

What's Missing? Analysis of NCVS Missed Crimes Results 2012 to 2017

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Abstract

The National Crime Victimization Survey (NCVS) is a household survey conducted to provide national level personal victimization and property crime rates from a general population sample. Data are gathered on the types and incidence of crime; monetary losses and physical injuries due to crime; characteristics of the victims; and characteristics of the offender. Survey results are subject to differing measurement errors, one of those indicators being missed crimes. Missed crimes are crimes that were reported during subsequent reinterview of a household that were not reported during the initial NCVS interview.

Four measures of missed crime estimates created are: the number of missed crimes, the estimated proportion of missed crimes, the number of households with missed crimes, and the proportion of households with missed crimes. This paper examines the processes used to create missed crime estimates for the years 2012 through 2017, noting yearly trends as well as the household, person and interviewer characteristics found when identifying missed crimes. Analysis will provide insight into whether NCVS processes are a factor in properly screening for crime victimization reporting.

Key Words: Reinterview, Crime reporting, National crime surveys

1. Introduction

The National Crime Victimization Survey (NCVS) is a nationally representative household survey sponsored by the Bureau of Justice Statistics (BJS). It is one of the nation's primary sources of information on criminal victimization, and the only source of data including victimizations both reported and not reported to police.

Data collection for NCVS is subject to survey measurement errors, including the quality indicator of missed crimes. Missed crimes are crimes that were reported during subsequent reinterview of a household that were not reported during the initial NCVS interview. This paper examines the processes used to create missed crime estimates, the yearly trends of those estimates, and the household, person and interviewer characteristic breakdowns related to missed crimes.

1.1 NCVS Design

The NCVS sample is a two-stage stratified sample of housing units and GQs within 542 sample areas (Bureau of Justice Statistics, 2017). The first stage of sampling involves the

definition, stratification, and selection of primary sampling units (PSUs), which are defined as a large metropolitan area, county, or group of bordering counties. First-stage sampling occurs once every ten years, which reduces survey costs and allows for consistent data collection from trained interviewers within each PSU area. The 2000 design sample PSUs were sampled using population data from the 2000 census and interviewed in years 2006 through 2015. Every ten years, the NCVS sample is redesigned. In 2015, the 2000 sample design began to be phased out and the 2010 sample design began to be phased in. The new 2010 design sample PSUs were sampled using population data from the 2010 census and began interviewing in 2016.

The second stage of sampling selects housing units and GQs within selected PSUs. This within-PSU selection occurs every year for housing units and every three years for GQs. At the time of sampling, all selected units are divided into the rotations and panels that will begin interviewing in the following one or three years. The housing unit and GQ samples are both divided into two rotations per year and six panels (or months) per rotation.

The NCVS is a self-report survey in which interviewed persons are asked about the number and characteristics of victimizations experienced during the previous 6 months. Households are interviewed every 6 months for a total of 7 interviews over a 3-year period. The survey uses a two-stage approach to identify and enumerate victimizations. In the first stage, respondents are asked a series of screen questions to identify experiences with crime during the 6-month reference period. In the second stage, each victimization identified during the screening process is followed up with a detailed crime incident report that collects information about the date and characteristics of the event.

NCVS interviews are conducted by personal visit or by telephone. Data is provided by self-response for household members 12 years of age or older. Proxy interviews are acceptable only in certain situations such as when a parent does not want his or her 12- or 13-year-old child to be interviewed, when a household member is temporarily absent and will not return until after the interview period is over, or when a household member is physically or mentally incapacitated for the entire interview period.

1.2 NCVS Reinterview Design

Quality Control (QC) reinterview (RI) is a second interview conducted at a household to determine whether an interviewer actually conducted an interview and if so, whether he/she conducted it in accordance with established interview procedures (Treat, February 2017). Census Bureau conducts QC RI to:

- Detect interviewers who intentionally falsified interview responses or who misclassified occupied units as noninterviews.
- Detect interviewers who intentionally did not follow proper interview procedures such as the use of a laptop for personal visit, politeness, and collection of the household roster.
- Re-ask screener questions to permit estimation of missed crimes.

Reinterviewers verify that the original interviewer contacted the correct sample unit, determined the correct household composition, and classified noninterview households correctly. Reinterviewers also verify the household roster and tenure, ensure specific questions are covered, and re-ask a subset of the crime screener questions.

Normally, the original household respondent will answer the household crime screener questions during RI. However, a proxy household member age 18 or older is allowed if the household respondent is not available. Only one household member (i.e., the reinterview sample person) age 12 or older will be reinterviewed for the individual screener questions. If the RI sample person is the household respondent, the individual screener questions are asked of the household respondent. If the RI sample person is someone other than the household respondent, the household respondent is asked only the household screener questions during RI and not the individual screener questions.

To maintain independence between the original interview and RI reinterviewers are not allowed to see or edit the original responses or to observe or take part in the preparation of the reinterview materials for households in the RI assignment.

To save costs, most RI is conducted by telephone, either at one of the Census Bureau's phone centers or at a regional office. Personal visits for RI are usually only conducted when a valid phone number is unavailable or the respondent does not want to respond by phone. Effort is made to conduct reinterviews within 2 weeks so that respondents can easily recall the original interview.

2. Methodology

2.1 NCVS Reinterview Sampling

NCVS QC RI uses a two-stage sampling method to select random RI (Treat, February 2017). At the beginning of the RI cycle, interviewers are placed into groups. The interviewers are stratified by experience level. A different number of groups and cases are selected based on the experience level of the interviewers. Experienced interviewers are sampled less often and have more cases selected, while inexperienced interviewers are sampled more often and have fewer cases selected. During first-stage sampling, each month specific groups/interviewers are eligible for RI. During second-stage a sub-sample of cases from assigned work assignments for interviewers from those groups is selected. Due to eligibility restrictions, not all cases selected for random QC RI will be eligible.

NCVS interviewers are considered experienced after five years of work at the Census Bureau while supervisory staff are considered experienced after two months of work at the Census Bureau. The number of cases selected for experienced and inexperienced interviewers is set at the beginning of the year so that the overall percentage of selected cases that are also eligible is near the target RI sampling percentage each month.

Experienced interviewers are eligible for random RI once a year. Six of their cases are randomly selected for RI. Inexperienced interviewers are eligible for RI twice a year. Five of their cases are randomly selected for RI each time. All supervisory staff are eligible for random RI once a year. Either five (for inexperienced supervisory staff) or six (for experienced supervisory staff) of their cases are randomly selected for RI. If an interviewer's assigned workload is not as large as proposed for RI, then all of the interviewer's cases are selected for RI.

In addition to random QC RI, any interviewer with an original interview assignment can be put into supplemental QC RI. The interviewer can be flagged for supplemental RI for the next assignment period, or the interviewer's inactive cases can be activated in the current assignment period. Inactive cases are those cases that were not selected for random

or regular supplemental RI. Interviewers flagged for various data quality indicators may be put into supplemental RI.

Random QC RI involves selection of 3 to 4 percent of original NCVS case workloads. Supplemental QC RI selection has no sample size requirements except for practical limits based on reinterviewer staffing and availability.

2.1.1 Missed Crime Estimates

Missed crimes are crimes that were reported during reinterview that were not reported during the NCVS (Treat, February 2017). The four missed crime estimates provided are:

- the number of missed crimes,
- the estimated proportion of missed crimes,
- the number of households with missed crimes, and
- the proportion of households with missed crimes.

These estimates use reinterview responses to crime screener questions as proxies for edited crimes when comparing to the NCVS original interview responses. Listed below are the four missed crime estimates with a brief description of each.

Missed Crime Estimate

The missed crime estimate is a weighted average of the number of missed crimes found by experienced and inexperienced interviewers.

Proportion of Missed Crimes

This is the ratio of the sum of the number of missed crimes to the number of crimes in the original interview.

Households with Missed Crimes

This is a weighted average of the number of households with missed crimes found by experienced and inexperienced interviewers.

Proportion of Households with Missed Crimes

This is the ratio of the number of households with missed crimes to the number of households in the original interview.

2.1.2 Weighting and Standard Error Calculation

The experience level of the interviewer is used to weight each interviewed case in order to calculate an estimate of the number of missed crimes in the original survey. The estimates are calculated using the completed cases for the original interview and the completed cases for the RI. The formulas to calculate the weighted estimate of missed crimes are listed below. Formulas include the four missed crime measures and their respective standard errors.

- N_1 = completed cases interviewed in the original survey by inexperienced interviewers

- N_2 = completed cases interviewed in the original survey by experienced interviewers
- $N = N_1 + N_2$ = total number of cases interviewed in the original survey
- n_1 = reinterviewed cases that were originally interviewed by inexperienced interviewers
- n_2 = cases reinterviewed cases that were originally interviewed by experienced Interviewers

- Weights for inexperienced Interviewers: $W_1 = \frac{N_1}{N}$

- Weights for experienced Interviewers: $W_2 = \frac{N_2}{N}$

- The proportion of cases reinterviewed by inexperienced interviewers:

$$f_1 = \frac{n_1}{N_1}$$

- The proportion of cases reinterviewed by experienced interviewers:

$$f_2 = \frac{n_2}{N_2}$$

- The average number of missed crimes for inexperienced interviewers:

$$\bar{y}_1 = \frac{\text{(total \# of missed crimes or hh with missed crimes for inexp interviewers)}}{n_1}$$

- The average number of missed crimes for experienced interviewers:

$$\bar{y}_2 = \frac{\text{(total \# of missed crimes or hh with missed crimes for exp interviewers)}}{n_2}$$

- The weighted estimate of missed crimes, and households with missed crimes is

estimated by: $\hat{y}_{st} = \sum_{i=1}^2 w_i \bar{y}_i$, so the total is $\hat{y}_{st} = N \bar{y}_{st}$

- The standard error estimate for missed crimes, and households with missed crimes:

$$s(\bar{y}_{st}) = \left[\frac{1}{N_2} \sum_{h=1}^2 N_h (N_h - n_h) \frac{S_h^2}{n_h} \right]^{1/2}$$

where, $S_h^2 = \left(\frac{n_h}{n_h - 1} \right) p_h q_h$, $p_h = \bar{y}_h$, $q_h = 1 - \bar{y}_h$

- The 90 percent confidence interval for the weighted estimate of missed crimes, and households with missed crimes is calculated using the following formula:

$$\hat{Y} \pm Z_{0.90} \cdot N \cdot s(\bar{y}_{st})$$

- The estimated proportion of missed crimes:

$$P_{mc} = \frac{\hat{y}_{st}}{\hat{y}_{st} + \text{reported number of crimes in the original survey}}$$

- The estimated proportion of households with missed crimes:

$$P_{hc} = \frac{\hat{y}_{st}}{N}$$

- The standard error estimate for the estimated proportion of missed crimes:

where, $s_e(P_{mc}) = NP_{mc} \left[\frac{s(\bar{y}_{st})^2}{\hat{Y}^2} + \frac{s(\bar{y}_{st})^2}{(\hat{Y} + c)^2} - \frac{2 s(\bar{y}_{st})^2}{\hat{Y}(\hat{Y} + c)} \right]^{1/2}$, c = reported number of crimes

- The 90 percent confidence interval for the estimated proportion of missed crimes is calculated using the following formula:

$$P_{mc} \pm z_{0.90} s_e(P_{mc})$$

- The 90 percent confidence interval for the estimated proportion of households with missed crimes is calculated using the following formula:

$$P_{hc} \pm z_{0.90} s(\bar{y}_{st})$$

3. Limitations

There are some limitations to be considered in the interpretation of the presented missed crimes results.

Sample selection:

- NCVS reinterview sample selection is done prior to when the original NCVS interview cases are conducted. Effective reinterview sample sizes are thus reduced as certain noninterviews from original NCVS work are then ineligible for reinterview.
- Reinterview selects and asks just a single household member the individual personal crime screener questions; therefore missed personal crimes could go undetected in reinterviewed households based on who receives those individual screener questions.
- NCVS sample size was increased in 2015 to allow for creation of state-level crime victimization estimates. Additional interviewers came onto the program to handle workload increases. Then the revised NCVS sample design, moving from the 2000 sample design to 2010 sample design starting in 2016, led to new sample areas and interviewers involved with NCVS. Both sample changes require new interviewers and expose survey results to potential interviewer effects.

Data collection:

- Missed crimes are comparisons across both interviews and rely on original interview and reinterview being complete. Nonresponse within reinterview removes those cases from missed crime determination.
- The NCVS reinterview program underwent several changes in instrument and data collection over the 2012 to 2017. Major changes included:
 - A standardized reinterview instrument for multiple Census Bureau demographic surveys was developed in 2015. Moving to that standardized instrument changed some of the NCVS reinterview instrument content though not the missed crime screener questions.
 - Prior to April 2016 the NCVS reinterview used regional office field staff for data collection. In April 2016 NCVS reinterview transitioned data collection to a combination of that regional office field staff and the Census Bureau’s call centers. This cost saving measure to centralized call centers also allowed for a more rigorous monitoring process for telephone interview cases from the call centers.

4. Results

4.1 Yearly Missed Crime Trends

Missed crimes estimates for the four defined measures are produced as part of the annual NCVS QC Report provided to BJS (Tersine Jr, A., July 2018). The 90 percent confidence intervals for each estimate is provided for their corresponding number or percent. A difference of proportion test with Bonferroni adjustment for multiple comparisons is conducted for the two proportion measures: proportion of missed crimes and proportion of households with missed crimes.

Table 1 reports the weighted estimates of the number and percent of missed crimes and households with missed crimes for 2012 through 2017.

Table 1: Missed Crimes and Households with Missed Crimes				
Year	Missed Crimes	Percent of Crimes Missing	Households with Missed Crimes	Percent of Households with Missed Crimes
2012	709 (523, 895)	7.90% (5.99%, 9.81%)	513 (355, 671)	7.99% (5.73%, 10.25%)
2013	1,022 (778, 1,266)	12.41% (9.82%, 15.01%)	645 (454, 837)	10.99% (8.08%, 13.90%)
2014	959 (747, 1,171)	12.60% (10.17%, 15.03%)	639 (467, 811)	11.79% (8.99%, 14.59%)
2015	717 (528, 906)	8.65% (6.57%, 10.74%)	580 (414, 746)	9.53% (7.06%, 12.00%)
2016	1,621 (1,336, 1,907)	10.56% (8.89%, 12.22%)	1,151 (912, 1,389)	10.58% (8.62%, 12.54%)

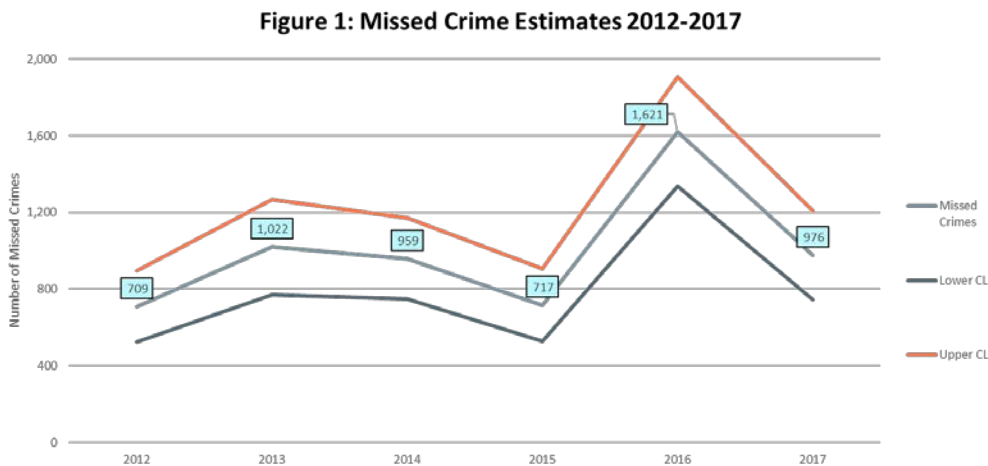
Note: The 90 percent confidence intervals for each estimate are provided underneath their corresponding number or percent.

Source: U.S. Census Bureau 2012-2017 National Crime Victimization Survey Quality Control Reinterview Data/Results

Difference of proportions tests found that the percent of missed crimes estimate in 2017 (7.75 percent) was significantly different from percent of missed crimes estimates in years 2013 and 2014. Based on the NCVS sample design prior to 2015 (a stable, ongoing NCVS sample design environment) compared to design after 2015 (NCVS sample size increase plus sample redesign) the fluctuations in percent of missed crimes is not surprising for those two years. Tracking percentages from 2016 forward will continue as NCVS sample design stabilizes to see if consistent proportions are observed.

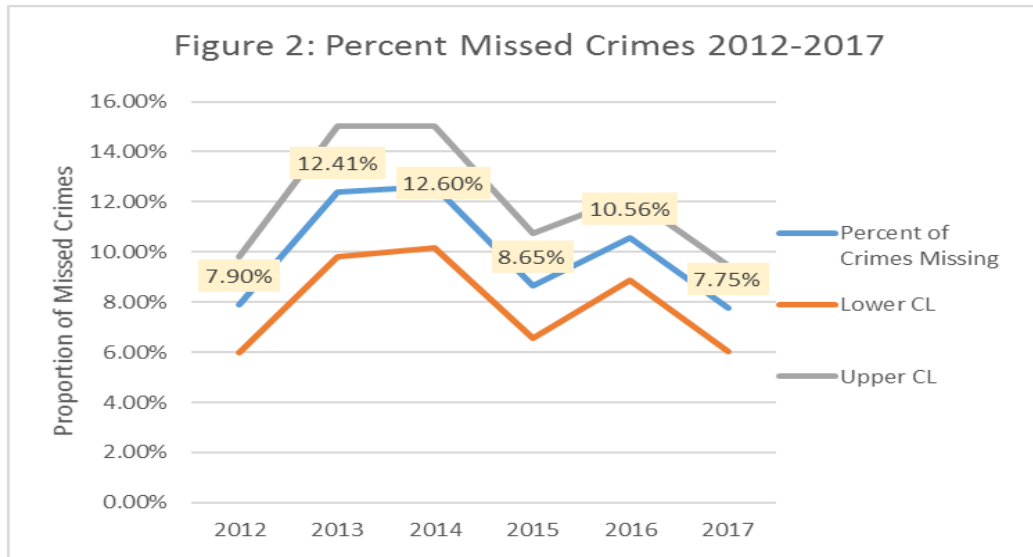
For the other proportion measure, percent of households with missed crimes, the difference in proportions tests found that the 2017 proportion (8.10 percent) was not significantly different from percentage estimates from years 2012 through 2016. The six years do vary between somewhere 8 and 12 percent but with no significant trend indicated.

Figure 1 below represents the first column of Table 1, the weighted number of missed crimes from 2012 through 2017 along with corresponding 90 percent confidence limits.



Source: U.S. Census Bureau 2012-2017 National Crime Victimization Survey Quality Control Reinterview Data/Results

The estimated missed crime total for 2016 (1,621) seems an outlier. The increased count in 2016 shows the effect of the NCVS sample size (and thus NCVS reinterview) increase associated to the 2010 sample design. To adjust for such yearly sample size fluctuations the proportion measures are needed. Figure 2 below represents the second column of Table 1, the weighted proportion of missed crimes from 2012 through 2017 along with corresponding 90 percent confidence limits.



Source: U.S. Census Bureau 2012-2017 National Crime Victimization Survey Quality Control Reinterview Data/Results

Note the 2016 percent of missed crimes (10.56 percent) now shows as not significantly different from the 2017 percent of missed crimes (7.75 percent) and more in line with many of the prior year estimates.

4.2 Missed Crime Distributions

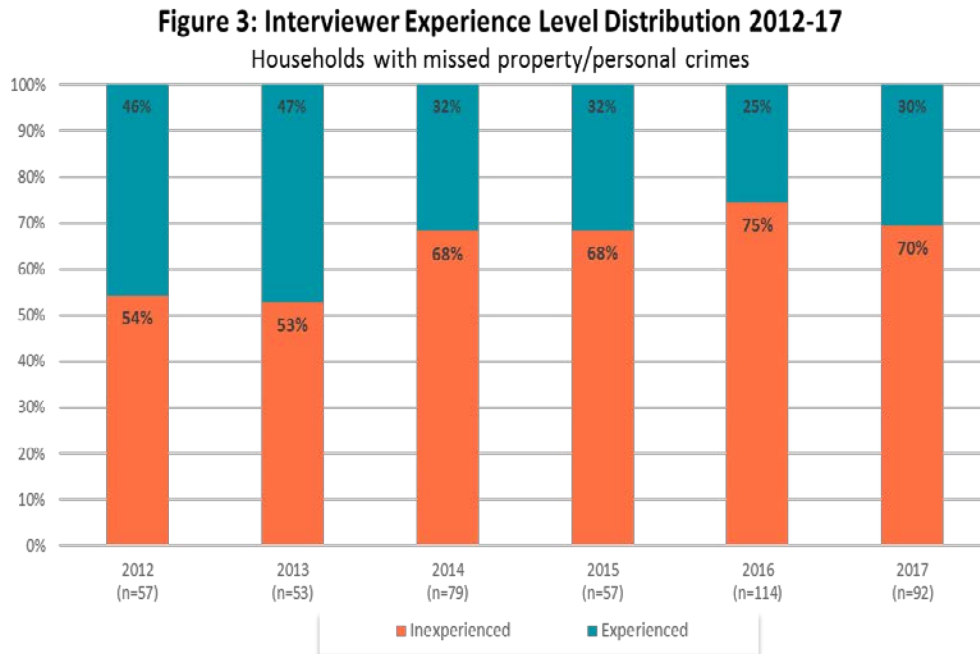
Also investigated for this report was the effect of interviewers on missed crimes: Was the number of missed crimes found by reinterview biased by either original interviewer characteristics or by the respondent characteristics for cases that they interviewed? This question seemed relevant based on the many changes that took place for the NCVS and reinterview over the 2012 through 2017 timeframe. Were the sample size increases, sample redesign, and data collection changes (new reinterview instrument and new interview mode) doing any shifting to missed crime reporting distributions?

We narrowed the variables of interest on the missed crime distributions to four characteristics, variables that are either collected at the time of the NCVS interview or were easily accessible from interviewer information. The four characteristics were interviewer experience level, sample unit's urban/rural status, household tenure, and household income. As most characteristics analyzed were household-based we chose to investigate the number of households with missed crimes as the measure of interest.

This research element was focused on measuring the interviewer performance, not on the quality of the NCVS. That enabled using the unweighted counts of number of missed crimes when creating and analyzing the related distributions. We also used just the random reinterview sample case results for 2012 through 2017. That avoided the potential bias of supplemental sample cases, knowing supplemental reinterview can vary over the years by reason for including cases into supplemental reinterview and the number of overall cases.

Figure 3 below provides the unweighted proportion of households with missed crimes by interviewer experience level. Looking at the trend for years 2012 and 2013 we start off with a nearly equal breakdown of missed crimes between inexperienced (less than five

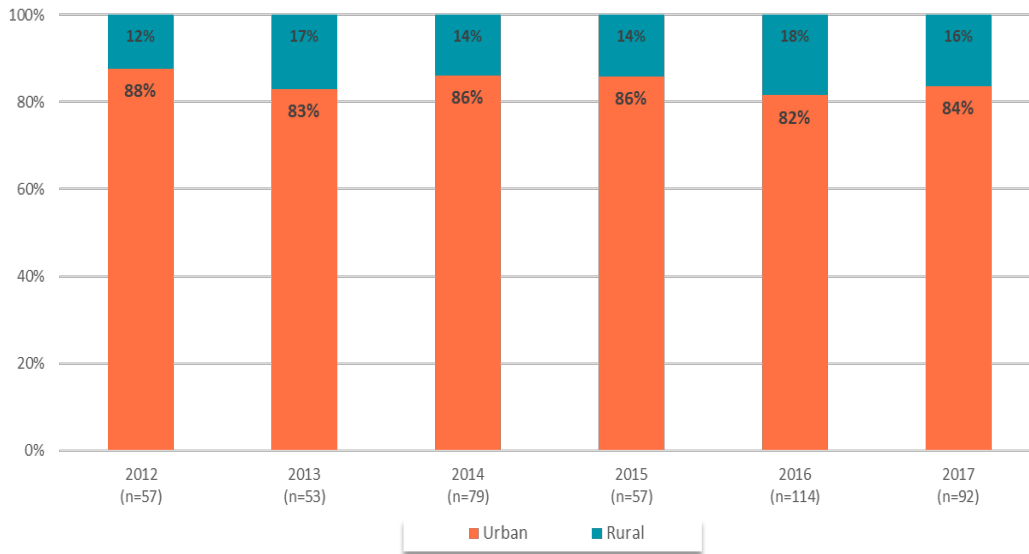
years with the Census Bureau) and experienced (five years or more with the Census Bureau) interviewers. At 2014 and later years you see an increase in the proportion of missed crimes that are reported from NCVS cases done by inexperienced staff. This makes sense as the more recent years have seen NCVS staff turnover, the program conducting more sample interviews nationwide in existing sample areas and also moving into new sample areas. The interviewer experience level trend should be tracked going forward as phase in of the 2010 sample redesign is now complete and more existing field staff should move from and inexperienced to experienced level.



Source: U.S. Census Bureau National Crime Victimization Survey Production and Reinterview Results Files

Figure 4 below displays the unweighted proportion of households with missed crimes by urban/rural status.

Figure 4: Urban/Rural Distribution 2012-17
Households with missed property/personal crimes



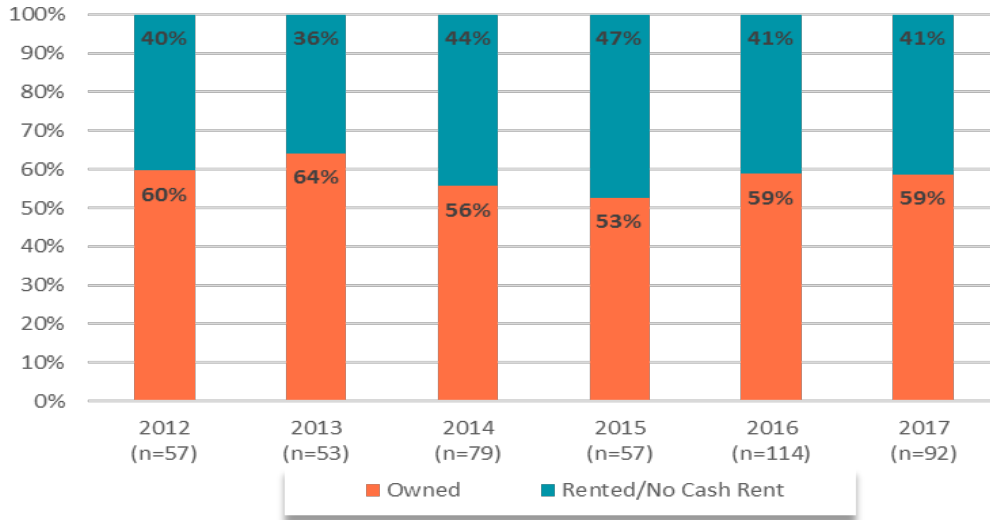
Source: U.S. Census Bureau National Crime Victimization Survey Production and Reinterview Results Files

The breakdown by urban/rural status appears consistent throughout the years 2012 to 2017. The percentages of missed crimes in urban areas, between 82 and 88 percent, remained close to the percentage of the U.S. population that lives in urban areas (approximately 80 percent). We would expect a slight increase in the urban proportion of missed crimes based on NCVS reporting that urban areas have significantly higher victimization rates than rural areas (Bureau of Justice Statistics, December 2017).

Figure 5 below displays the unweighted proportion of households with missed crimes by household tenure. The distribution varies slightly more than urban/rural status but most years fall around 60 percent of the missed property/personal crimes coming from cases where the household responding owns the property. This is lower than the home-ownership rate in the United States of 63.7 percent in the second quarter 2017. The slightly higher renter proportion of missed crimes is expected as NCVS has observed higher victimization rates with rented households compared to owned households (Bureau of Justice Statistics, 2011).

Figure 5: Tenure Distribution 2012-17

Households with missed property/personal crimes

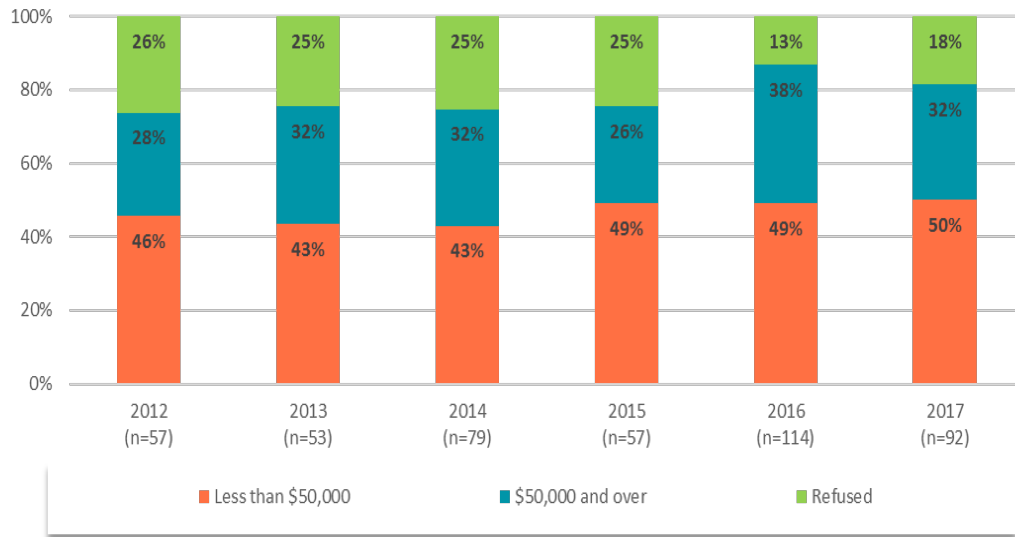


Source: U.S. Census Bureau National Crime Victimization Survey Production and Reinterview Results Files

Figure 6 below displays the unweighted proportion of households with missed crimes by household income level.

Figure 6: Household Income Distribution 2012-17

Households with missed property/personal crimes



Source: U.S. Census Bureau National Crime Victimization Survey Production and Reinterview Results Files

The lowest household income groups had fluctuations in 2012 through 2014, then became very consistent in 2015 through 2017. The households with income less than \$50,000

comes in at 49-50 percent of all missed crimes. There was a decrease in the proportion of households that refused to report income in the last couple years. Otherwise not much deviation in results based on household income level but we will continue to monitor going forward.

5. Discussion

For NCVS looking at missed property and personal crimes estimates the 2017 percentage did not differ significantly from 2015 or 2016 in terms of their proportion of total crimes. The 2017 percentage was, however, at a lower percentage than the 2013 and 2014 cycles. The decrease in percent of missed crimes is a preferred outcome in that the original NCVS interview is capturing the crime victimizations. The downward trend likely has multiple components. On the original NCVS interview side the inclusion of new field staff started in 2015, to account of the NCVS sample increase and 2010 sample redesign. Those changes would have additional people trained on the survey more recently, hopefully leading to following data collection procedures more consistently. Additionally for NCVS reinterview changes in the program required refreshing staff on procedures. The redesigned reinterview instrument in 2015 and moving some work to centralized call centers in 2016 meant supervisory staff needed to revisit NCVS concepts and methods, again stressing following procedures.

When examining the missed crime distributions by household, person and interviewer characteristics there was encouraging results with regards to the reinterview program. There didn't appear to be a changing trend over time in missed crime distributions for household characteristics such as urban/rural status, household tenure, and household income. Therefore evidence that interviewer/respondent effects or bias from reinterview led to certain household groups either over or under reporting crimes for those elements, at least at the national level, lacks support when looking at the data. Missed crime distributions fell as expected based on characteristic group distributions and prior reported NCVS victimization rates for those subgroups.

An evaluation of interview experience and its effect on the missed crime distributions was more complicated, based on the factors mentioned with evaluating estimated missed crimes. Continued monitoring should take place in 2018 and moving forward to see if the NCVS 2010 sample design, and the ongoing field staff, realize stabilized missed crime reporting trends.

We touched on a subset of household characteristics to investigate missed crime distributions for this paper. An extension to this research could include adding in other household and person characteristics to review as possible factors in identifying missed crimes. They include household size, household respondent's race, or region of the sample case as examples.

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References

Bureau of Justice Statistics (2017, December). Victimization Survey, 2016
NCJ 251150. Retrieved from BJS website <https://www.bjs.gov/content/pub/pdf/cv16.pdf>

Bureau of Justice Statistics (2017). Victimization Survey, 2016
Technical Documentation, NCJ 251442. Retrieved from BJS website
<https://www.bjs.gov/content/pub/pdf/ncvstd16.pdf>

Bureau of Justice Statistics (2011). Victimization rates by type of crime, form of tenure,
race of head of household, and locality of residence
<https://www.bjs.gov/content/pub/pdf/cvus/previous/cvus56.pdf>

Tersine Jr, A. (2018, July), *Quality Control Reinterview Results from the 2017 National
Crime Victimization Survey (NCVS)* Unpublished U.S. Census Bureau document

Treat, J. (2017, February), *Master Quality Assurance Plan for the 2017 National
Crime Victimization Survey (NCVS)*. Unpublished U.S. Census Bureau internal
document