

Methodological Note: Calculating estimates of crime numbers in the Scottish Crime & Justice Survey

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1. Calculating SCJS estimates

This methodological note outlines the approach taken to deriving the estimated number of crimes in the SCJS in the context of recent changes made to the approaches used in the Crime Survey for England and Wales.

National crime surveys such as the Scottish Crime and Justice Survey produce estimates of the total numbers of crimes experienced in Scotland over a given period. These estimates are based on a sample of the adult population in Scotland so may therefore differ from the values that would have been obtained if the whole population had been interviewed.

Respondents to the survey contribute different amounts to these estimates of total numbers of crimes. Two factors influence this contribution: the number of crimes which a respondent reports experiencing, and their *survey weighting*¹ (a proxy for the number of people in the population that they represent).

This method results in potential cases of respondents who report a large number of crimes coinciding with a high survey weighting, and resulting in a relatively large influence on the total estimated number of crimes. For example, if a respondent with a weighting of 1,000 reports experiencing a series of 100 crimes then the estimate of total crimes would increase by 100,000 (1,000 x 100). The number of these highly influential respondents that are present in the survey sample is small and varies year-by-year. This means that they have the potential to introduce large fluctuation in overall crime estimates between survey years, making it difficult to monitor underlying trends consistently.

2. What is a cap, and why do we have it?

To reduce potential volatility, the number of crimes in a series that a respondent can report experiencing has been capped at 5 (with up to 5 victim forms, meaning a maximum total of 25 crimes are included for each respondent). The cap at 5 has been applied consistently throughout the SCJS and earlier crime surveys in Scotland. Under this methodology, a respondent with a survey weighting of 1,000 who reports experiencing a series of 100 crimes adds 5,000 (1,000 x 5) to the total crime estimate.

Survey-weights in the SCJS

This issue is particularly relevant following recent changes to the SCJS where the sample size for the Scottish Crime and Justice Survey has been approximately halved as of 2016/17.

As a consequence, the average weight (and so relative leverage) of a respondent has increased proportionally:

Mean and maximum weightings before and after changes to the SCJS

	Mean weighting	Maximum Weighting
Pre-2016/17	233	2338
Post-2016/17	613	4504

¹ More information on weighting is available in technical report:

<https://www2.gov.scot/Topics/Statistics/Browse/Crime-Justice/crime-and-justice-survey/publications/SCJS2017-18TechReport>

The benefit of such a cap is that it reduces the influence of these outliers, thereby making the crime estimates more comparable year on year, and enhancing the ability of the survey to monitor underlying trends consistently.

An example of this can be seen in the 2016/17 SCJS where further analysis identifies a single respondent who reports 90 incidents in a series of violent crimes, and has a weighting of >3,000 (and thereby would represent c270,000 crimes – 3,000 x 90). If no cap were applied to the number of crimes in a series, this one individual would result in the estimated total number of violent crimes increasing by 139% (from 230,900 to 551,700, see Table 1). The volatility in trends of uncapped estimates varies depending upon how many of these influential respondents are present in the survey sample each year – for example without a cap, relative to the start of the time series in 2008/09, we would see an increase of more 30% in violent crimes in 2016/17, and a decrease of more than 40% in 2017/18).

3. Changes to CSEW Methodology

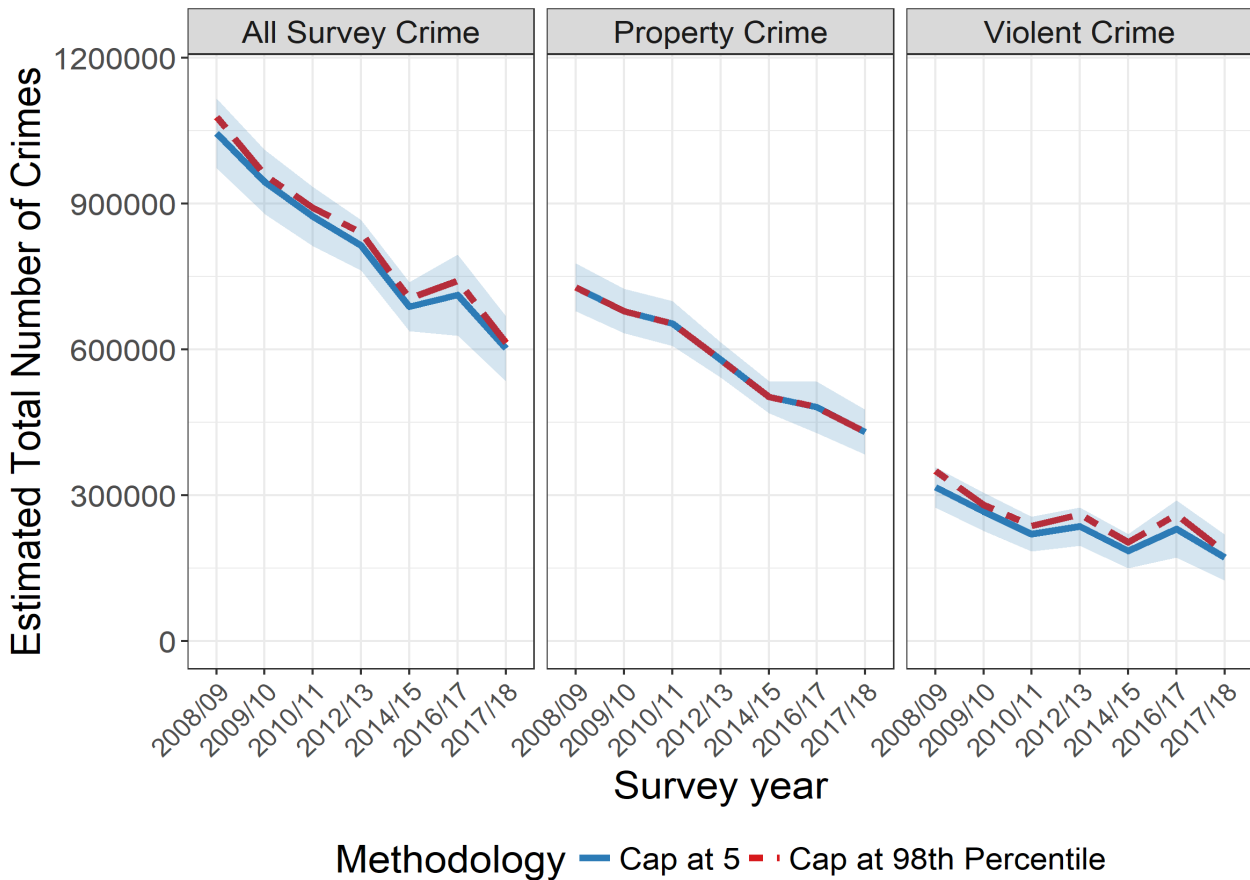
[Recent analysis from the Crime Survey England & Wales](#) (CSEW) has examined and questioned whether the cap at 5 affects estimates of different types of crimes to different extents, and the distributions of crimes by demographic breakdowns such as the gender of victim. Due to the volatility incurred by removing the cap altogether, CSEW maintained a cap on the number of crimes in a series, moving from capping at 5 to capping at the 98th percentile of numbers of crimes for that crime type, averaged over the three years up to that point (or 5 if the 98th percentile falls below).

4. The impact of the cap for the SCJS

Were the new CSEW approach to be adopted in Scotland, estimates of crime numbers for property crime in the SCJS would remain unchanged as the 98th percentile falls below or at 5 (as demonstrated by the overlapping lines for property crime in Figure 1, below).

Point estimates of violent crime numbers under a 98th percentile cap would increase (and therefore so would estimates of overall crime captured by the survey). However it should be noted that the point estimates derived under a 98th percentile approach are within the confidence intervals of the estimates based on a cap at 5 (see Figure 1). In addition, as presented in Table 1, the overall trends in each crime type remain consistent whether using a cap of 5 or capping at the 98th percentile, suggesting limited differences between these methodologies in understanding the wider trend. For example, relative to 2008/09, 2017/18 estimates of violent crime calculated with the cap at 5 have decreased by 46%, and those based on the cap at the 98th percentile have decreased by 48%.

Figure 1 Estimates of total crime numbers when series of crimes are capped at 5 or at the 98th percentile, by crime type. 95% Confidence Intervals displayed for capped-at-5 estimates.



The increase in the violent crime estimates (but not in those of property crime) when the cap is amended to the 98th percentile reflects underlying differences in the extent of repeat victimisation between crime types. These sort of differences are currently outlined in the sections of the SCJS report on repeat victimisation. Results are provided there on the prevalence of experiencing 1, ≥ 2 or ≥ 5 of each crime type, as well as the proportion of crime reported that each of these groups represent, thereby capturing these between-crime-type differences in repeat victimisation (see *Repeat victimisation in the SCJS*, below).

The SCJS produces total crime estimates to offer a broad picture of crime trends in Scotland, and does not disaggregate them by demographic variables. Instead, demographic breakdowns of victimisation are presented in crime *prevalence* statistics (and so avoid any problems of a small number of highly influential respondents). Additionally, specific sections of the survey are devoted to investigating issues such as partner abuse, providing in-depth studies of certain types of crime and the demographics and experiences of victims.

Repeat victimisation in the SCJS.

The SCJS currently reports the percentages of the population experiencing different levels of repeat victimisation, as well percentages of crime reported to the survey which these respondents account for. An example of this for violent crime is presented in the table below (Table 3.3 of the 2017/18 SCJS main findings report).

The 2017/18 SCJS report presents this information for any crime within the scope of the survey and for property crime and violent crime individually, showing how repeat victimisation levels differ between these crime types.

Proportion of violent crime experienced by repeat victims, by number of crimes experienced (2017/18)

Number of crimes	% of population	% of violent crime
None	97.7%	0%
One	1.6%	41%
Two	0.5%	26%
Three	0.1%	4%
Four	0.1%	9%
Five or more	0.1%	20%
Two or more	0.7%	59%

Base: SCJS 2017/18 (5,480).

Variable: PREVVIOLENT, INCVIOLENT.

5. Conclusions

With estimates of overall crime numbers intended to be used for assessing underlying trends over time, it would be challenging to completely remove the cap given the likely high-level of volatility in the resulting crime estimates. There may be some potential benefits in moving from capping at 5 to capping at the 98th percentile, as this is more responsive to variation in repeat victimisation both by crime type and over time.

However, the SCJS currently captures some of this variation using several other approaches, for instance in reporting prevalence of different levels of repeat victimisation in different crime types and a section on partner abuse. Additionally, planned work for the future to analyse a pooled sample across years of the survey will help to investigate the characteristics and experiences of those respondents reporting high levels of repeat victimisation.

It is also notable that, at current levels of repeat victimisation, the trends in the SCJS estimates of the *volume of crime* experienced over time are similar, whether capped at 5 or at the 98% percentile. In addition, a particular strength of the survey, particularly for some lower volume (although often higher harm) crime categories like serious assault, is its ability to provide findings on the *proportion of adults* experiencing different types of crime in any one year with a relatively good level of precision.

Therefore, on balance, based upon our initial analysis the SCJS will continue to retain the cap of 5 crimes in a series. We would be grateful for views from users of these statistics on this planned approach. Please get in touch if you would like to provide feedback on our planned approach: scjs@gov.scot.

Table 1: Estimated total number of crimes for the three main crime types in the SCJS when capping the number of crimes in a series at 5, at the 98th percentile for that crime type, and uncapped, 2008/09 to 2017/18.

Also shown are the percentage increases in estimates based on the 98th-percentile-capped and uncapped data, relative to the capped-at-5 estimates.

Methodology	Crime Type	2008/09*	2009/10*	2010/11*	2012/13	2014/15	2016/17	2017/18	Change 2008/09 to 2017/18	Change 2014/15 to 2017/18
Capped at 5: Estimate	Any survey crime	1044809	945419	874142	814636	687847	712101	601723	-42%	-16%
	Property crime	728220	679301	654007	578698	502269	481201	429934	-41%	-11%
	Violent crime	316590	266119	220136	235937	185578	230899	171789	-46%	-26%
Capped at 98th Percentile: Estimate	Any survey crime	1078553	959537	891583	839998	705458	741990	613761	-43%	-17%
	Property crime	728220	679301	654007	578698	502269	481201	429934	-41%	-11%
	Violent crime	350334	280236	237576	261299	203189	260789	183827	-48%	-30%
Capped at 98th Percentile: % Increase from cap at 5	Any survey crime	3%	1%	2%	3%	3%	4%	2%		
	Property crime	0%	0%	0%	0%	0%	0%	0%		
	Violent crime	11%	5%	8%	11%	9%	13%	7%		
Uncapped: Estimate	Any survey crime	1206023	1053847	1039713	964246	788372	1051568	757679	-37%	-28%
	Property crime	785893	738885	716111	658838	520854	499865	540098	-31%	8%
	Violent crime	420131	314962	323602	305408	267518	551704	217581	-48%	-61%
Uncapped: % Increase from cap at 5	Any survey crime	15%	11%	19%	18%	15%	48%	26%		
	Property crime	8%	9%	9%	14%	4%	4%	26%		
	Violent crime	33%	18%	47%	29%	44%	139%	27%		

*the 98th percentile for the first three survey years are calculated from the dataset ranging from 2008/09 to 2010/11. For other survey years this is the three year rolling dataset ending in that year.