how ONS balanced user need, societal changes, timeliness and quality in order to recommend a new methodology and data source to be able to produce the Population Estimates by Marital Status to a high standard.

Why did the methodology used to produce the Population Estimates by Marital Status need to change?

The methodology needed to be updated because of:

- societal changes which were not being captured using the previous methodology, for example;
 - Civil partnerships were introduced in England and Wales in December 2005 and although administrative statistics on civil partnership formation and dissolution are available, the previous method had not been able to be updated to reflect this. This is primarily because the old method relied on the 2001 Census population by marital status as a starting point, but at the time of the 2001 Census civil partnerships did not exist and so the population was adjusted each year from 2001 without taking civil partnerships into account
 - In addition, cohabitation has become much more common, either as a precursor, or an alternative, to marriage. Estimates of the cohabiting population were not possible using the previous method as there is no requirement to formally register cohabiting relationships
- concerns over quality of the survey estimates of the number of marriages occurring abroad and concerns over the quality of marital status information, including civil partnerships, collected from migrants

The publication of data from the 2011 Census on the marital status of the England and Wales population provided a good opportunity to review whether the Population Estimates by Marital Status were still fit for purpose.

How did ONS reach the decision on which methodology to use?

Stage 1: What were the options?

Initially 3 options were proposed;

1. Continue with existing method (Cohort component method) and output
2. Use survey sources to produce alternative outputs
3. Cease publishing Population Estimates by Marital Status

The potential survey sources included the Labour Force Survey (LFS), Annual Population Survey (APS) and the Integrated Household Survey (IHS). The IHS was selected at this stage as the survey source option because of its larger sample size and because it was used as a comparator source when quality assuring the marital status topic for the 2011 Census.

The first stage was to undertake a comparison of the Population Estimates by Marital Status created using the existing method (Cohort component method) with the 2011 Census results and Survey data (IHS)¹. These were presented at an internal ONS committee.

Comparison of Population Estimates by Marital Status with Survey estimates and 2011 Census data.

Two measures (Table 1 and Table 2) were used to determine which source provided a better estimate, that is an estimate which is closer to the 2011 Census distribution:

- Percentage differences between both of the sources and the 2011 Census for all people by marital status
- Mean absolute percentage differences between both the sources and the 2011 Census by marital status/age/sex group

¹ It should be noted that at this stage neither the mid 2010 Population Estimates by Marital Status nor the IHS had been rebased following the 2011 Census. An assumption was made that the Census is the 'gold standard' although there is potential for [over and underestimation for some sub-groups](#) in the Census.

Table 1: IHS Survey data, percentage difference compared to 2011 Census data
England and Wales

Sex	Age group	Marital / civil partnership status						Total
		Single	Married	Separated (marriage or CP)	Divorced / dissolved CP	Widowed / surviving CP	Civil partnered	
All	16-24	0	9	-6	-71	-95	1	0
	25-34	-2	7	-7	-28	-55	-12	0
	35-49	-6	6	-10	-11	-11	30	0
	50-64	-9	5	-5	-12	-5	-9	0
	65-74	-17	3	7	-5	-4	0	0
	75-84	-7	2	47	-14	-1	-54	0
	85+	-6	21	48	-10	-7	-73	0
Total		-3	6	-5	-11	-8	7	0
Male	16-24	0	1	-24	-84	-92	-21	0
	25-34	-2	5	15	-28	-62	-2	0
	35-49	-5	5	-8	-12	-11	38	0
	50-64	-10	5	-8	-13	-3	1	0
	65-74	-18	3	-6	-13	1	3	0
	75-84	-14	3	45	-26	0	-60	0
	85+	-25	7	63	-9	-5	-59	0
Total		-3	5	-3	-14	-4	13	0
Female	16-24	0	13	1	-62	-97	20	0
	25-34	-3	9	-18	-28	-51	-25	0
	35-49	-6	6	-11	-10	-12	18	0
	50-64	-7	5	-2	-11	-6	-23	0
	65-74	-15	2	22	0	-5	-6	0
	75-84	0	1	51	-6	-1	-41	0
	85+	5	27	-2	-10	-4	-100	0
Total		-3	7	-6	-9	-9	-2	0
Mean absolute percentage difference		8	7	20	22	25	30	0

Percentage differences between the IHS survey data and the Census for all people by marital status (shown in yellow)

Mean absolute percentage differences between IHS survey data and the Census by marital status / age / sex group (shown in red).

Table 2: Existing method (Cohort component method), percentage difference compared to 2011
Census data
England and Wales

Sex	Age group	Marital / civil partnership status					
		Single	Married	Divorced / dissolved CP	Widowed / surviving CP	Civil partnered	Total
All	16-24	1	-14	-50	-91	-	0
	25-34	7	-13	14	-23	-	0
	35-49	3	-2	7	-16	-	0
	50-64	-2	1	1	-4	-	0
	65-74	4	0	0	0	-	0
	75-84	10	-2	2	1	-	0
	85+	19	1	-17	-1	-	0
	Total	3	-2	3	0	-	0
Male	16-24	0	-2	-68	-90	-	0
	25-34	5	-11	18	-30	-	0
	35-49	1	-1	10	-18	-	0
	50-64	-3	1	0	-3	-	0
	65-74	3	0	-2	-1	-	0
	75-84	12	-1	0	2	-	0
	85+	43	-3	-6	-1	-	0
	Total	2	-2	3	-1	-	0
Female	16-24	1	-18	-38	-91	-	0
	25-34	10	-14	13	-18	-	0
	35-49	5	-2	5	-15	-	0
	50-64	-1	0	1	-5	-	0
	65-74	7	-1	2	0	-	0
	75-84	9	-3	3	1	-	0
	85+	9	7	-22	-1	-	0
	Total	3	-3	3	0	-	0
Mean absolute percentage difference		8	5	13	20	-	0

Percentage differences between the IHS survey data and the Census for all people by marital status (shown in yellow)

Mean absolute percentage differences between IHS survey data and the Census by marital status / age / sex group (shown in red).

Married

Compared with the Census, the IHS overestimated the proportion of married people by 6% overall, and by 21% for those aged 85+. For separated (married or civil partnered) people, the IHS underestimated the proportion by 5% but the separated population is much smaller. It has previously been speculated that married people (particularly those with children) are more likely to be at home and to take part in a household survey than others such as those who live alone. This may have led to the IHS overestimating the proportion of the population who are married.

The marital status estimates underestimated the proportion of the population which is married by 2%, a smaller absolute difference than the IHS. The differences by age group were also generally smaller than those for IHS, with the exception of those aged under 35. This underestimate could be as a result of the underestimation of the population who were married abroad since 2001, due to the IPS sample size.

Single

The IHS underestimated the proportion of single (never married) people by 3%. The underestimates were larger for men aged 50+. The marital status estimates overestimated the single population by a similar amount.

The reason for these under- and overestimates may be due to the need for consistency in population totals. In other words, estimates for all marital status categories summed together must equal the population estimate. Therefore if one marital status category (e.g. married) is overestimated, this may cause the other categories to be underestimated (and vice versa).

Divorced / dissolved civil partner

The IHS underestimated the proportion of the population which was divorced (or a dissolved civil partnership) by 11%, with underestimates in nearly all age / sex groups, particularly those under 35 (where smaller numbers tend to lead to larger percentage differences). The marital status estimates overestimated the proportion by 3%, a much smaller absolute difference. Again larger percentage differences were found in those aged under 35.

One possible reason for the IHS underestimation here may be that divorced people are more likely to live alone than married people. Those who live alone are known to be less likely to take part in a household survey.

Widowed / surviving civil partner

The IHS underestimated the percentage of people in this category by 8%, with underestimates in nearly all age / sex groups, particularly those under 35. The marital status estimates are much better overall with an underestimate of <0.1%. Again differences are focussed in the under 35s.

There is likely to be a higher proportion of people who are widowed in communal establishments than in the household population, and the IHS does not count most people in communal establishments.

Civil partnered

The IHS overestimated the proportion of people who are in a civil partnership by 7%. Small numbers in other age / sex groups create large percentage differences. The marital status estimates in their existing form were unable to account for civil partnerships as explained earlier.

Comparison of sex ratios

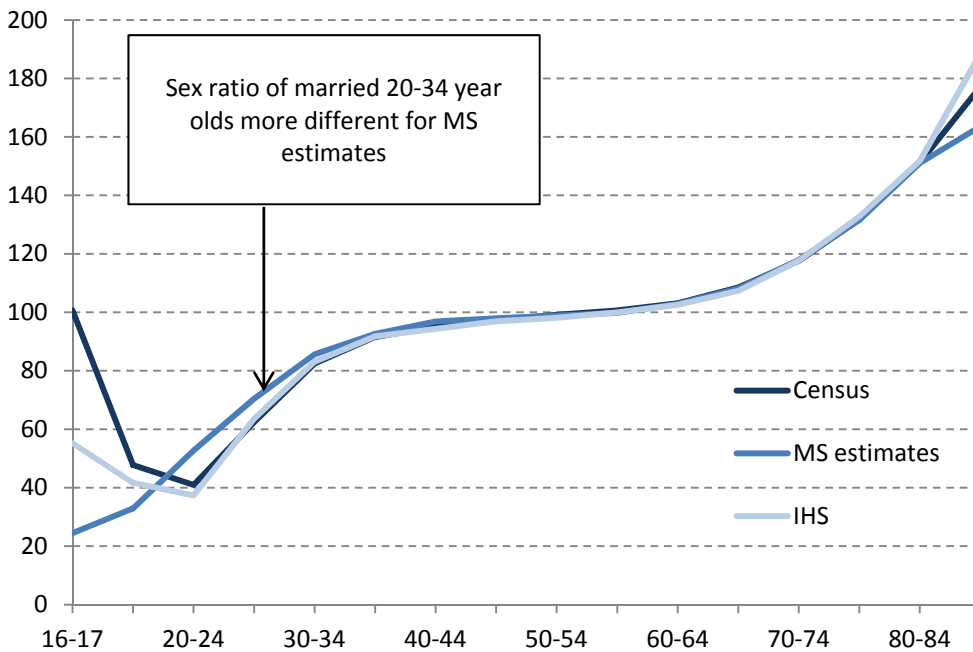
As part of the comparisons of the various data sources, the sex ratios from each data source were compared. These comparisons were carried out due to concerns surrounding the sex ratios for the Population Estimates by Marital Status created using the Cohort Component Method. This is because more men than women marry abroad (so were accounted for in the marriages abroad adjustment), but the women who migrate to this country to be with them were not sufficiently accounted for in the Population Estimates by Marital Status migration methodology. This was because the migration methodology used data from the 2001 Census.

Table 3: Sex ratios (the number of men per 100 women) for broad age groups

Age group	Single			Married (inc. separated)			Divorced / dissolved CP			Widowed / surviving CP		
	Census	MS estimates	IHS	Census	MS estimates	IHS	Census	MS estimates	IHS	Census	MS estimates	IHS
16-24	105.6	108.2	107.5	41.8	51.7	37.7	63.4	33.6	26.1	64.1	73.9	166.0
25-34	120.4	118.8	125.4	74.8	80.0	75.5	55.9	60.6	57.7	50.1	44.4	40.0
35-49	127.0	121.8	128.5	94.8	96.0	94.5	70.6	74.3	68.5	37.0	35.8	37.4
50-64	153.0	148.6	145.7	101.0	100.5	100.2	80.5	79.3	77.5	33.9	34.3	34.4
65-74	150.3	143.0	142.7	112.4	112.3	111.7	78.6	75.0	68.1	30.6	29.9	32.4
75-84	90.5	91.6	77.3	138.6	138.3	139.3	66.9	63.7	52.5	29.1	29.1	29.3
85+	40.9	54.4	36.5	177.2	163.6	188.5	42.0	51.0	52.6	26.7	26.9	33.2
Total	116.6	116.1	118.3	99.2	100.9	98.8	74.2	74.7	70.4	29.7	29.5	31.8

Source: Census 2011, Cohort component method estimates and HIS

Figure 1: Sex ratio of the married (including separated) population by quinary age group



Source: Census 2011, Cohort component method estimates and IHS

The IHS appeared to have a closer sex ratio to the 2011 Census than the existing Population Estimates by Marital Status for those aged 16-49, particularly the 20-34 age group. For the 50-84 age group the Population Estimates by Marital Status produced a better sex ratio. This could be evidence that the Population Estimates by Marital Status migration methodology was undercounting married women as people aged 20-49 are more likely to get married than older age groups.

The sex ratio results for the other marital status categories showed a mixed picture for those aged 16-49 with some age / marital status groups showing the IHS providing a more accurate estimate and others showing that the Population Estimates by Marital Status provided a better estimate. For almost all age / marital status groups over age 50, the Population Estimates by Marital Status provided a closer sex ratio to the 2011 Census. This could have been because it is easier to estimate the marital status of those in this age group using a cohort component method as they are less likely to get married or to migrate.

The advantages and disadvantages of each of the initial options are presented here:

Option	Advantages	Disadvantages
Existing method (Cohort component method)	<ul style="list-style-type: none"> Compared to the 2011 Census, this method appears to produce the more accurate statistics Long time series, and on consistent basis if revised back to 2002 No extra work required if do not revise back to 2002 Current users would be happy with this option as they would not need to change their methods 	<ul style="list-style-type: none"> Most time consuming and costly option (estimated to cost £11k per year) Is published 17 months after reference date Data not available for UK or sub-England and Wales geographies Substantial work required to revise back series to 2002 Inconsistent time series if do not revise back to 2002 A new system would need to be built to produce the estimates
Survey source	<ul style="list-style-type: none"> Provides an opportunity to produce more relevant statistics, possibly increasing user base Publishing quality measures is possible Cheaper than existing method Could publish data for UK or sub-England and Wales geographies Lower risk in terms of availability of data sources More future-proof and flexible than existing method as no need to update method for same-sex marriage and the outcome of the Census Transformation Programme 	<ul style="list-style-type: none"> Compared to the 2011 Census, this method appears to produce less accurate statistics Ceasing of long time series of data but could produce a small back-series once survey has been re-weighted Statistics by single year of age and sex likely to be less robust than using existing method More work needed to research potential outputs and data sources Reweighting of surveys to revised population estimates back to 2002 not due until summer 2014 Some current users may require

	<p>presents a lower risk</p> <ul style="list-style-type: none"> • A project would be required to decide exactly what outputs to produce (e.g. Age group / sex / geographic levels) 	<p>specific outputs</p> <ul style="list-style-type: none"> • Excludes communal establishment population
Cease output	<ul style="list-style-type: none"> • Cheapest option • No need to revise back series to 2002 	<ul style="list-style-type: none"> • Leaves an unmet user need, possibly leading others to create their own estimates, with ad hoc requests for data likely to be more frequent • Ceasing of long time series of data

Conclusion

Conclusions from the analysis were that the existing Population Estimates by Marital Status provided a closer match to the 2011 Census distributions of marital status compared to the IHS for all groups except for those who were single. However, the results indicated that the marital status estimates may have been undercounting women migrating to this country after marrying a UK resident abroad.

Following this first piece of research the analysis was updated to use 2011 Census data that excluded data for people living in communal establishments. The same conclusions were drawn from the updated analysis.

This analysis and the conclusions drawn from it were discussed with a subgroup of internal ONS stakeholders. Although the analysis that was carried out showed the Population Estimates by Marital Status using the Cohort Component Method produced the most accurate statistics compared to the 2011 Census it was evident that the IHS data also produced accurate robust estimates. Accuracy is only one dimension of quality and so considering other dimensions such as relevance and timeliness, the subgroup suggested that the survey source option would be the best option to take forward.

Stage 2: How to adjustment for the communal establishment population?

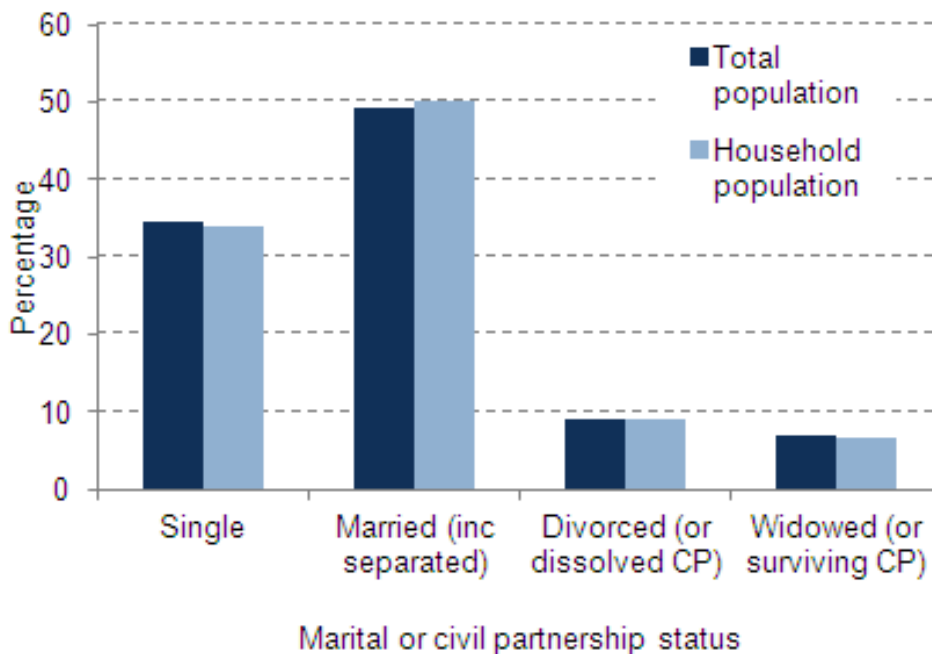
At this stage it was discovered that the survey that had been selected (IHS) as a potential survey source would no longer be viable. This was due to the IHS core questions being removed from the Living Costs and Food Survey. This meant that the LFS and the APS would have to be considered again as potential survey data sources.

As a survey source was likely to be taken forward for use in the production of the Population Estimates by Marital Status it was also decided that the household dataset should be used, based on advice from the LFS and APS teams.

Communal establishment population

One disadvantage of using a sample survey alone is that a survey provides estimates of the household population only. Not only does this exclude those living in communal establishments, meaning estimates by marital status do not exactly equal population estimates by age and sex, but the marital status of the household and communal populations can be quite different. However because over 98% of the total population live in a household, the marital status distribution of the total population is very similar to that of the household population, as illustrated in Figure 2. Those in civil partnerships (which comprised 0.23% of the population aged 16 or over in 2011) were excluded from the graph due to the small percentages.

Figure 2: Percentage of total and household population aged 16 or over by marital status, 2011



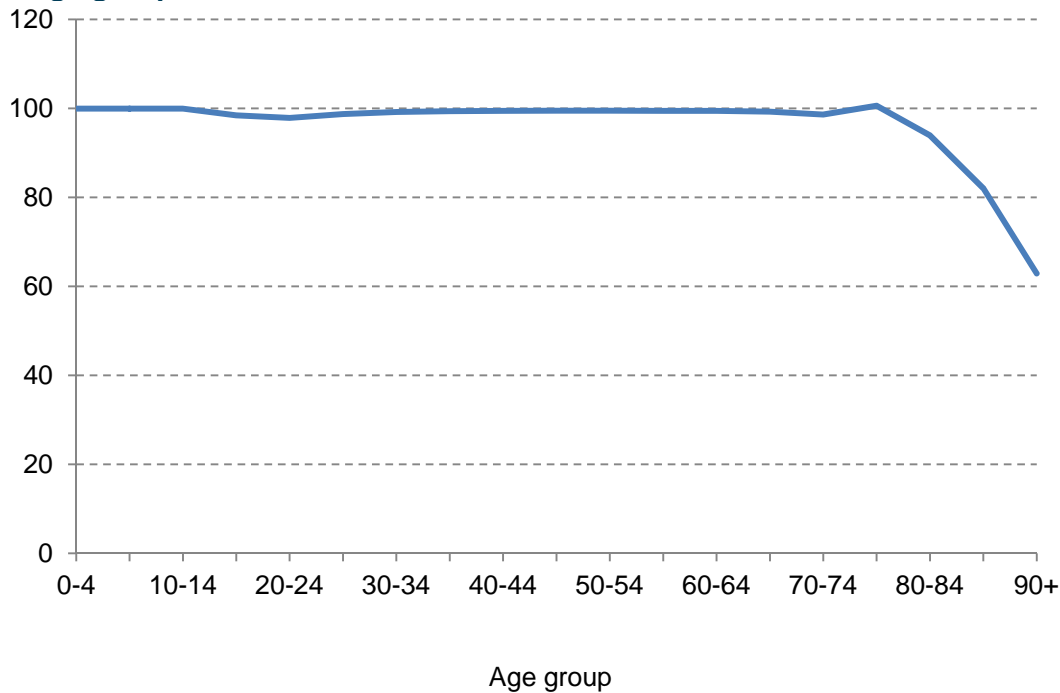
Source: Census 2011

Note: Civil Partnerships have been excluded from the graph

The disadvantage of excluding the communal establishment population could be overcome by making a suitable adjustment, for the marital status of this population, to the results from the survey of the household population. This would mean that the total population using this method would equal that of the total mid-year population estimates by age and sex.

The following graph shows the APS population for January to December 2010, which was weighted to June 2010 population estimates / projections (which had not been rebased as a result of the 2011 Census), divided by published mid-2010 population estimates (which had not been rebased as a result of the 2011 Census).

Figure 3: APS population estimate divided by published mid-year population estimate, five year age groups, UK, 2010



Source: APS and Annual Mid-year population estimate

The graph shows that for the 75-79 year age group the APS population estimate is higher than the published population estimate, despite the former representing people living in private households and the latter representing all usual residents. Although at first this may appear illogical, possible explanations for this include:

- Population estimates not being available when the APS was weighted so population projections were used instead
- Individual weights are rounded to integers, leading to small differences when summed
- There are different levels of calibration used in the weighting process (by age group, local authority, sex etc).

There are various reasons why the weighted estimates were larger than the published population estimates, especially when certain ages are examined. However, in total the APS population represented 98.6% of the published population estimate for 2010.

This suggested that it was not possible to simply add on a communal establishment population estimate to the APS household population estimate. Instead it would be necessary to apply a marital status distribution from the APS to a mid-year population estimate of the household population.

Undertaking an option where the marital status estimates equalled published population estimates could have worked as follows:

- Take the latest population estimates. Then for each age / sex / area group:
 - Split the total population between the household and communal establishment population using a percentage split from the 2011 Census
 - For the household population, apply the marital status distribution from the APS or LFS
 - For the communal establishment population, apply the marital status distribution from the Census of those living in communal establishments
- Add the result of these previous two steps together to get the total population by marital status

Coverage of older people

Analysis of marriage and divorce rates were conducted at this time because of the concerns about the coverage of older people on social surveys. The analyses of first marriage rates for men are presented in Table 4. (First marriage rates for women and divorce rates are presented in Annex A)

Table 4: Difference in first marriage rates for men (existing method estimates minus LFS estimates)

Year	Age at date of marriage - rate per 1,000 single population									
	All ages	Under 20	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55+
2010	-1.7	0	-0.3	-3.1	-7.8	-4.5	-2.1	-1.5	-1.1	-0.7
2009	-1.4	0	-0.3	-1.7	-7.5	-4.9	-3.1	-0.5	-0.9	-0.4
2008	-1.5	0	-0.5	-2.5	-6.7	-3.9	-1.9	-0.9	-0.1	-0.6
2007	-1.5	0	-0.4	-2.5	-5.5	-3.1	-2.8	-1	-0.3	-0.6
2006	-1.4	0	-0.3	-2	-5.5	-3.3	-2.2	-0.9	-1	-0.5

Source: Cohort component estimates and Labour Force Survey

Divorce rates were on average 0.5 per 1,000 married people lower using the LFS compared with the estimates produced using the cohort component method, with larger differences amongst those aged 20-34. First marriage rates were on average 1.9 per 1,000 single people higher using the LFS, with larger differences amongst those aged 25-39. These patterns were observed because the LFS tends to overestimate the number of married people compared with the marital status estimates produced using the existing method and underestimates the number of single people.

It was also noticeable that there is a greater difference in the first marriage rates for women than for men. This was because there was a greater difference in the estimates of single women (10%) than single men (7%) between the LFS and marital status estimates produced using the existing method.

There was little difference for both first marriage and divorce rates between the sources for the oldest age groups (55+ and 60+). There was a concern that there would be larger differences in rates for these age groups as those in communal establishments such as nursing and residential homes are not included in the LFS sample. However because so few people get married for the first time or divorce in these age groups, the rates change little.

As few people marry for the first time at older ages remarriage rates were calculated using a survey source to get a better understanding of the impact at older ages. The difference of re-marriage rates using LFS data and using the marital status estimates (existing method) are shown in Table 5. (Analysis of re-marriage rates for women can be found in Annex B).

Table 5: Difference in re-marriage rates for men (existing method estimates minus LFS estimates)

Year	Age - rate per 1,000 divorced or widowed population						
	All ages	20-24	25-29	30-34	35-44	45-54	55+
2010	-4.8	22.3	-74.4	-15.4	-7.1	-8.0	-2.0
2009	-4.1	-108.2	-37.4	-41.6	-8.8	-9.6	-1.1
2008	-3.3	-154.5	-78.4	-49.3	-13.2	-6.9	-0.4
2007	-3.1	-52.5	-69.0	-51.9	-19.2	-5.3	-0.2
2006	-2.5	N/A	-40.7	-124.6	-27.5	-1.7	0.4

Source: Cohort component estimates and Labour Force Survey

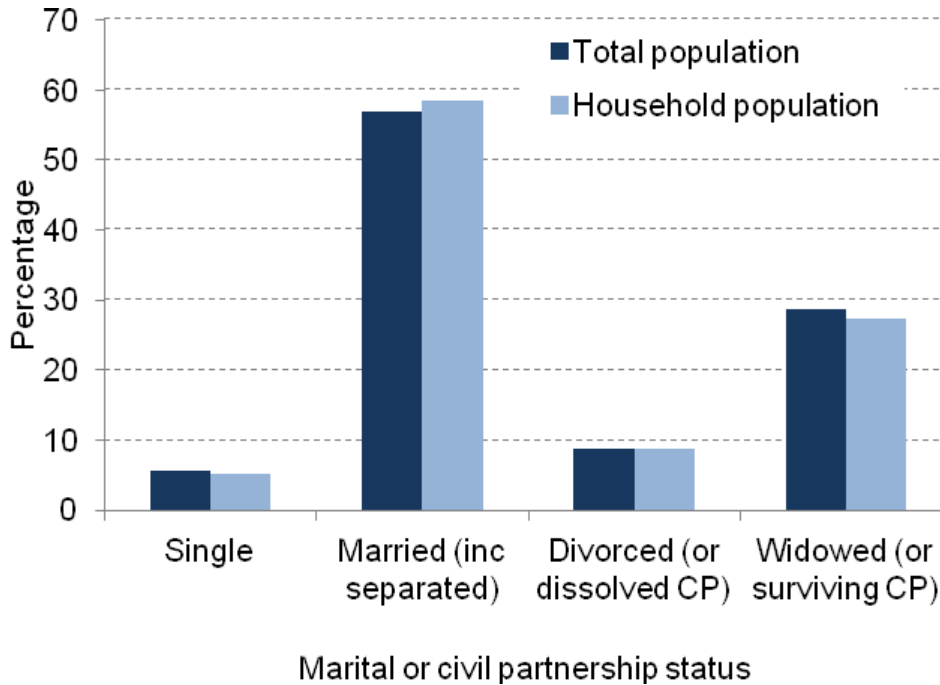
The rates calculated using the LFS were both unstable (year on year) and much higher than the published rates for those aged up to 44, where there are relatively small numbers of people remarrying and smaller age groups (e.g. 20-24, 25-29). Remarriage rates were higher than published rates for the 45-54 and 55+ age groups but were much more stable year on year. These patterns were observed because the LFS underestimates the number of divorced or widowed people compared with the Population Estimates by Marital Status.

At this stage a further option was discovered. It was thought that using an option where a survey was constrained to the Annual Mid-year Population Estimates may have less of an impact on the remarriage rates as they would be constrained to published population estimates.

Further analysis was required to compare the marital status distribution for the household population and the total population because this proposed method of constraining a survey source to the mid-year population estimate would also not take into account the communal establishment population.

Further analysis of the communal establishment population

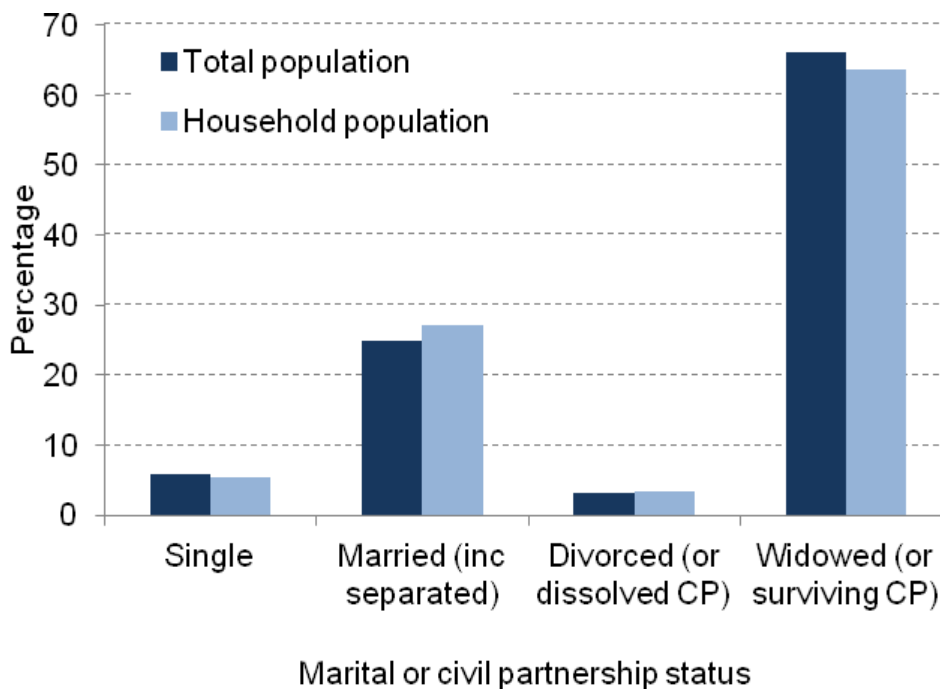
Figure 4: Percentage of total and household population aged 65 or over by marital status, 2011



Source: Census 2011

Note: Civil Partnerships have been excluded from the graph

Figure 5: Percentage of total and household population aged 85 or over by marital status, 2011



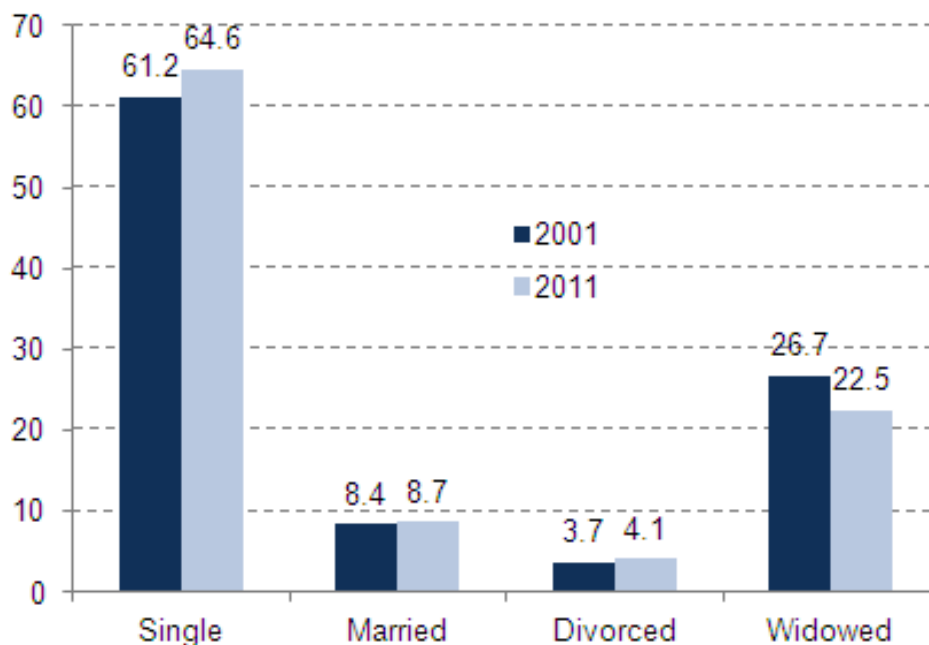
Source: Census 2011

Note: Civil Partnerships have been excluded from the graph

There was little difference in the distribution of the household and total populations by marital status. Even in the 85+ age group where more difference might be expected, 25% of those in the total population were married, compared with 27% in the household population. Similarly, 66% of those in the total population were widowed, compared with 64% in the household population. This finding added credibility to the option where a survey source is constrained to the Annual Mid-year Population Estimate, as this method essentially involved ignoring the marital status distribution of the communal establishment population.

The survey source plus a communal establishment population adjustment option and the survey source constrained to the Annual Mid-year Population Estimate option would not work well over a long period of time if there was a substantial shift in the marital status distribution of the communal establishment population. This chart illustrates that there was a change between 2001 and 2011.

Figure 6: Percentage of communal establishment residents by marital status, 2001 and 2011, England & Wales



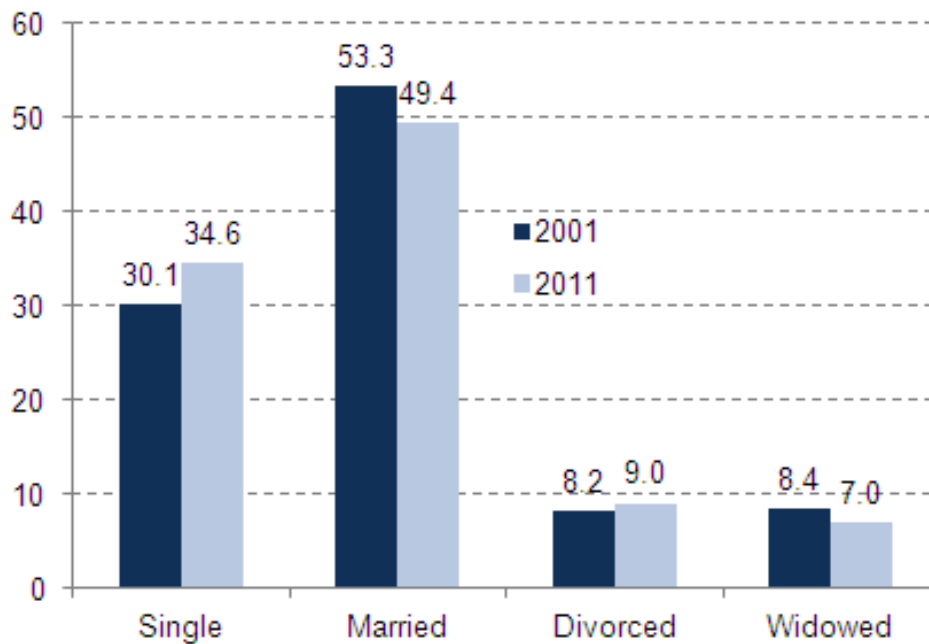
Source: Census 2001 and Census 2011

Notes for Figure 6 and Figure 7:

1. Separated have been included in married column for both years
2. Civil partnerships in 2011 have been ignored
3. These tables include communal establishment residents only (so in 2011 no guess is made for the marital status of owners or their family members)

The percentage of communal establishment residents who were single increased between 2001 and 2011 while the percentage that were widowed decreased. This trend was also observed amongst the total population.

Figure 7: Percentage of the adult population by marital status, 2001 and 2011, England & Wales



Source: Census 2001 and Census 2011

So if the survey source constrained to the Annual Mid-year Population Estimate option is used for the last decade, some of the changes in the marital status distribution in the communal establishment population (such as an increase in the percentage of single people) would be picked up. In other words, if the change in the total population is similar to the change in the communal establishment population, that is an argument in favour of the survey source constrained to the Annual Mid-year Population Estimate option.

This analysis showed that the survey data on average produced lower divorce rates and higher first marriage rates compared to when they were calculated using the Population Estimates by Marital Status (existing method) but there were little differences for the older age groups (55+ and 60+) for both first marriage and divorce rates.

The analysis also showed that the LFS underestimated the divorced and widowed population which results in higher re-marriage rates for those aged 45 to 54 and 55+. Analysis showed that there was little difference in the household and total population by marital status which meant that not including an adjustment for the communal establishment population would have little impact on the overall estimate.

The advantages and disadvantages of the 3 options at this stage were summarised in this table:

Option	Advantages	Disadvantages
Survey source only	<ul style="list-style-type: none"> • Simple to calculate and explain method to users • If LFS is used, no need to wait until population estimates are published • It will be possible to produce confidence intervals using this method • It will be easier to produce any ad hoc requests using this method 	<ul style="list-style-type: none"> • The estimates will not sum to published population estimates, leading to possible confusion for users, especially where household estimates are larger than population estimates • The estimates represent only the household population, leading to possible bias, especially amongst the oldest ages (who are more likely to be living in a communal establishment)
Survey source + communal population adjustment	<ul style="list-style-type: none"> • The estimates will sum to published population estimates • The estimates represent the whole population 	<ul style="list-style-type: none"> • The method is slightly more complex • Will need to wait until population estimates are published. This will not be a problem if the LFS is used but would cause a delay if the APS is used • It will not be possible to produce any indication of the robustness of the estimates (e.g. confidence intervals) using this method • It will not be possible to easily produce any ad hoc requests using this method • The Census data about the communal establishment population will become out of date over the next decade
Survey source constrained to the mid-year population estimates	<ul style="list-style-type: none"> • Simple to calculate and explain method to users • It will be possible to produce confidence intervals using this method • It will be easier to produce any ad hoc requests using this method • The estimates will sum to published population estimates 	<ul style="list-style-type: none"> • The estimates represent only the household population, leading to possible bias, especially amongst the oldest ages (who are more likely to be living in a communal establishment) • Will need to wait until population estimates are published. This will not be a problem if the LFS is used but would cause a delay if the APS is used. However, estimates using the existing method (cohort component) have been published 17 months after the mid-June reference date, so estimates using either the LFS or APS would still be more timely

It became clear to ONS internal stakeholders that the 3rd option, Survey source constrained to the Annual Mid-year Population Estimates, had clear advantages over the other options. A recommendation to the Research Review Group (RRG) was made to suggest that the 3rd option should be used to produce the Population Estimates by Marital Status. It was then agreed that a consultation, consulting users with a defined method and proposed outputs would be the best way forward.

Further work was required to determine whether the APS or the LFS would be taken forward as the survey source, what geographies the output should be produced for, whether the estimates could be by single year of age and whether the estimates should be for legal marital status only or should they include estimates of the cohabiting population too.

Stage 3: User needs and consultation

Geography

Analysis of known user requirements found that:

- National Population Projections and Vital Statistics Output Branch with ONS required estimates for England and Wales (combined)
- Government Actuary's Department required estimates for individual UK countries
- Department for Work and Pensions required estimates for Great Britain (although they used marital status estimates and projections for England and Wales in their models)
- Northern Ireland Statistics and Research Agency said that there was no appetite for marital status estimates for Northern Ireland
- National Records of Scotland (NRS) were going to review the need for marital status estimates later in 2014²
- No known users required estimates for smaller areas than UK country.

Therefore it was proposed that the estimates continue to be published for England and Wales (combined) because this both satisfied half of users' need and would mean no step-change following on from the currently published Population Estimates by Marital Status using the Cohort Component method. In addition, estimates for Scotland and Northern Ireland using a survey source would not be very robust.

Whether estimates of cohabiting population should be published

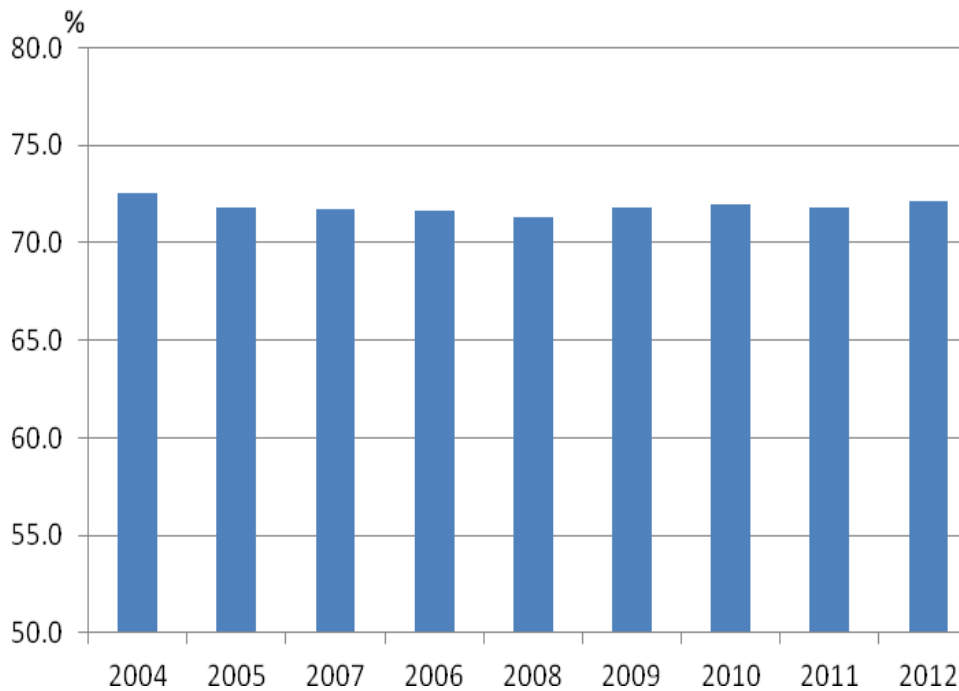
DWP required estimates of the cohabiting population for their models which estimate the impact of reforms to benefits over the medium term, and because they were interested in families, children and the impact of family breakdown. The subgroup of internal ONS stakeholders agreed that the opportunity of reviewing the method for the marital status estimates should be used to extend the estimates to cover cohabitation.

Single year of age or age groups?

There was some concern that using a survey source might mean that percentages of people in each marital status category would be volatile year on year for each age or sex group. The graphs show how the percentages of those who are married varies over time for people who are in the age group 65-69 compared to those who are married aged 69.

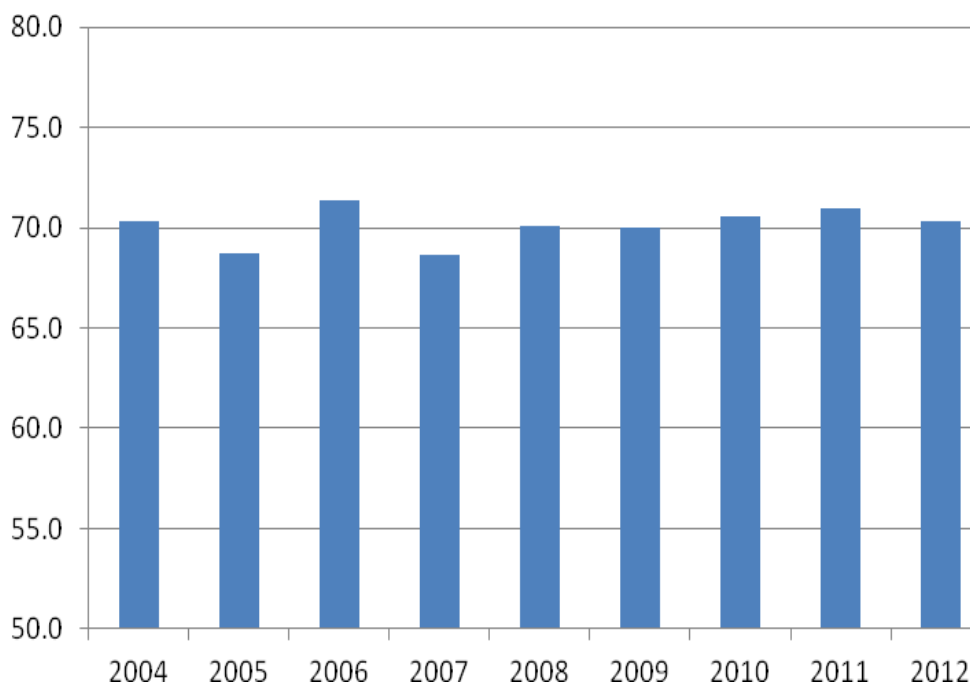
² NRS [consulted](#) users surrounding the production of these statistics. The [analysis of responses](#) was published in July 2015.

Figure 8: Percentage of people aged 65-69 who are married, UK, 2004 to 2012



Source: Annual Population Survey (APS)

Figure 9: Percentage of people aged 69 who are married, UK, 2004 to 2012



Source: Annual Population Survey (APS)

All marital statuses and age groups were compared and the conclusion was that because a survey source constrained to the Annual Mid-year Population Estimate option was being taken forward it would be beneficial to present the estimates by five year age groups and sex, as this would reduce the volatility in the final estimates.

Which survey source should be used?

Both Government Actuary's Department (GAD) and Department for Work and Pensions (DWP) required estimates by single year of age and sex, but estimates from survey sources are not sufficiently robust to provide this, even at national level. Therefore estimates by 5 year age group and sex were proposed, where robust.

The choice of survey was a balance between quality and timeliness. The LFS has a sample size of around 100,000 people per quarter whereas the APS has a sample size of around 350,000 in a calendar year. However the APS is less timely. If the marital status estimates were to be produced using this method for 2013 for example:

- Population estimates would be required (available June 2014)
- LFS dataset was available September 2013, so estimates could be produced around July 2014
- APS dataset was available September 2014, so estimates could be produced around November 2014 (after the annual Families and Households publication which has in the past been produced in September or October each year).

Therefore using the APS meant a 4 month lag over using the LFS. It was proposed that the LFS is used because of this lag and because there is not much more stability in the percentages of people in each marital status year-on-year using the APS, particularly for the very young (16-19) and very old age groups. Percentages of people aged 55-59 who are married were compared using the APS and the LFS in this chart as an example:'

Figure 10: Percentage of people aged 55-59 who are married, England and Wales, 2004 to 2012



Source: APS and LFS

It was decided that the estimates would continue to be produced for England and Wales combined and that the LFS would be used as the survey source. It was also agreed that the estimates would be extended to cover the cohabiting population.

The ONS consulted on the methodology and the outputs for the Population Estimates by Marital Status and Living Arrangements. The [consultation and the results](#) were published to the ONS website. The [Population Estimates by Marital Status and Living Arrangements](#) were published for the first time on 8 July 2015. This publication included a comparison of the marital status estimates produced using the new methodology and the previous methodology.

Conclusion

ONS explored methods and analysed data sources to build a body of evidence which would help to inform the decision on which would be the best way to produce the Population Estimates by Marital Status. ONS has selected a method and data source combination which provides estimates which are generally comparable to the estimates produced using the Cohort Component Method allowing for a long time series of Population Estimates by Marital Status. This is alongside the other advantages that the selected method provides;

- future proof- will be responsive to changes in legislation e.g. introduction of same sex marriages
- more flexible- geographic level that can be produced, different cross tabulations and age groups
- timely- produced 13 months after reference date rather than 17 months like the cohort component method
- cheaper to produce
- allows measures of precision

- allows the addition of cohabitation statistics

The revised methodology produces robust estimates for the public and government stakeholders to use confidently. The analysis shown in this report helps users of the estimates to understand the strengths and limitations of the method and data source allowing them to assess the impact this may have on their future use of the estimates.

Annex A

Table 6: Difference in first marriage rates for women (existing method estimates minus LFS estimates)

Year	Age at date of marriage - rate per 1,000 single population									
	All ages	Under 20	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55+
2010	-2.7	0.0	-0.6	-5.7	-14.3	-5.3	-2.9	-2.1	-1.5	-0.5
2009	-2.4	-0.1	-0.5	-5.9	-10.2	-4.8	-2.4	-1.2	-1.0	-0.5
2008	-2.1	0.0	-0.8	-5.1	-9.9	-3.5	-1.7	-1.4	-1.1	-0.4
2007	-2.1	0.0	-0.5	-3.8	-6.0	-5.2	-1.7	-3.2	-1.8	-0.4
2006	-1.8	0.0	-0.2	-4.3	-6.5	-3.8	-1.5	-2.4	-1.1	-0.5

Source: Cohort component estimates and Labour Force Survey

Table 7: Difference in divorce rates for men (existing method estimates minus LFS estimates)

Year	Age at date of marriage - rate per 1,000 single population										
	All ages	Under 20	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
2010	0.4	1.5	-1.5	5.0	1.9	1.9	0.7	0.4	0.3	-0.2	0.0
2009	0.5	0.8	-0.1	3.6	3.6	1.6	1.1	0.6	0.5	0.2	0.0
2008	0.4	-2.1	2.3	3.1	3.6	1.7	1.3	0.6	0.3	0.0	-0.1
2007	0.4	0.3	3.2	4.3	3.2	1.4	0.9	0.4	0.3	0.2	0.0
2006	0.4	1.1	2.8	3.3	2.7	1.7	1.3	0.7	0.3	0.1	-0.1

Source: Cohort component estimates and Labour Force Survey

Table 8: Difference in divorce rates for women (existing method estimates minus LFS estimates)

Year	Age at date of marriage - rate per 1,000 single population										
	All ages	Under 20	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
2010	0.5	0.5	5.7	5.2	2.4	1.7	0.8	0.7	0.3	0.1	0.0
2009	0.7	1.8	6.2	6.5	4.5	2.1	0.9	1.0	0.4	0.2	0.0
2008	0.6	0.2	6.0	6.4	4.1	1.6	1.2	0.5	0.3	0.1	0.0
2007	0.6	3.5	5.9	5.6	3.6	1.4	1.1	0.7	0.3	0.2	0.0
2006	0.6	3.0	5.2	3.8	3.1	2.3	0.7	1.1	0.4	0.1	0.0

Source: Cohort component estimates and Labour Force Survey

Annex B

Table 9: Difference in re-marriage rates for women (existing method estimates minus LFS estimates)

Year	Age - rate per 1,000 divorced or widowed population						
	All ages	20-24	25-29	30-34	35-44	45-54	55+
2010	-1.4	19.9	-41.9	-4.9	-0.9	-4.8	-0.3
2009	-1.4	-68.7	-28.8	-13.0	-4.0	-4.3	-0.3
2008	-1.6	-41.6	-31.7	-27.3	-7.5	-3.2	-0.3
2007	-1.5	-165.3	-43.9	-46.5	-11.5	-1.9	-0.2
2006	-1.4	-106.7	-55.8	-67.1	-10.4	0.1	-0.2

Source: Cohort component estimates and Labour Force Survey