

Household Analysis Review Group (HARG)

Incorporating the 2011 Census into the Household Estimates

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1. Purpose

In this paper we will discuss a revised methodology to adjust our current and previous household estimates to the 2011 Census.

2. Current household estimate methodology

Each local authority keeps a record of all dwellings, and any discounts or exemptions that they are entitled to, for Council Tax billing purposes. If a dwelling is vacant, or is a second home, it is entitled to a Council Tax discount or exemption. This makes it possible to estimate the number of dwellings which are occupied or vacant. An occupied dwelling is considered equivalent to a household for the purposes of the household estimates.

After vacant dwellings and second homes are removed from the dwelling counts, the resulting number of occupied dwellings is then adjusted from September back to June. This is so that the population estimates and projections and household estimates and projections are all based at 30th June each year.

In order to improve consistency and comparability, the household estimate for each local authority is then adjusted by the difference between the number of households recorded in the 2001 Census (after adjustment for the different date of the census) and the 2001 Council Tax figures. The same adjustment is applied to each year's figures and will affect the number of households, but not the trends over time. The current published figures, including those for 2011, are adjusted to the 2001 census, as the 2011 household estimates were published before the release of the 2011 Census.

3. The 2001 Census adjustment

The first step in calculating these adjustments was to adjust the census-day estimates to 30 June 2001. This was done by taking the 2001 mid-year population estimate, which had been rolled forward from census day to 30 June and applying the communal establishment and headship rates from the 2001 census to the mid-year estimate. This produced a census-based mid-year household estimate using a methodology equivalent to the methodology used in the household projections. The difference between the census-based estimate and the unadjusted council tax estimate was calculated and this number of households added to the unadjusted local authority estimate for each year from 2001 to 2011.

The unadjusted and adjusted 2011 household estimates are compared to the 2011 census-day estimate in [Table 1](#) (Annex A). In Scotland overall, the unadjusted household estimate was 0.8 per cent above the census estimate and the adjusted household estimate was 0.2 per cent below. In 19 local authorities, the 2001-adjusted household estimate was either closer to the 2011 census figure than the unadjusted household estimate, or the adjusted estimates were less than 0.1 per cent further from the census figure than the unadjusted estimate.

4. Revising the historical household estimates

Now that 2011 census information is available we plan to revise the household estimates back series (2001 to 2011) to take account of both the 2001 and 2011 census information. The household estimates from 2012 onwards will be adjusted in the same way as the revised 2011 estimate.

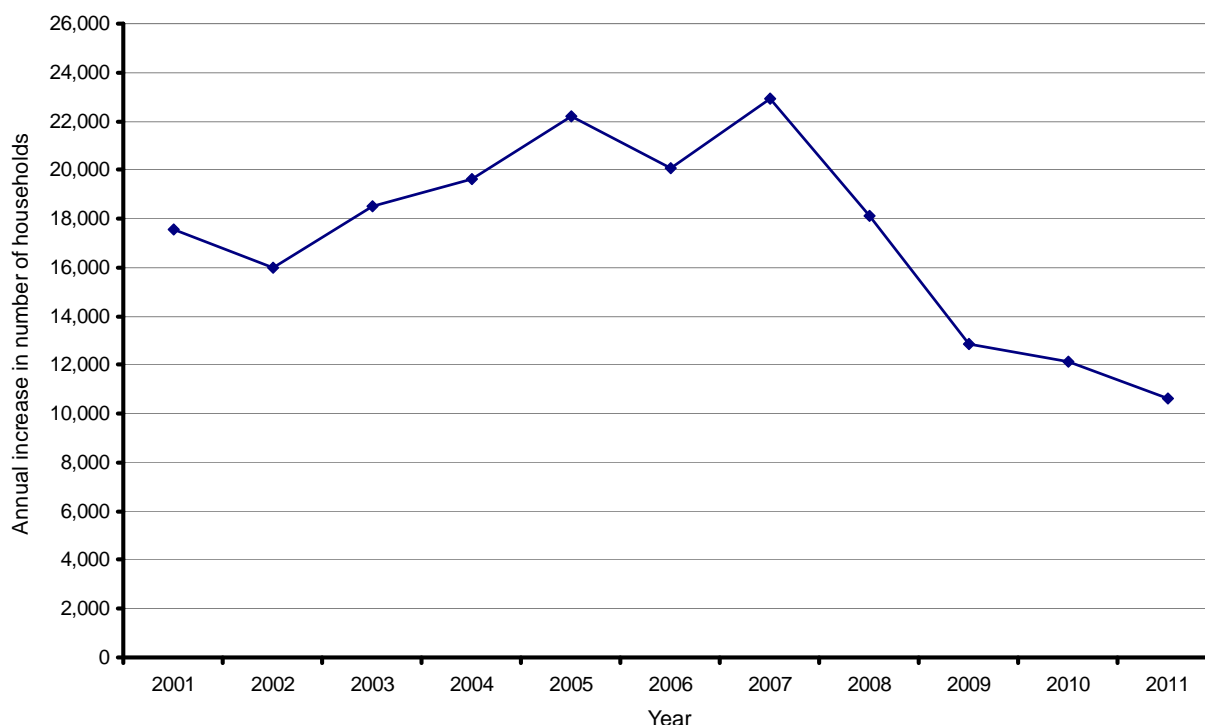
There are several possible ways of revising the household estimates, in light of the publication of the 2011 Census results. These are described below.

4.1 Based on population

Following the 2001 census, mid-year household estimates were produced for 1991 to 2001 by using an adjustment method similar to that used for the current household projections. The rebased mid-year population estimates were used as a starting point. Communal establishment rates were calculated for each year (using interpolation between the 1991 and 2001 census communal establishment rates) and used to calculate the private household population. Headship rates for each year were also calculated by interpolation between the 1991 and 2001 census headship rates and applied to the private household population to give household estimates for each year.

This method does not make any use of the historical council tax data, therefore we would lose information such as the year-on-year change, which showed a slowing of the rate of change in the household estimates following the economic downturn (Figure 1). Using this methodology would also mean that we cannot incorporate 2011 census data into the 2012 household estimates publication, due to be published in June. This is because revised mid-year population estimates based on the 2011 census, 2011 communal establishment rates and 2011 headship rates would not be available. The publication would have to be significantly delayed, or estimates for 2012 published that are still adjusted to the 2001 census.

Figure 1: Annual increase in the number of households in Scotland between 2001 and 2011



4.2 Straight line interpolation

A method could be developed where a straight line (or an alternative equation) is drawn between the 2001 and 2011 census day estimates of household numbers and the household estimates for intervening years calculated from this line. The points on the line could be chosen at a date different to census-day, therefore adjustment to 30th June would be simple for 2001 to 2010. A different method would have to be used for the 2011. The simplest method would be to extend the line 3 months beyond census-day 2011 to give a 2011 mid-year estimate. This is a fairly basic method of

adjustment, particularly for 2011. The difference between this 2011 estimate and the 2011 unadjusted Council Tax figures could be calculated and this difference would be applied to the 2012 household estimate, and future estimates, to take into account the 2011 census.

Again this method doesn't make any use of the historical council tax data but it would be possible to implement for the 2012 household estimates publication in June.

4.3 Mixed method

This method has been developed to take into account historical council tax data. Rather than drawing a straight line between the 2001 and 2011 census household numbers, we could look at the differences between the 2001 Census estimate (rolled forward to June) and the unadjusted 2001 Council Tax based estimate and between the 2011 census estimate (rolled forward to June) and the unadjusted 2011 Council Tax based estimate. A straight line could then be drawn between the difference in 2001 and the difference in 2011, rather than the household numbers as in Section 4.2. Differences for each year could be calculated from this line. The differences for each year would move smoothly from the 2001 difference between Census and Council Tax data and the 2011 difference. The difference for each year would be applied to the unadjusted Council Tax based estimate. The differences used could be expressed in either numbers of households or percentages.

This method would require us to develop a new method of adjusting the 2001 and 2011 census day figure to June, based on the council tax data rather than that based on headship rates as described following the 2001 Census, as headship rates that are not yet available. It would, however, have the advantage of preserving the majority of the year-on-year change observed in the Council Tax data and would be available for the 2012 household estimates publication in June.

Note:

We propose to use the third method of adjustment, incorporating the historical council tax data. The results from this methodology are described at Section 5. We would welcome HARG members' views on this methodology

5. Draft revisions

The methodology we propose to revise the household estimates from 2001 to 2011, to take account of the 2011 census, consists of four stages:

- Adjust the 2001 and 2011 census-day estimates to June. This is done by adding three months (25 per cent) of the relevant year on year change in the unadjusted council tax-based estimate (i.e. 2000 to 2001 or 2010 to 2011) to the relevant census day estimate. We considered using the population/headship based adjustment for the 2001 year, but decided to revise this estimate as well, so that there was consistency in the methodology used for 2001 and 2011.
- Calculate the difference between the census- and council tax-based estimates for 2001 and 2011. We chose to calculate these on a percentage basis.
- Draw a straight line between the 2001 and 2011 percentage differences and use that to estimate percentage differences for each year.
- Apply the percentage differences to the unadjusted Council Tax figures.

Table 2 (Annex A) shows the 2001 and 2011 Census estimates adjusted to June and compares them to the census-day estimates and the published household estimates (which are adjusted to the 2001 Census using the population/headship based method). The revisions to the published figures for 2001 are small; for Scotland just 678 households (0.03 per cent) are added. For local authorities, the 2001 revisions range between a downwards revision of -0.63 per cent in Renfrewshire and an upwards revision of 0.24 per cent in West Dunbartonshire. The revisions for 2001 are still based on 2001 census data, but incorporate the new methodology for adjusting the census-day estimate to mid-year. This is why the revisions are small; most of the difference between the 2001 Census and Council Tax data was already incorporated into the published figures.

The 2011 revisions are based on 2011 Census data, in comparison to the published 2011 figures, which were adjusted using 2001 Census data. These revisions are larger than the revisions for 2001, with the household estimate for Scotland being increased by 7,398 households (0.31 per cent). For local authorities, the revisions range between a downwards revision of -3.84 per cent in Argyll & Bute to an upwards revision of 4.02 per cent in the Orkney Isles.

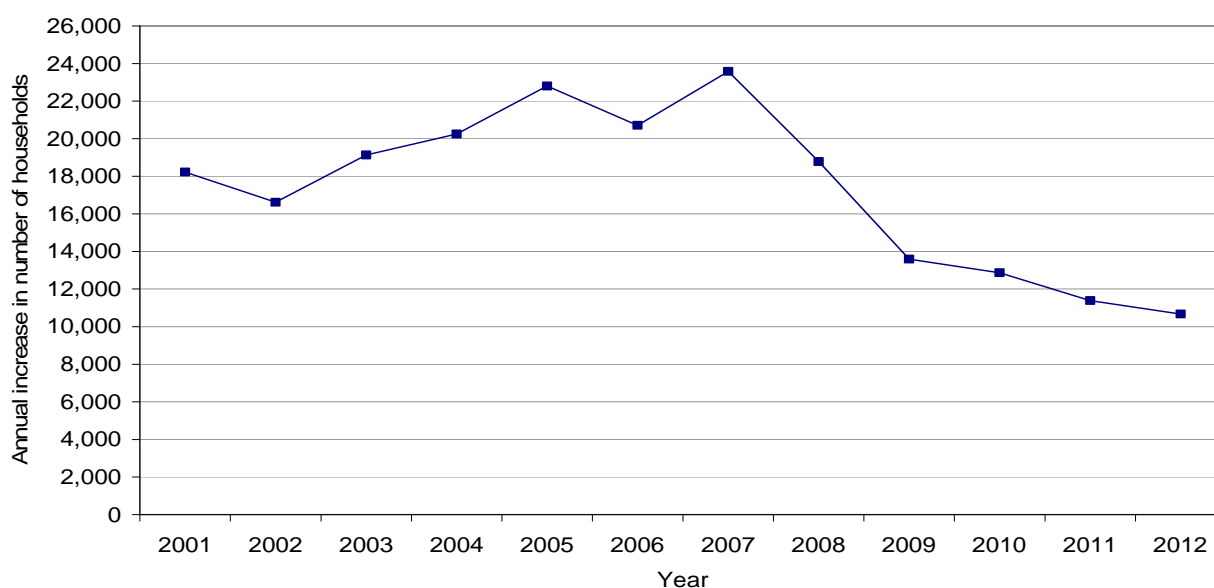
Table 3 (Annex A) presents the complete revised back series from 2001 to 2011.

6. Draft 2012 household estimates

The unadjusted 2012 council tax data will be adjusted by the same proportions as the revised 2011 household estimates to produce the 2012 household estimates. These estimates are presented in **Table 4** (Annex A, along with a comparison to the revised 2011 household estimates.

Figure 2 presents the revised annual increase in the number of households in Scotland between 2001 and 2011 and incorporates the draft 2012 figure. The draft household estimate for 2012 is 2,386,106. This is an increase of 10,673 households (0.4 per cent) compared to 2011, the lowest annual increase in household numbers since 2001.

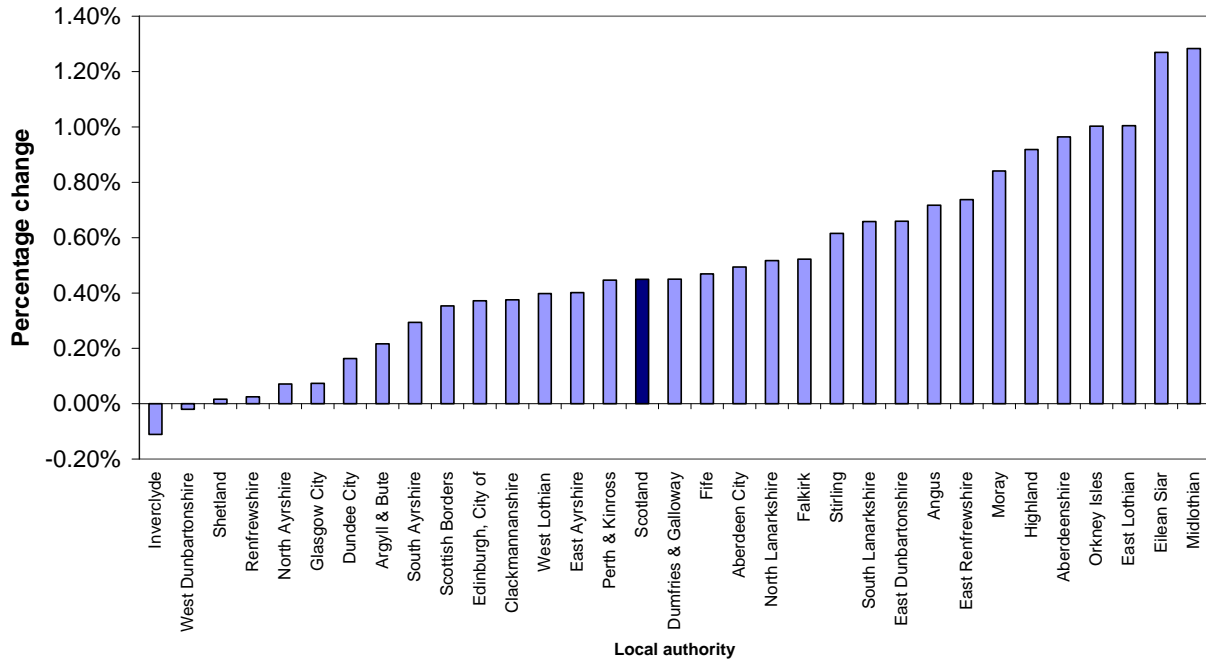
Figure 2: Annual increase in the number of households in Scotland between 2001 and 2012



The household estimates for 2012 were higher than the household estimates for 2011 in all local authorities except for Inverclyde (-42 households, -0.1 per cent) and West Dunbartonshire (-8 households, -0.02 per cent). The largest percentage increases were in Midlothian (450 households, 1.3 per cent), Eilean Siar (160 household, 1.3 per cent) and East Lothian (432 households, 1.0 per cent). The percentage change for each local authority can be seen in Figure 3.

Table 4 (Annex A) compares the 2011 and 2012 household estimates for Scotland and each local authority.

Figure 3: Percentage change in the household estimates between 2011 and 2012



7. Conclusion

We have produced draft household estimates for 2012. In order to adjust these estimates to the 2011 census, rather than the 2001 census, we have had to revise the adjustment methodology. We have also used this methodology to produced a revised back series for 2001 to 2011.

Note:

We would welcome HARG members' views on the revised methodology and the draft 2012 household estimates.

NRS: Household estimates and projections branch
April 2013

Table 1: Comparison between the 2011 census day household numbers and the unadjusted and 2001-adjusted household estimates

Local Authority	2011 Household Estimate		2011 Census Day Estimate	Difference from 2011 census	
	unadjusted	adjusted to 2001 census		unadjusted	adjusted
Aberdeen City	106,624	103,843	103,370	3.1%	0.5%
Aberdeenshire	105,217	104,724	104,710	0.5%	0.0%
Angus	51,294	50,766	51,620	-0.6%	-1.7%
Argyll & Bute	41,367	41,775	40,130	3.1%	4.1%
Clackmannanshire	22,939	22,949	22,730	0.9%	1.0%
Dumfries & Galloway	68,663	68,685	67,980	1.0%	1.0%
Dundee City	69,868	70,596	69,190	1.0%	2.0%
East Ayrshire	54,930	53,841	53,920	1.9%	-0.1%
East Dunbartonshire	43,424	43,171	43,480	-0.1%	-0.7%
East Lothian	43,434	43,215	42,910	1.2%	0.7%
East Renfrewshire	36,506	36,166	37,210	-1.9%	-2.8%
Edinburgh, City of	224,794	221,954	223,050	0.8%	-0.5%
Eilean Siar	12,525	12,208	12,580	-0.4%	-3.0%
Falkirk	69,441	68,974	68,730	1.0%	0.4%
Fife	161,776	161,820	160,950	0.5%	0.5%
Glasgow City	288,729	282,522	285,690	1.1%	-1.1%
Highland	103,683	102,736	102,090	1.6%	0.6%
Inverclyde	36,770	36,431	37,440	-1.8%	-2.7%
Midlothian	35,584	35,668	34,980	1.7%	2.0%
Moray	40,128	39,474	40,060	0.2%	-1.5%
North Ayrshire	62,946	62,097	62,500	0.7%	-0.6%
North Lanarkshire	146,418	145,589	146,000	0.3%	-0.3%
Orkney Isles	9,414	9,368	9,730	-3.3%	-3.7%
Perth & Kinross	65,057	65,001	64,780	0.4%	0.3%
Renfrewshire	79,772	79,083	80,910	-1.4%	-2.3%
Scottish Borders	52,615	52,233	52,500	0.2%	-0.5%
Shetland	10,046	9,928	9,950	1.0%	-0.2%
South Ayrshire	52,275	51,745	51,290	1.9%	0.9%
South Lanarkshire	140,360	138,196	139,190	0.8%	-0.7%
Stirling	37,901	38,280	37,570	0.9%	1.9%
West Dunbartonshire	42,974	41,558	42,170	1.9%	-1.5%
West Lothian	73,549	73,439	73,400	0.2%	0.1%
Scotland	2,391,022	2,368,034	2,372,780	0.8%	-0.2%

Table 2: Comparison between the published and revised household estimates for 2001 and 2011

Local Authority	2001			2011			Size of revision			
	Census-day estimate	Published mid-year estimate	Revised mid-year estimate	Census-day estimate	Published mid-year estimate	Revised mid-year estimate	2001		2011	
							Number	%	Number	%
Aberdeen City	97,010	96,944	97,090	103,370	103,843	103,412	146	0.15%	-431	-0.42%
Aberdeenshire	90,740	90,902	90,974	104,710	104,724	104,948	72	0.08%	225	0.21%
Angus	46,950	46,948	47,011	51,620	50,766	51,670	63	0.13%	904	1.78%
Argyll & Bute	38,970	39,037	38,922	40,130	41,775	40,172	-115	-0.29%	-1,603	-3.84%
Clackmannanshire	20,560	20,572	20,596	22,730	22,949	22,729	24	0.12%	-220	-0.96%
Dumfries & Galloway	63,810	63,899	63,846	67,980	68,685	68,049	-53	-0.08%	-636	-0.93%
Dundee City	66,910	66,851	66,900	69,190	70,596	69,239	49	0.07%	-1,357	-1.92%
East Ayrshire	50,350	50,404	50,439	53,920	53,841	53,950	35	0.07%	109	0.20%
East Dunbartonshire	42,210	42,254	42,240	43,480	43,171	43,520	-14	-0.03%	349	0.81%
East Lothian	38,160	38,232	38,240	42,910	43,215	43,014	8	0.02%	-201	-0.47%
East Renfrewshire	34,950	35,024	35,019	37,210	36,166	37,253	-5	-0.01%	1,087	3.00%
Edinburgh, City of	204,680	204,956	205,127	223,050	221,954	223,490	171	0.08%	1,536	0.69%
Eilean Siar	11,280	11,283	11,291	12,580	12,208	12,628	8	0.07%	420	3.44%
Falkirk	62,600	62,689	62,749	68,730	68,974	68,810	59	0.09%	-165	-0.24%
Fife	150,270	150,530	150,567	160,950	161,820	161,086	37	0.02%	-733	-0.45%
Glasgow City	271,600	271,953	271,736	285,690	282,522	285,771	-217	-0.08%	3,250	1.15%
Highland	89,530	89,637	89,714	102,090	102,736	102,316	77	0.09%	-420	-0.41%
Inverclyde	36,690	36,698	36,746	37,440	36,431	37,422	48	0.13%	991	2.72%
Midlothian	32,920	32,939	32,979	34,980	35,668	35,080	41	0.12%	-589	-1.65%
Moray	35,800	35,870	35,866	40,060	39,474	40,127	-5	-0.01%	652	1.65%
North Ayrshire	58,730	58,781	58,811	62,500	62,097	62,523	30	0.05%	425	0.69%
North Lanarkshire	132,620	132,765	132,998	146,000	145,589	146,181	234	0.18%	592	0.41%
Orkney Isles	8,340	8,344	8,343	9,730	9,368	9,745	-1	-0.01%	377	4.02%
Perth & Kinross	58,320	58,370	58,397	64,780	65,001	64,835	26	0.04%	-166	-0.25%
Renfrewshire	75,360	75,773	75,292	80,910	79,083	80,917	-481	-0.63%	1,834	2.32%
Scottish Borders	47,370	47,463	47,442	52,500	52,233	52,563	-22	-0.05%	330	0.63%
Shetland	9,110	9,111	9,128	9,950	9,928	9,975	16	0.18%	47	0.47%
South Ayrshire	48,750	48,804	48,814	51,290	51,745	51,345	10	0.02%	-400	-0.77%
South Lanarkshire	126,500	126,626	126,797	139,190	138,196	139,432	171	0.13%	1,236	0.89%
Stirling	35,510	35,544	35,613	37,570	38,280	37,628	69	0.19%	-652	-1.70%
West Dunbartonshire	40,780	40,768	40,866	42,170	41,558	42,165	98	0.24%	607	1.46%
West Lothian	64,900	65,062	65,190	73,400	73,439	73,470	128	0.20%	31	0.04%
Scotland	2,192,250	2,195,033	2,195,711	2,372,780	2,368,034	2,375,433	678	0.03%	7,398	0.31%

Table 3: Revised household estimates, 2001 to 2011

Local Authority	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Aberdeen City	97,090	97,520	97,969	98,624	99,202	100,589	101,968	102,614	103,098	103,290	103,412
Aberdeenshire	90,974	92,402	93,824	95,706	97,524	98,912	100,345	101,686	102,814	103,976	104,948
Angus	47,011	47,317	47,813	48,424	49,008	49,558	50,116	50,613	51,069	51,382	51,670
Argyll & Bute	38,922	39,015	39,592	39,678	40,078	40,252	40,241	40,270	40,128	40,160	40,172
Clackmannanshire	20,596	20,749	20,958	21,253	21,543	21,845	22,198	22,481	22,680	22,758	22,729
Dumfries & Galloway	63,846	64,156	64,856	65,483	66,186	66,442	66,886	67,395	67,646	67,832	68,049
Dundee City	66,900	67,183	67,163	67,368	67,250	67,126	68,082	68,669	69,148	69,190	69,239
East Ayrshire	50,439	50,678	51,018	51,340	51,527	51,973	52,455	53,107	53,546	53,818	53,950
East Dunbartonshire	42,240	42,265	42,319	42,493	42,721	42,819	42,905	43,072	43,191	43,323	43,520
East Lothian	38,240	38,637	38,938	39,308	39,682	40,328	41,128	41,799	42,228	42,619	43,014
East Renfrewshire	35,019	35,265	35,536	35,746	35,936	36,064	36,277	36,385	36,660	36,968	37,253
Edinburgh, City of	205,127	206,661	207,985	209,659	212,419	214,454	217,473	218,749	220,015	221,584	223,490
Eilean Siar	11,291	11,274	11,390	11,509	11,653	11,804	11,954	12,106	12,226	12,393	12,628
Falkirk	62,749	63,571	64,408	65,381	65,848	66,596	67,301	67,708	68,102	68,512	68,810
Fife	150,567	151,724	152,779	153,889	155,630	156,583	157,761	158,981	159,799	160,621	161,086
Glasgow City	271,736	272,834	274,569	277,072	279,264	280,347	282,222	283,342	284,261	285,079	285,771
Highland	89,714	90,707	91,892	93,152	94,830	96,166	97,831	99,448	100,583	101,462	102,316
Inverclyde	36,746	36,713	36,796	37,025	37,119	37,213	37,204	37,272	37,400	37,400	37,422
Midlothian	32,979	33,014	33,065	33,145	33,224	33,439	33,588	33,827	34,368	34,750	35,080
Moray	35,866	36,285	36,630	37,158	37,724	38,301	38,892	39,254	39,464	39,788	40,127
North Ayrshire	58,811	59,321	59,794	59,976	60,501	61,058	61,303	61,803	62,153	62,388	62,523
North Lanarkshire	132,998	134,827	136,510	138,001	139,706	141,374	142,866	143,911	144,409	145,417	146,181
Orkney Isles	8,343	8,460	8,583	8,743	8,931	9,046	9,198	9,328	9,502	9,645	9,745
Perth & Kinross	58,397	58,952	59,876	60,776	61,566	62,559	63,147	64,247	64,527	64,634	64,835
Renfrewshire	75,292	76,068	76,909	76,944	77,434	78,201	79,068	79,876	80,387	80,652	80,917
Scottish Borders	47,442	47,986	48,549	49,142	49,643	50,178	50,884	51,486	51,893	52,274	52,563
Shetland	9,128	9,156	9,224	9,302	9,405	9,474	9,533	9,624	9,744	9,873	9,975
South Ayrshire	48,814	49,054	49,451	49,770	50,157	50,312	50,647	50,856	50,939	51,168	51,345
South Lanarkshire	126,797	127,847	128,786	130,095	131,640	133,647	135,330	136,434	137,391	138,347	139,432
Stirling	35,613	35,964	36,391	36,524	36,753	36,887	36,977	37,130	37,289	37,473	37,628
West Dunbartonshire	40,866	40,749	40,807	40,791	41,141	41,474	41,698	41,898	41,973	42,131	42,165
West Lothian	65,190	66,058	67,195	68,360	69,401	70,318	71,422	72,310	72,621	73,200	73,470
Scotland	2,195,711	2,212,332	2,231,460	2,251,705	2,274,510	2,295,219	2,318,799	2,337,587	2,351,175	2,364,049	2,375,433

Table 4: Draft 2012 household estimates

Local Authority	2011	2012	Change in the household estimates	
			Number	%
Aberdeen City	103,412	103,922	510	0.5%
Aberdeenshire	104,948	105,960	1,011	1.0%
Angus	51,670	52,040	371	0.7%
Argyll & Bute	40,172	40,258	87	0.2%
Clackmannanshire	22,729	22,814	85	0.4%
Dumfries & Galloway	68,049	68,356	306	0.5%
Dundee City	69,239	69,352	113	0.2%
East Ayrshire	53,950	54,166	216	0.4%
East Dunbartonshire	43,520	43,807	287	0.7%
East Lothian	43,014	43,447	432	1.0%
East Renfrewshire	37,253	37,528	275	0.7%
Edinburgh, City of	223,490	224,321	831	0.4%
Eilean Siar	12,628	12,788	160	1.3%
Falkirk	68,810	69,170	360	0.5%
Fife	161,086	161,843	756	0.5%
Glasgow City	285,771	285,981	210	0.1%
Highland	102,316	103,255	939	0.9%
Inverclyde	37,422	37,381	-42	-0.1%
Midlothian	35,080	35,530	450	1.3%
Moray	40,127	40,464	337	0.8%
North Ayrshire	62,523	62,567	45	0.1%
North Lanarkshire	146,181	146,937	756	0.5%
Orkney Isles	9,745	9,843	98	1.0%
Perth & Kinross	64,835	65,125	289	0.4%
Renfrewshire	80,917	80,937	20	0.0%
Scottish Borders	52,563	52,748	186	0.4%
Shetland	9,975	9,976	2	0.0%
South Ayrshire	51,345	51,495	151	0.3%
South Lanarkshire	139,432	140,350	918	0.7%
Stirling	37,628	37,860	232	0.6%
West Dunbartonshire	42,165	42,157	-8	0.0%
West Lothian	73,470	73,762	292	0.4%
Scotland	2,375,433	2,386,106	10,673	0.4%