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Authors: Marcus Berzofsky, DrPH, RTI International  
Stephanie Zimmer, PhD, RTI International  
Christopher Krebs, PhD, RTI International

BJS Project Managers: Heather Brotsos, Deputy Director of Statistical Programs  
Grace Kena, Chief, Communications Unit  
Rachel E. Morgan, PhD, Chief, Victimization Statistics Unit

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**Abstract:**

The Bureau of Justice Statistics (BJS) sought to evaluate the current method for estimating prevalence rates using the National Crime Victimization Survey (NCVS). Because the NCVS was designed to produce incident rates and uses a rotating panel, its data structure contributes to challenges with estimating prevalence rates. Prevalence rates describe the level of victimization based on the number of persons (or households) in the population who experienced at least one victimization during a specified time period. RTI compared several alternative methods to determine whether any would overcome the limitations of the current method. Additionally, RTI developed detailed examples to illustrate how each method could be operationalized and what the resulting estimates would look like.

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# **National Crime Victimization Survey:**

## **Prevalence Estimation Methods**

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**Prepared for**

Bureau of Justice Statistics  
810 Seventh Street, NW  
Washington, DC 20531

**Prepared by**

Marcus Berzofsky, DrPH  
Stephanie Zimmer, PhD  
Christopher Krebs, PhD

**RTI International**

3040 East Cornwallis Road  
Research Triangle Park, NC 27709



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# ***Executive Summary: NCVS Prevalence Rate Methodology***

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The Bureau of Justice Statistics (BJS) sought to evaluate the current method for estimating prevalence rates using the National Crime Victimization Survey (NCVS).<sup>1</sup> Because the NCVS was designed to produce incident rates and uses a rotating panel, its data structure contributes to challenges with estimating prevalence rates. Prevalence rates describe the level of victimization based on the number of persons (or households) in the population who experienced at least one victimization during a specified time period.<sup>2</sup> BJS is interested in assessing whether the current method for calculating prevalence rates is potentially underestimating the actual prevalence rate and exploring alternatives to address this issue.

BJS asked RTI International and the U.S. Census Bureau to determine whether an alternative method for estimating prevalence rates could be developed to address some or all of the concerns BJS has about the current methodology. The key concerns are (1) victims with only one victimization are counted more in the prevalence calculation; (2) a subset of respondents has only one interview during the year (due either to nonresponse or the panel design) and, therefore, their 12-month prevalence is unknown; and (3) no bounding adjustment is being applied.

RTI compared several alternative methods to determine whether any would overcome the limitations of the current method. Additionally, RTI developed detailed examples to illustrate how each method could be operationalized and what the resulting estimates would look like.

## **ES.1 Research Phases**

The research consisted of four phases, and findings from each phase are integrated into the report:

- Phase 1: Develop a set of priorities that an alternative prevalence methodology, if possible, should address (chapter 1)
- Phase 2: Develop and compare attributes of alternative methods with the current approach (chapters 2 and 3)
- Phase 3: Determine whether a hybrid methodology integrating the best parts of the alternative approaches is feasible (chapter 4)
- Phase 4: Develop examples to illustrate how to implement each alternative prevalence method and compare to the current method (chapter 5).

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<sup>1</sup> For more information on the National Crime Victimization Survey, see [National Crime Victimization Survey, 2016 Technical Documentation](#), NCJ 251442, December 2017.

<sup>2</sup> For more information on the history of prevalence measures using NCVS data, see [Measuring the Prevalence of Crime with the National Crime Victimization Survey](#), NCJ 241656, BJS, September 2013.

## ES.2 Summary of Research and Findings

The key takeaways from the research into alternative prevalence methods include the following:

- Two alternative methods were developed: (1) The one-victimization adjustment method (OVAM) and (2) the one-interview adjustment method (OIAM).
- The OVAM focuses on ensuring that a person with one victimization during the year counts as only one victim in the prevalence calculation. It includes a bounding factor but the bounding factor is not directly tied to prevalence. Instead, the bounding factor is directly tied to victimization weights (see **Table ES-1** for highlights).
- The OIAM accounts for the fact that some respondents do not have two interviews in the year. Additionally, it incorporates a prevalence-specific bounding adjustment (see Table ES-1 for highlights).
- The hybrid method attempted to combine the benefits of the OVAM and the OIAM, but the last adjustment in the OVAM cancels out the benefits of the OIAM, so the results are identical to the OVAM.

**Table ES-1. Comparison of Prevalence Rate Estimation Methods**

Feature	Current Method	OVAM	OIAM
<b>Base weight</b>	Person weight	Victimization weight	Person weight
<b>Consistency</b>	None	For people with only one victimization, sum of PREV_WGT is same as sum of WGTVICCY, and sum of PREV_WGT is same as sum of WGTPERCY for all persons	Sum of PREV_WGT is same as sum of WGTPERCY for all persons
<b>Bounding</b>	No bounding factor for telescoping is used	Prevalence bounding is implicitly treated as the same as victimization bounding adjustment	Prevalence bounding is calculated on its own and bounding factor is closer to 1 than victimization bounding factor, illustrating that telescoping for prevalence may be less of an issue
<b>Cases with only one interview in year and no victimization</b>	Treated same as person with two interviews and no victimization	Treated same as person with two interviews and no victimization	Adjusts weight to reflect probability victimization may have occurred in other 6 months, using data for people with two interviews

<b>Estimation of standard errors</b>	Direct estimation can be computed with Taylor Series Linearization (TSL); existing Balanced Repeated Replication (BRR) weights can be used for BRR estimation	Direct estimation can be computed with TSL; new BRR weights would be required for BRR estimation because of prevalence-specific weight	Direct estimation can be computed with TSL; new BRR weights would be required for BRR estimation because of prevalence-specific weight
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The key findings (see **Table ES-2**) of the Evaluation included the following:

- The OVAM produced the highest prevalence rate. Rates were 12%–27% higher than with the current method.
- The OIAM produced a rate lower than the OVAM because the prevalence-specific bounding adjustment is not as large as the incident-based adjustment factor used in the OVAM. Rates using OIAM ranged from 8% lower than with the current method to 16% higher than the current method.
- The hybrid method produces rates identical to the OVAM.

**Table ES-2. Violent Prevalence Rate and Number of Violent Crime Victims by Prevalence Method and Survey Year**

Year	Prevalence Rate (%)				Victims			
	Current	OVAM	OIAM	Hybrid	Current	OVAM	OIAM	Hybrid
2007	1.32	1.68	1.50	1.68	3,308,009	4,214,134	3,760,262	4,214,134
2008	1.31	1.60	1.46	1.60	3,298,915	4,027,932	3,683,095	4,027,932
2009	1.17	1.45	1.31	1.45	2,978,166	3,674,792	3,340,446	3,674,792
2010	1.08	1.28	1.20	1.28	2,753,159	3,270,651	3,062,339	3,270,651
2011	1.20	1.44	1.40	1.44	3,089,720	3,700,194	3,612,431	3,700,194
2012	1.36	1.65	1.52	1.65	3,575,902	4,309,904	3,983,391	4,309,904
2013	1.15	1.39	1.27	1.39	3,041,167	3,663,619	3,358,287	3,663,619
2014	1.11	1.28	1.20	1.28	2,948,537	3,402,069	3,210,876	3,402,069
2015	0.98	1.14	0.90	1.14	2,650,665	3,077,312	2,439,110	3,077,312
2016	1.06	1.29	1.12	1.29	2,882,324	3,503,722	3,048,949	3,503,722
2017	1.14	1.32	1.10	1.32	3,106,336	3,589,439	2,995,198	3,589,439
2018	1.18	1.41	1.11	1.41	3,254,253	3,893,095	3,055,002	3,893,095
2019	1.10	1.33	1.04	1.33	3,059,063	3,673,646	2,878,363	3,673,646
2020	0.93	1.12	0.91	1.12	2,599,624	3,125,905	2,520,456	3,125,905
2021	0.98	1.10	0.90	1.10	2,734,703	3,065,934	2,519,805	3,065,934

Given the key findings, RTI *recommends BJS transition to calculating prevalence rates using the OVAM rather than the current method and instead of the OIAM*. We recommend the OVAM over the other methods considered for the following reasons:

- The OVAM produces weights that are more appropriate for the estimation of a prevalence rate. Specifically, victims with only one victimization only represent single victim persons in the estimation of prevalence. This is not the case with the current method or the OIAM.
- The OVAM produces the highest prevalence rate of the methods considered. While the true prevalence rate is unknown, due to the design of the NCVS (i.e., the focus on victimization rates), it is likely that the prevalence rate is being underestimated. While both the OVAM and OIAM result in higher prevalence rates compared to the current method prior to 2017, the higher rate produced by the OVAM is likely more accurate because of how it treats single and multi-victim persons in the estimation of prevalence.

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# **Chapter 1: Understanding the Challenges of Estimating Prevalence Rates in the NCVS (Phase 1)**

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## **1.1 Introduction**

### **1.1.1 Purpose**

This report describes the two main measures of the amount of crime victimization in the United States: (1) prevalence rates and (2) victimization rates. These two measures are included in BJS’s annual *Criminal Victimization* bulletin.<sup>3</sup> Prevalence rates measure the percentage of unique persons or households affected by crime. Victimization rates measure the number of times that crime victimization occurs in the population.

The National Crime Victimization Survey (NCVS) was originally designed to measure victimization rates. Though the Bureau of Justice Statistics (BJS) has been presenting both prevalence rates and victimization rates since 2013, the two estimates cannot be compared because of how these two estimates are calculated. Currently, the relationship is clouded because of the different weighting approaches used to estimate the two measures.

This report reviews the issues related to calculating a prevalence rate in the NCVS and the ways in which those issues affect the relationship between victimization and prevalence.

### **1.1.2 Measures of Crime**

The two measures of crime rates—prevalence and victimization rates—are both related and complementary. Prevalence rates measure the magnitude of crime based on the percentage of people affected by crime. Victimization rates measure the magnitude of crime based on the rate at which crimes occur in a population regardless of the number of people affected.

The goal of the NCVS is to enumerate how many crime victimizations occurred and describe the characteristics of each of those victimizations. In the NCVS, the victimization is the most basic unit of analysis; each victimization represents one event experienced by a person or household. The victimization rate is the number of victimizations in the population divided by the number of people in the population. This number is then usually multiplied by 1,000 to provide the number of victimizations per 1,000 persons.

The impact of crime on a population can alternatively be described using prevalence rates. The prevalence rate is defined as the number of victims in a specified population divided by the total number

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<sup>3</sup> See the Methodology section of *Criminal Victimization, 2022* (NCJ 307089, BJS, September 2023) for more information on the types of crime estimates that can be produced with NCVS data.

of persons in the specified population. Prevalence rates help demonstrate the number of unique persons or households affected by a crime victimization. Because different types of crime may happen to the same person/household at varying rates, the victimization rate alone does not quantify the number of individuals affected by crime.

These two estimates, victimization rates and prevalence rates, together create a clear picture of crime victimization. Whereas one describes the number of people affected by crime, the other describes the number of occurrences of crime. Both numbers are important in discussing the impact of crime.

### **1.1.3 Measuring Victimization and Victims Using the Same Survey**

The NCVS is designed to estimate the total number of victimizations rather than the total number of unique victims, which is needed for prevalence rates. To go from victimizations to victims, the analyst creates an indicator for each person interviewed on whether they were victimized within the year. The NCVS is designed such that sampled households are included in the survey every 6 months for seven time points across 3.5 years. NCVS respondents are interviewed every 6 months and are not guaranteed to participate in both halves of the year, either by design or due to nonresponse. Therefore, creating this annual indicator is not possible for everyone. When only one interview occurs and no victimization is reported in that interview, the indicator is assigned to 0 (not a victim)—that is, it is assumed that the respondent was not victimized during the 6 months for which no information is known about the person. Additionally, analysis weights, which will be discussed in the next section, are different for counting persons/households and victimizations, so the count of people victimized and the count of victimizations are estimated using different weights.

## **1.2 Method for Calculating Measures of Crime**

In this section, the formulas for the victimization and prevalence rates are defined. The estimates use two different but related weights. Understanding the relationship between the two weights is helpful in understanding how the two measures are related. For illustration purposes, the prevalence and victimization rates for violent crime are presented. The relationship between household weights and victimization weights for household-level crimes is the same except for using household-level adjustment factors.

### **1.2.1 Victimization and Prevalence Rate Definition**

Currently, victimization and prevalence rates are estimated using weighted sums. Victimization rates for a given year are estimated as

$$\frac{\sum_{j=1}^4 \sum_i (WGTVICCY_{ij} \times VicCount_{ijk})}{\sum_{j=1}^4 \sum_i WGTPERCY_{ij}}$$

where  $WGTVICCY_{ij}$  is the victimization weight for each person ( $i$ ) and quarter ( $j$ ),  $VicCount_{ijk}$  is the number of victimizations for crime type  $k$  in each quarter ( $j$ ) for each person ( $i$ ), and  $WGTPERCY_{ij}$  is the person weight across each quarter ( $j$ ) for each person ( $i$ ). The two weights are discussed in the next section.

Prevalence rates are currently estimated as

$$\frac{\sum_{j=1}^4 \sum_i (WGTPERCY_{ij} \times Victim_{ik})}{\sum_{j=1}^4 \sum_i WGTPERCY_{ij}}$$

where the denominator is the same as that for victimization rates. In the numerator,  $Victim_{ik}$  is an indicator that an individual was victimized for crime type  $k$  at any point in the year. This can be calculated from the victim count as follows:

$$Victim_{ik} = I\left(\left(\sum_{j=1}^4 VicCount_{ijk}\right) > 0\right),$$

where  $I$  is the indicator function, which is 1 if the argument is true and 0 if the argument is false.

### 1.2.2 Weight Definition and Relationship

As illustrated above, the two key differences between the victimization and prevalence estimates are the weights used in the numerator and defining what an outcome is—whether it is a count of victimizations or an indicator of any victimizations.  $WGTPERCY$ , or the person weight, is a weight constructed to reflect the number of people in the population. Summing the person weights for a given year estimates the number of people in the population for the NCVS for that year—that is, all individuals age 12 and older in the United States residing in housing units or group quarters such as dormitories, rooming houses, and religious group quarters in that year. The victimization weight ( $WGTVICCY$ ) is calculated from the person weight and is designed to estimate the number of victimizations. The victimization weight is defined as

$$WGTVICCY_{ij} = 2 \times WGTPERCY_{ij} \times BF_{ij} \times TISFAC_{ij}$$

where  $BF_{ij}$  is a bounding factor and  $TISFAC_{ij}$  is a time-in-sample adjustment factor, both of which are defined in the next subsections.

#### 1.2.2.1 Bounding Adjustment and Definition

In a respondent's first interview, it is likely that telescoping bias exists. Telescoping bias occurs when a respondent reports events of victimization that occurred outside the 6-month recall window [see [NCVS, 2013: Technical Documentation](#) (NCJ 247252, BJS, September 2014) and [NCVS, 2016: Technical Documentation](#) (NCJ 251442, BJS, December 2017)]. Before 2006, the first time a person or household was in the sample, also known as time-in-sample 1 (TIS-1), an interview was conducted, but the data were not included in analysis files. The interview served the sole purpose of bounding, or framing, the recall period for respondents. However, beginning in 2006, the data for the TIS-1 interviews were included in the analysis. It is possible that these interviews include recall of events occurring more than 6 months ago, so the NCVS adjusts for potential bounding for first interviews for violent and property victimizations. The bounding adjustment factor (BF) is applied to the incident weights of TIS-1 cases and is defined as

$$BF = \frac{\sum_{i=2}^7 \hat{R}^{(i)}}{6 \hat{R}^{(1)}}$$

where  $\hat{R}^{(i)}$  is the violent victimization rate for the  $i^{th}$  interview in the prior 12 months, which is not yet adjusted for bounding. The bounding adjustment, which is less than 1, is applied only to TIS-1 cases, and a bounding factor of 1 is applied to TIS 2-7, that is, cases that are scheduled for their first interview. Otherwise, the bounding adjustment is equal to 1. Since 2016, a constant bounding factor has been used.

### 1.2.2.2 Time-in-Sample Adjustment Factor Definition

In addition to a bounding factor, since 2016, a time-in-sample adjustment has been applied to victimization weights. This adjustment factor is designed to prevent bias when large groups of the sample begin interviewing in a TIS that is not what they are assigned in the rotation chart. This occurs if there are sample reductions or reinstatements and during the phase-in of the new design sample. The TIS adjustment factor is defined as

$$TISFAC = \frac{\hat{R}_T}{\hat{R}_t}$$

where  $\hat{R}_T$  and  $\hat{R}_t$  are the unbounded crime rates from the previous four quarters for sample cases within TIS groups  $T$  (from the rotation chart) and  $t$  (the actual TIS). For cases where  $T = t$ , there is no *TISFAC* adjustment, that is,  $TISFAC = 1$ . This factor is calculated separately for property and violent crimes. Before 2016, this was 1 for all cases, as it was not implemented.

### 1.2.3 Reason for Annualization of Victimization Weights

As detailed in *Section 2.2*, when the bounding adjustment and time-in-sample adjustment are not used (i.e., set to 1), the victimization weight is twice the person weight in a 6-month time period. This is because the NCVS produces national estimates for each 6 months of data. In other words, initially, each respondent weight represents the full population in the United States. Therefore, if the person weights were not adjusted, when the interviews from both 6-month periods are combined, the total person weight would equal twice the population. To correct for this, person weights are divided by 2 for annual estimates. However, the victimization weights are meant to represent all victimizations during the reference period of 6 months. Therefore, they cannot be divided by 2 in the same manner as the person weights.

## 1.3 Relationship Between Victimization and Victims

### 1.3.1 Theoretical Relationship

The major difference between the victimization and person/household-level weights is the adjustment for two interview periods in a year and the bounding factors. In this section, the expected relationship between victimizations and victims is demonstrated in an ideal situation when the issues surrounding the differences in the weights do not exist. Under the ideal scenario the following conditions are met: (1) no bounding factor is required, (2) each respondent is interviewed twice in the year, and (3) the person and household weights are the same for each interviewing period. When these conditions are met—among those who report only one victimization during the year—the following relationships are expected across prevalence, victimization, and victims per victimization:

1. The prevalence rate and victimization rate will be equal.



2. The ratio of victimizations per victim will be 1.

**1.3.1.1 Data Example**

To illustrate the properties of the ideal situation, interviews from the NCVS that meet the required criteria were identified (see **Table 1**). Only cases with at least one victimization are shown because, when the relationship between victimization and victims holds, the properties related to prevalence rates and victimization rates will hold as well.

**Table 1. Data Example at Victimization Level**

Person #	Period	TOC	Vic #	WGTVICCY	WGTPERCY
1	2	Robbery	1	3,140	1,570
1	4	Aggravated assault	2	3,140	1,570
2	1	Rape or sexual assault	1	3,090	1,545
3	4	Simple assault	2	3,560	1,780
4	2	Simple assault	1	3,336	1,668
4	2	Aggravated assault	1	3,336	1,668
5	1	Robbery	1	3,230	1,615
Total			9	22,832	11,416

Then, the victimizations can be summarized across each person and period as shown in **Table 2**.

**Table 2. Data Example at Person-by-Period Level**

Person #	Quarter	WGTPERCY	Number of Victimizations (Period)	Number of Victimizations (Year)
1	2	1,570	1	2
	4	1,570	1	2
2	1	1,545	1	1
	3	1,545	0	1
3	2	1,780	0	1
	4	1,780	1	1
4	2	1,668	2	2
	4	1,668	0	2
5	1	1,615	1	1
	3	1,615	0	1
Total		16,356	7	14

1.3.1.2 How Victimization and Victims Are Related

In theory, there are three approaches to calculate the number of victimizations per victim based only on the weights available on the public files for counting persons, households, and victimizations. Each approach can be calculated using the weighted counts in **Table 1** and **Table 2**.

Current method: Using WGTVICCY to calculate the number of victimizations (numerator) and WGTPERCY to calculate the number of victims (denominator). The steps to calculate the number of victimizations per victim under the current methods are as follows:

1. Numerator (number of victimizations): sum of WGTVICCY in **Table 1** (22,832)
2. Denominator (number of victims): sum of WGTPERCY in (16,356)
3. Number of victimizations per victim:  $22,832/16,356 = 1.40$

*Alternative 1: Using WGTPERCY to calculate the number of victimizations (numerator) and the number of victims (denominator).* To use WGTPERCY to calculate the number of victimizations, multiply WGTPERCY by the total number of victimizations reported during the period (**Table 2** columns 3 and 5) and then sum across all persons. The number of victims (denominator) is calculated in the same manner as for the current approach.

*Alternative 2: Using WGTVICCY to calculate the number of victimizations (numerator) and the number of victims (denominator).* To use WGTVICCY to calculate the number of victims, average WGTVICCY across each victim (**Table 1**) and then sum. The number of victimizations (numerator) is calculated as described in the current method.

As shown in **Table 3** under the ideal scenario—each respondent has two interviews, the person weight is the same across each interview, and no bounding factor needs to be applied—the current method and the two alternatives result in the same rate for the number of victimizations per victim.

**Table 3** considers three scenarios. The ideal scenario is defined by a situation in which each respondent has two interviews with the same person weight and no bounding adjustment is needed. Under the ideal scenario, the current method and the two alternatives result in the same rate for the number of victimizations per victim.

**Table 3. Rate of Victimization Per Victim by Design Scenario**

Design Scenario	Estimate Type	Method		
		Current	Alternative 1	Alternative 2
Ideal	Victimizations	22,832	22,832	22,832
	Victims	16,356	16,356	16,356
	Ratio	1.40	1.40	1.40

(continued)

**Table 3.      Rate of Victimizations Per Victim by Design Scenario (continued)**

Design Scenario	Estimate Type	Method		
		Current	Alternative 1	Alternative 2
One Interview	Victimizations	22,832	21,287	22,832
	Victims	14,811	14,811	16,356
	Ratio	1.54	1.44	1.40
Different Weights	Victimizations	22,832	23,007	22,832
	Victims	16,531	16,531	16,356
	Ratio	1.38	1.39	1.40
Bounding Factor	Victimizations	21,331	22,832	21,331
	Victims	16,356	16,356	15,605
	Ratio	1.30	1.40	1.37

### 1.3.2 Reasons Theoretical Relationship May Not Hold

Although the relationship between victimization and victims holds under the ideal scenario, there are three reasons that, in practice, this relationship may not hold:

1. A person is interviewed only once during the year.
2. WGTPERCY is not the same for each interview period.
3. A bounding factor is applied to the first time-in-sample.

In this section, how each of these situations affects the relationship between victimization and victims is presented.

#### 1.3.2.1 One-Interview-per-Year Cases

For the relationship between the person and victimization weights to be as expected, two interviews are needed for each respondent. As discussed in the first section, interviews occur every 6 months across seven periods. For some sampled units, their first interview can occur in the last half of the year or their seventh interview can occur in the first half of the year. When this occurs, only one interview is done for the year. Additionally, there is some nonresponse in the NCVS, such that a person or household can miss their scheduled interview and have only one interview in the year even though they were scheduled for two interviews. Later sections show how often each of these situations occurs.

For our theoretical example in **Table 1** and **Table 2**, Person 2 is treated as if they were not interviewed in quarter 3, which makes their WGTPERCY = 0 in that time period. This approach affects estimates using WGTPERCY—namely, the victimization estimate using Alternative 1 decreases from

22,832 to 21,287, and the victim estimate using the current method and Alternative 1 (see **Table 3**) decreases from 16,356 to 14,811. Only by using the Alternative 2 method of calculation, which uses WGTVICCY only, is the ratio of victims to victimizations maintained.

### **1.3.2.2 Different Person or Household Weights Across Interview Periods**

Within each 6-month period, WGTPERCY is adjusted for nonresponse and calibrated to the population. Thus, WGTPERCY for an individual in period 1 is not the same as WGTPERCY in period 2, because the adjustments are different in the two periods. As will be discussed later, these differences are relatively small, but they are always present.

For our theoretical example, a scenario where Person 2 in quarter 3 has a WGTPERCY = 1,720, slightly more than the quarter 1 weight of 1,545, was considered. Similar to when people are only interviewed once in a year, the impact is only to the current method and Alternative 1; the ratio of victimizations to victims is decreased slightly compared to the ideal scenario (see **Table 3**). The ratio of victimizations to victims is the same under the ideal scenario using Alternative 2 for calculation.

### **1.3.2.3 Bounding**

When a bounding factor is incorporated to account for telescoping, the victimization weight is reduced for TIS-1 cases, altering the direct relationship between the person and victimization weight. The bounding factor is implemented for TIS-1 cases to adjust for potential telescoping.

To illustrate this situation, consider a scenario in which Person 1's interview in period 1 occurs in TIS-1. It is subject to a bounding adjustment of 0.55 so that WGTVICCY = 1,835 rather than 3,336 in that period. The estimates under Alternative 1 remain the same compared to the ideal situation, but if the current method and Alternative 2 are used, the estimated victimizations are decreased from 22,832 to 21,331, so the victimizations per victim are also reduced (see **Error! Reference source not found.**). For Alternative 2, the estimated number of victims is also decreased in addition to the victimizations.

## **1.3.3 Actual Relationship Between Victimization and Victims**

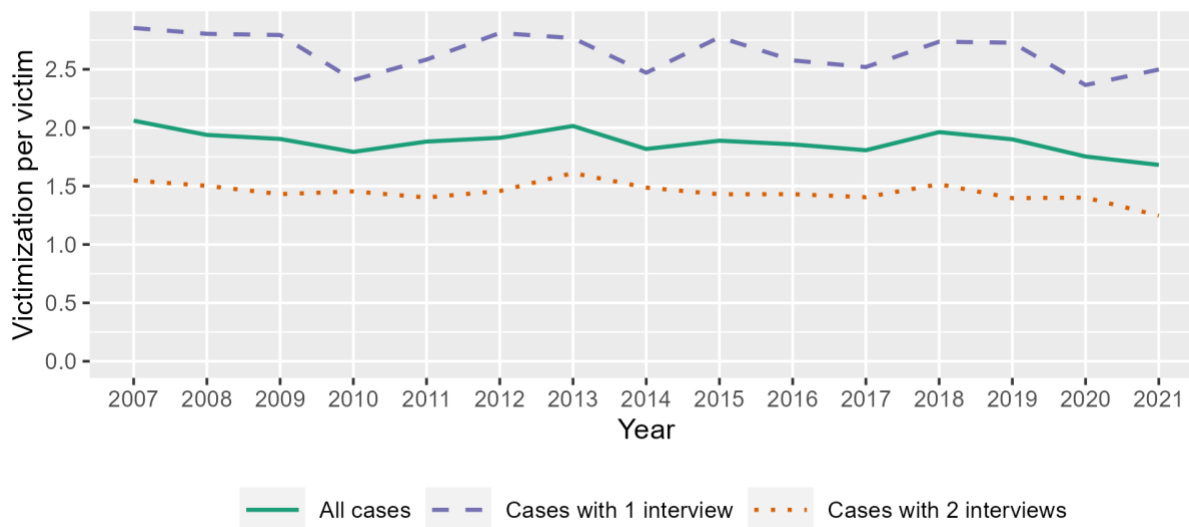
Because the scenarios described in *Section 1.3.2* occur in the NCVS, the theoretical relationship between victimizations and victims does not occur in practice. These scenarios affecting the relationship all occur at once, thus it can be hard to discern the impact of each one individually. This section tries to isolate each theoretical relationship and illustrate how the relationship holds in actuality.

### **1.3.3.1 Victimization per Victim**

If a case has only one interview in the year, when the person weight is used to calculate the number of victims, the estimated number of victimizations per victim is higher than for those with two interviews. For example, if a person is interviewed twice in the year with WGTPERCY of 1,600 each time and victimized once when WGTVICCY is 3,200, then the victimizations per victim is  $WGTVICCY / (WGTPERCY + WGTPERCY) = 3,200 / 3,200 = 1$ . However, if the person was interviewed only once and had one victimization, the WGTPERCY in one time period would be 0, so the victimizations per victim would be  $WGTVICCY / (WGTPERCY + WGTPERCY) = 3,200 / 1,600 = 2$ .

This phenomenon is observed in the NCVS data and illustrated in **Figure 1** (dashed purple line). It occurs because cases with only one interview have a victimization weight that represents the full year but a person weight that represents only half the year. This leads to a victimizations-per-victim rate that is higher than it should be. Alternatively, when two interviews occur (dotted red line), the rate is closer to the expected rate because the denominator properly accounts for a full year’s worth of persons—but it is affected by bounding and differing weights across periods.

**Figure 1. Average Number of Victimization per Victim, by Number of Interviews**



**1.3.3.2 Equal Victimization and Prevalence Rates**

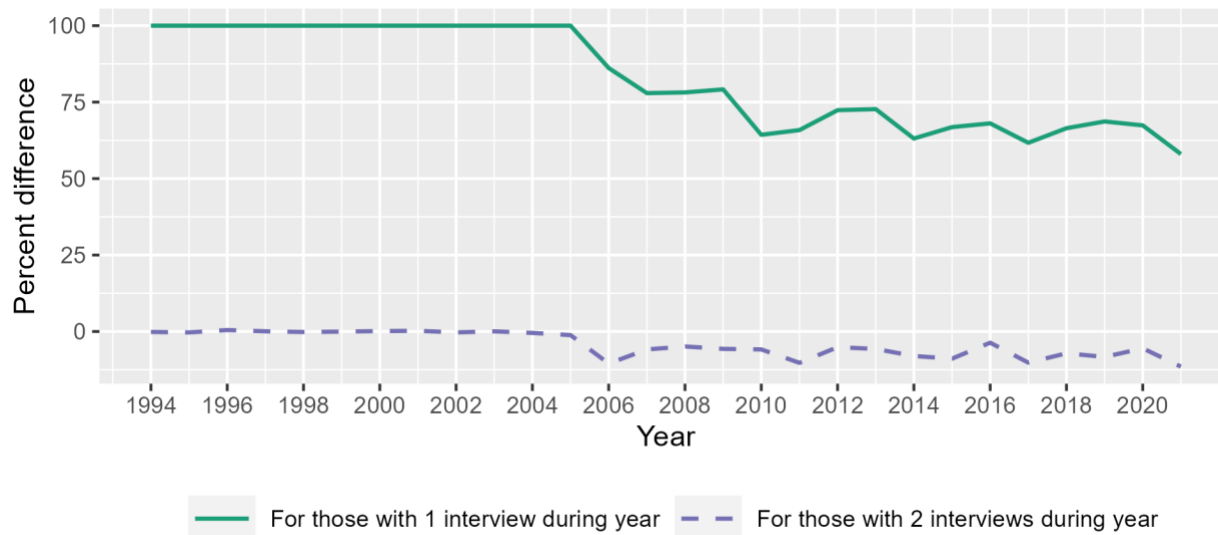
In theory, among people who experience one victimization in the year, the resulting prevalence rate and victimization rate will be equal. However, this is not true for people with only one interview for two reasons: (1) the annualization of victimization weights and (2) the bounding adjustment to correct for telescoping.

**Impact of annualization of weights.** As shown in **Figure 2**, the difference between prevalence and victimization rates is approximately 0 for cases with two interviews in the year (among cases with a single violent victimization), whereas the prevalence rate is approximately double the victimization rate for those with only one interview.

**Impact of bounding adjustment.** Since 2006, TIS-1 interviews have been included in the analysis dataset. To compensate for the inclusion of an unbounded interview, the victimization weight was adjusted to account for potential telescoping. Because this adjustment differs over time and the adjustment for victimizations is not necessarily the same adjustment that should be used for victims, the relationship between victimizations and victims was no longer a set factor of 2 as it was before 2006

(Figure 2). Furthermore, the inclusion of the bounding adjustments prevents those with two interviews during the year from having the expected relationship as well.

**Figure 2. Percent Difference Between Prevalence and Victimization Rates Among Victims of a Single Violent Crime During the Year**



### 1.3.4 Features Affecting the Estimated Number of Victims

As detailed in *Section 1.3.1*, three situations can affect the estimated victims. This, in turn, affects the rate of victimizations per victim. The three situations are:

1. When the respondent only has one interview during the year
2. When the respondent has two different weights across the two interviews
3. When a bounding adjustment is applied

In this section, how each of these cases affects (1) the prevalence rate and (2) the rate of victimizations per victim is detailed.

#### 1.3.4.1 One Interview-per-Year Cases

Persons or households may have only one interview in a year for either of two reasons: (1) by design or (2) due to nonresponse. Under the NCVS design, in a 6-month period, one-seventh of sampled households are rotated out of the panel, while another one-seventh of sampled households are rotated into the sample. When a household is rotated out during the first 6 months of the year, that household (and all eligible persons in it) are interviewed only once during the year. Similarly, households rotated into the sample during the second half of the year have only one interview because they were not part of the sample during the first half of the year. This is what is meant by missing by design. Nonresponse can also cause a person or household to have only one interview in a year. Nonresponse occurs when a household or a person within a household that should be interviewed in both periods of the year participates in only

one of the periods. As shown in the small example in *Section 1.3.2.1*, if a person or household only completes one interview in a year, then the estimated number of victims is altered from when everyone completes two interviews.

**Table 4** illustrates the magnitude of cases that have only one interview during a year, by reason, from 2007 through 2021. Although the rate has fluctuated over time, on average 45.8% of households and 51.6% of persons have only one interview during the year. Of these, within households, 47.5% had one interview by design and 52.5% because of nonresponse; among people, 43.1% had one interview by design and 56.9% because of nonresponse. In other words, about half of all cases are affected by this situation, and nonresponse is a larger issue than by design. Note, the year 2016 is excluded as the revised file does not include nonrespondents.

**Table 4. Percentage of Cases with Only One Interview, and Reason, 2007–2021**

Year	Households			People		
	One Interview in Year (%)	Reason for One Interview		One Interview in Year (%)	Reason for One Interview	
		By Design (%)	Nonresponse (%)		By Design (%)	Nonresponse (%)
2007	48.0	36.8	63.2	54.2	31.4	68.6
2008	41.8	54.5	45.5	48.7	45.1	54.9
2009	40.8	55.5	44.5	47.5	45.9	54.1
2010	44.1	50.6	49.4	50.3	43.0	57.0
2011	56.6	34.8	65.2	61.4	31.2	68.8
2012	42.7	53.2	46.8	49.3	44.6	55.4
2013	42.9	51.9	48.1	49.0	44.3	55.7
2014	43.2	53.1	46.9	49.0	45.5	54.5
2015	45.0	53.8	46.2	50.6	51.3	48.7
2016 <sup>a</sup>	--	--	--	--	--	--
2017	46.4	46.1	53.9	52.3	44.2	55.8
2018	47.1	46.0	54.0	52.9	42.5	57.5
2019	46.9	47.2	52.8	52.1	45.1	54.9
2020	47.9	35.4	64.6	52.5	45.9	54.1
2021	47.2	45.9	54.1	52.2	42.9	57.1
Average	45.8	47.5	52.5	51.6	43.1	56.9

<sup>a</sup> Year 2016 is excluded as the revised file does not include nonrespondents.

**Impact on prevalence rates.** For an annual prevalence rate, it is necessary to know whether a person is victimized at any point in the year. If one counted the victims in the first 6-month period and the second 6-month period independently and then summed them to create an annual estimate, there would be some overcounting because some people (about 4%) are victimized in both periods—so this is not an option to count annual victims.

**Table 5** demonstrates the different response patterns a person/household may have during a year. In Group 2 and Group 8, it cannot be determined if the person's/household's victim status, which, as unknown, results in an underestimation of the number of victims—and an underestimation in the prevalence rate. This problem is due to the difference in how victimization rates and prevalence rates are calculated. Those with only one interview who report a victimization are being undercounted because their weight is only a 6-month weight, and those with only one interview who do not report a victimization lead to an undercount of the number of victims. For violent crime, approximately 53% of people are in Group 2 or 8 and approximately 46% of households are in Group 2 or 8 for property crime (see **Table 5**).

- **Missing by design.** In theory, when a single interview occurs by design (i.e., a person/household is rotated out of the sample in the first half of the year or rotated into the sample in the second half of the year), there is an equivalent-by-design single interview person/household in the other period (i.e., a person/household is rotated into the sample in the first half of the year or rotated out in the second half of the year, or a person ages into the sample in the second half of the year or a person/household moves away from that address). Therefore, for victimization rates, there is likely an equivalent respondent providing victimizations, but a linkage is not necessary because the victimization estimate is a sum across all individuals and not an indicator across the year. Because the victimization weight is annualized, the lack of a link to a second interview does not affect the calculation of victimization rates. But, in the current calculation of prevalence rates, the rate is based on the specific individual rather than on an equivalent individual because the linkage between similar cases is not possible for all cases and would be necessary. This leads to an underestimate in the number of victims (but not the number of victimizations) because those rotating in or out have only 6 months of exposure to indicate a victimization, and their weight represents only half the year rather than the full year. Under the design, there should be an equal number of households rotating into the study and rotating out. However, for prevalence, linking those rotating in and out is not a feasible solution for two reasons. First, although the expectation is that those rotating in have characteristics similar to those rotating out, there may not be a good match in actuality because of sample variation. These differences will affect the propensity to be a victim for linked individuals. Second, those rotating in are in TIS-1, whereas those rotating out are in TIS-7. It has been shown that the likelihood of reporting a victimization decreases as TIS increases, making it less than ideal to link cases from these two TISs.
- **Missing because of nonresponse.** When a single interview is because of nonresponse, the person weights for the opposite period (e.g., period 2 if the response occurs in period 1) are



adjusted so that those who do respond have a larger weight, ensuring that the population totals are correct. Furthermore, this weight adjustment filters into the resulting victimization weight (see *Section 1.2.2*) for those who report a victimization. This ensures that the number of victimizations is correct. However, as shown in *Section 1.2.1*, the prevalence rate depends on an indicator of victimization for each unique person. For those who do not respond in one period, their exposure period is only half the year. Therefore, even though the adjustments for nonresponse correct the population totals within each 6-month period and the corresponding victimization counts, the adjustments do not correct for non-exposure for a single respondent for the full year when one interview is missed because of nonresponse.

**Table 5. Response Patterns and Victimization Outcome, 2007–2021**

Group	Response Pattern	Period 1 Victimization	Period 2 Victimization	Annual Victimization	Response Patterns for Violent Victimization (% of Respondents)	Response Patterns for Property Victimization (% of Respondents)
1	P1 only	Yes	Unknown	Yes	0.2	1.3
2	P1 only	No	Unknown	Unknown	26.6	22.5
3	P1 and P2	Yes	Yes	Yes	0.0	0.3
4	P1 and P2	Yes	No	Yes	0.3	2.2
5	P1 and P2	No	Yes	Yes	0.2	1.7
6	P1 and P2	No	No	No	45.7	47.2
7	P2 only	Unknown	Yes	Yes	0.3	1.8
8	P2 only	Unknown	No	Unknown	26.7	23.0
					100.0	100.0

***Impact on relationship between victimizations and victims.*** In four of the eight possible response patterns, a respondent has only one interview. If an individual responds in only one period, although it is still possible to know the victimization status (see Groups 1 and Group 7), the relationship between victimizations and victims is disrupted. For example, in Group 1 and 7, where victimization status is known, there will be an impact in the relationship between victimization and victim because only WGTVICCY is annualized but the person weight used only represents half the year. Therefore, the ratio of victimizations to number of victims will be larger, as demonstrated in *Section 3.2*. Those in Group 2 and Group 8 affect the relationship between victimization and victims by virtue of their exclusion, and these cases account for 53% of person respondents and 46% of household respondents (see **Table 5**). Because there is not a victimization reported during the one interview, these cases are not included in the ratio’s calculation. This is problematic because, as detailed above, it underestimates the number of victims (but not the number of victimizations), which leads to an inflated number of victimizations per

victim. In this situation, only the victim count is affected because the victim count is determined at the person level, which requires knowledge of the respondent's victimization status for the full year. By comparison, victimization requires only knowledge of the number of victimizations that occurred during the year and, therefore, does not require a link between the two interview periods.

Because of the issues that single interviews cause in the calculation of a prevalence rate and the number of victimizations per victim, a solution that excludes single-interview cases may seem attractive. However, this solution is problematic for two reasons. First, the person/household weight is calibrated to the full population using all respondents. Therefore, excluding a subset of cases could lead to biased prevalence estimates. Second, the exclusion of cases would reduce the total sample size by 53% among persons and 46% of households. This would lead to a dramatic (doubling or near doubling) increase in the standard errors.

#### **1.3.4.2 Different Person or Household Weights Across Interview Periods**

For each interview in the NCVS, each person and household respondent has a weight to allow for inference to the full population. These weights begin with a base weight and then the weights are adjusted for nonresponse and post-stratification. Post-stratification and nonresponse are done independently across the 6-month periods. Thus, even though the base weight for a person/household is the same for each interview wave, after the nonresponse and post-stratification adjustments, a person's or household's weights across the two periods are almost always different.

For those with two interviews in a year, there are two situations in the data to consider:

1. A person is victimized in one interview period, and the person weights differ across periods because of different nonresponse adjustments.
2. A person is victimized in both interview periods.

Because crime victimization is rare, most respondents who report a victimization report a victimization in only one interview period during the year. Therefore, of the cases with two interviews during the year, Situation 1 occurs in 95.7% of cases, and Situation 2 occurs in 4.3% of cases (on average from 2007 through 2021).

**Impact on prevalence rates.** When WGTPERCY is used to calculate the number of victims, as is done under the current method, the number of victims and the number of people are estimated using the same weight, so prevalence rates are not affected. However, if one wanted to use Alternative 2, the estimate of the number of victims would be different. Because this situation, of someone being victimized in both periods, occurs in only 4.3% of cases with a victimization—0.02% of all cases—the impact is usually small (on average from 2007 through 2021).

**Impact on relationship between victimizations and victims.** As described in *Section 1.3.1*, the number of victimizations per victim is affected by differing weights across the two periods. As with the impact on prevalence rates, the rate of victimizations per victim is affected only in the situation where the number of victimizations in the two periods differs. The direction and magnitude of the impact depends on in which period the larger weight and the greater number of victimizations occur. If the larger weight

occurs in the period with fewer incidents, the ratio of victimizations to victims is reduced; if the larger weight is in the period with more incidents, the ratio of victimizations to victims is increased. There is no effect if the number of incidents is the same in both periods.

### 1.3.4.3 Bounding

In a design like the NCVS that requires a bounding factor to correctly estimate the number of victimizations, there are two possibilities for determining the number of victims:

1. Do not apply a bounding factor.
2. Use a bounding factor.

The current method, which uses WGTPERCY to determine the number of victims, does not apply a bounding factor. However, it can reasonably be argued that being a victim in the TIS-1 interview can be telescoped just as the number of victimizations is. The alternative—to use a bounding factor—is incorporated in Alternative 2. However, the bounding factor (BF), as described in **Section 1.2.4**, is based on the number of victimizations rather than the number of victims. Therefore, it likely overstates the amount of telescoping for being a victim.

To correct for this overstatement, a prevalence bounding factor (PBF) can be created as

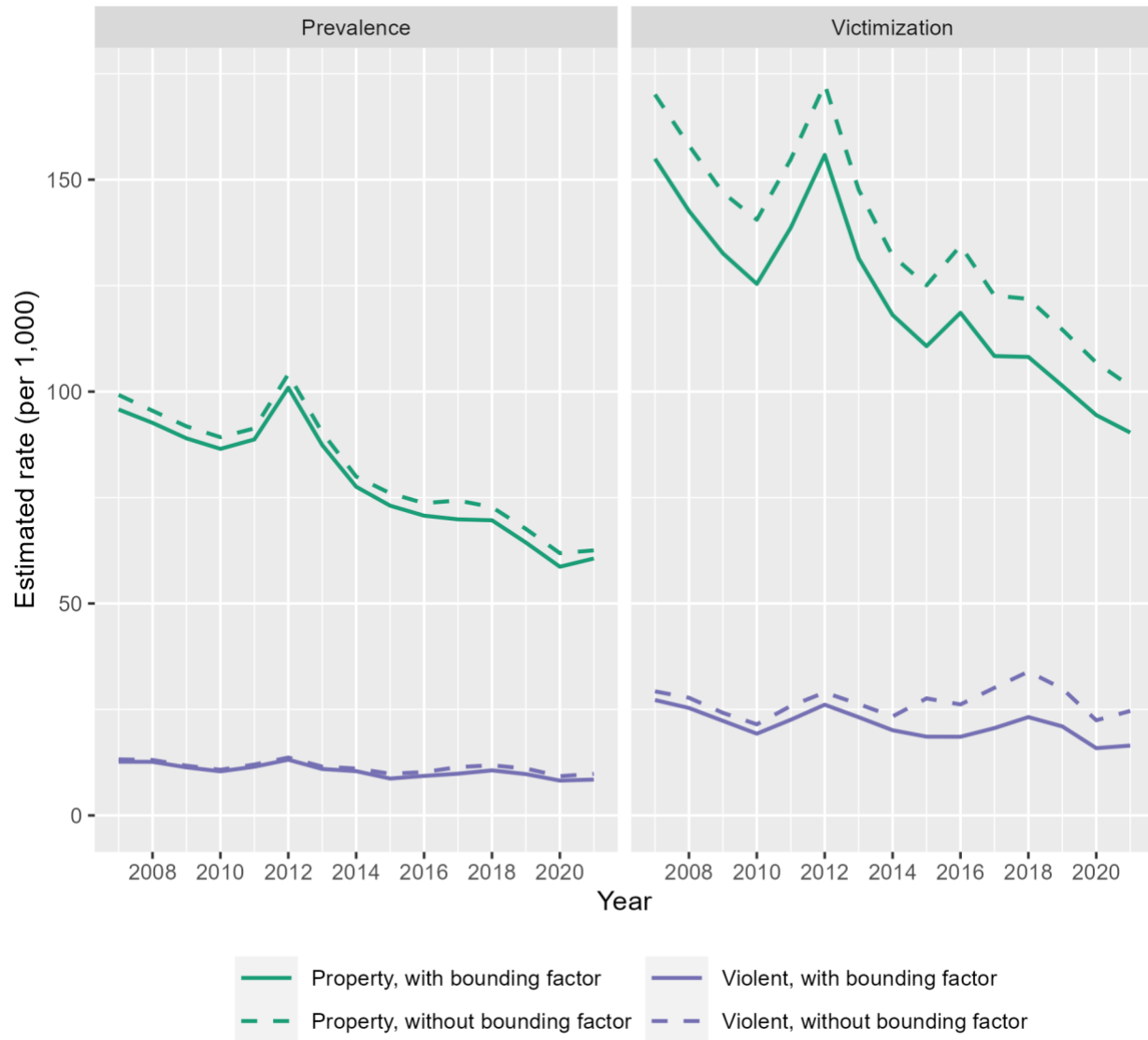
$$PBF = \frac{\sum_{i=2}^7 \hat{p}_k^{(i)}}{6\hat{p}_k^1}$$

where  $p_k^{(i)}$  is the prevalence rate for the interviews in TIS- $i$ ,  $i = 2-7$ , and  $\hat{p}_k^1$  is the prevalence rate for interviews in TIS-1 in the prior 12 months as defined in **Section 2.1** for crime type  $k$ , where  $k$  is either property crime (households) or violent crime (persons). The prevalence bounding factor for both property and violent crime is consistently larger than the victimization bounding factor for both estimate types, household and person (**Figure 3**). On average, from 2007 through 2021, the prevalence bounding adjustment is 43% larger than the victimization bounding factor for household crimes and 38% larger for person-level crimes. However, the prevalence bounding factor is not currently incorporated in any of the existing weights—WGTPERCY (person weight), WGTHHCY (household weight), and WGTVICCY (victimization weight). Victimization and prevalence rate estimates were calculated with and without bounding factors for violent and property crime (**Figure 4**); as illustrated with the bounding factors themselves, the effect of bounding on victimization is larger than on prevalence.

Figure 3. Bounding Factors for Victimization and Prevalence Rates



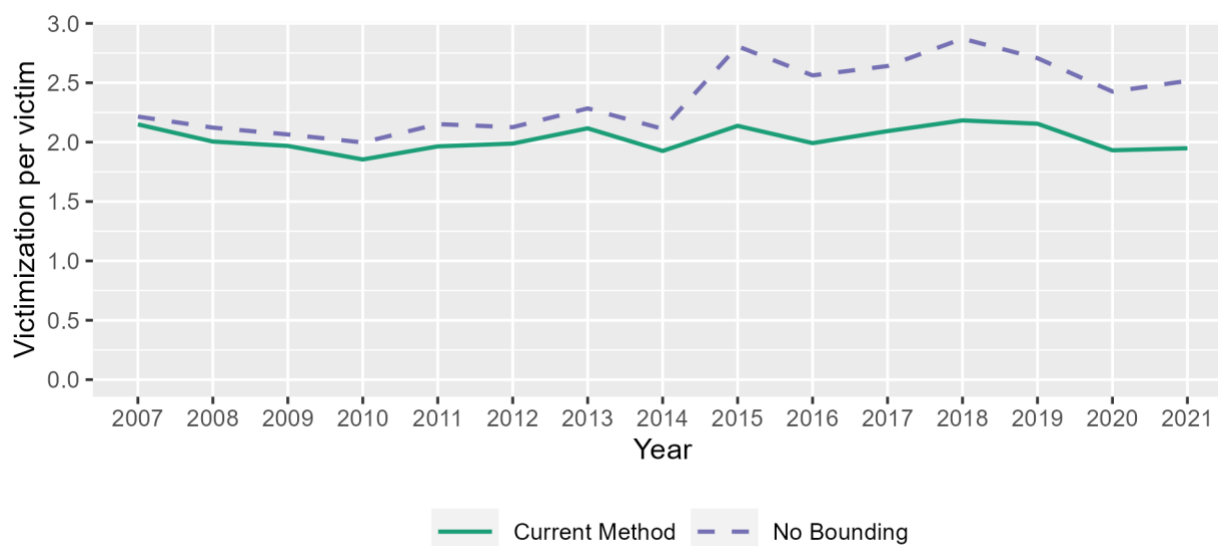
**Figure 4. Bounding Factor Effect on Prevalence and Victimization Rate Estimates**



**Impact on prevalence rates.** As detailed above, the choice of whether to use a bounding factor or not—and, if using a bounding factor, which bounding factor is used—will affect the estimated number of victims. The current method for estimating prevalence, which does not use a bounding factor, likely overstates the number of victims, but it has competing influences, such as cases with only one interview. However, the use of the current victimization bounding factor (Alternative 2) will lead to an understatement of the number of victims. The use of a new prevalence bounding factor would lead to a more accurate estimate of the number of victims, but it cannot be implemented directly using the existing weights.

*Impact on relationship between victimizations and victims.* When a bounding factor is used for victimizations and WGTPERCY is used to estimate the number of victims, the number of victimizations is decreased but the estimate of the number of victims remains unchanged. Thus, the bounding factor decreases the estimate of the number of victimizations per victim in a way that may not be accurate (because the number of victims is overstated). The average number of victimizations per victim is calculated, including the bounding factor in the weighting count of victimizations (current method; solid green line) and without the bounding factor included in the victimization weight (dashed purple line) in **Figure 5**. As expected, if the bounding factor is not used, the number of victimizations per victim increases. From 2007 through 2021, ignoring the bounding factor increases the average number of victimizations per victim by about 17%.

**Figure 5. Average Number of Victimizations per Victim, by Usage of Bounding Factor**



## 1.4 Cautionary Methods

Researchers at RTI and Census have been researching alternative methods for BJS to estimate prevalence rates using the NCVS. Although a new method has not been finalized, a few methods have been ruled out. This section describes the methods that have been ruled out and details why they are not viable options for the NCVS.

- Pairing single interviews within a year.* To account for the fact that many individuals have only one interview in a calendar year, one might think of pairing data to similar cases in the other 6 months of the year. However, when this pairing was attempted—by pairing cases with similar final weights within the household, primary sampling unit, and then overall—about 4% of single interviews per year could not be linked to a comparable case in the prior period (prior to the 2016 boost, this translates to about 1,000 individuals). This is because a single interview per year can be caused not only by the design but also by nonresponse, which has varying rates across periods.

- *Pairing single interviews with cases outside interview year.* For the cases with only one interview in a year, one might consider using data from outside the calendar year for the individual but in nearby months. Using this method has problems similar to those of linking of different individuals within the year. There are not always data in surrounding months for every individual (e.g., if they were a TIS-1 interview in the first period and a nonrespondent in TIS-2), and so a match to surrounding periods is not always possible.
- *Restricting data to only cases with two interviews.* When the data are restricted to only the cases where two interviews occurred, or only those with two interviews and not TIS-1, multiple issues are possible. First, the standard errors will be larger because the sample size will be at least halved. Second, restricting the annual data file yields a respondent set that is not a representative sample and has not been weighted properly to represent the population for the NCVS. This could provide incorrect inference on prevalence rates.

## 1.5 Considerations for Determining the Optimal Approach to Calculating Prevalence Rates

As this report details, in theory, estimating the number of victims should not depend on the choice of the weight used. In other words, in theory, the use of WGTPERCY/WGTHHCY or WGTVICCY to estimate the prevalence rate and the number of victimizations per victim should yield the same value. However, because of the complexities of the NCVS design, this is not the case. Therefore, before determining the optimal method for calculating the number of victims, which is the basis for both the prevalence rate and the number of victimizations per victim, it is critical to understand the impact that using the person/household weight or the victimization weight has on estimating the number of victims.

### 1.5.1 Using the Person or Household Weight<sup>4</sup>

If the person/household weight is used to calculate the number of victims, the following issues need to be considered and accounted for when calculating a prevalence weight:

- There is no bounding adjustment incorporated in the weight.
- There is inconsistency between estimates of victims and victimizations, due to different weights across the year.
- There are cases with only one interview in a year, leading to an unknown victimization status for the entire year, and the weights do not adjust for this fact.

### 1.5.2 Using the Victimization Weight

If the victimization weight is used to calculate the number of victims, the following issues need to be considered when calculating a prevalence rate:

- The bounding adjustment incorporated into the weight may overstate the impact of bounding because it is intended to adjust for victimization rates rather than prevalence rates.

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<sup>4</sup> For more information on the creation of weights in the NCVS, see “Chapter 5. Weighting” in *National Crime Victimization Survey, 2016 Technical Documentation*, NCJ 251442, December 2017.

- If a person reports in only one period of the year and is victimized in that period, the relationship between the number of victimizations and victims is incorrect because the person weight is underestimated.
- Each of the 6-month victimization weights is designed to represent the full population, i.e., counting the total population of victimizations/victims in the first and second 6 months. This works for victimizations, but when counting victims, an adjustment is required to be sure that victims are not double counted during the full year.
- Victimization and victims can be aligned, but this ratio may be understated because of the victimization bounding adjustment.

## **1.6 Summary**

On the basis of the issues discussed in this report, when determining the method for calculating prevalence, one should (1) determine the properties of the relationship between victimization and victims desired, (2) understand the impact those relationships have on bias, and (3) determine which if any of these issues need not be taken into account. Each viable option for calculating the prevalence rate should be evaluated on these three criteria. Although it is unlikely that a single method will excel in all three of these areas, grading across all three methods will help determine which method does the best, on average, across the three criteria.



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## **Chapter 2: Summary of Prevalence Estimation Methods (Phase 2)**

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### **2.1 Introduction**

BJS calculates two measures of crime victimization: (1) a victimization rate and (2) a prevalence rate. Because of the complexities in the NCVS file structure, the method for computing a prevalence rate is not straightforward. Furthermore, different methodologies will produce different prevalence rate estimates.

RTI explored three ways to estimate prevalence in the NCVS. In this section, an overview of the methods and comparisons of their strengths and weaknesses are presented. Additionally, estimates for each of the methods for violent and property crime were compared from 2007 through 2021.

### **2.2 Description of Methods**

#### **2.2.1 Current Prevalence Estimation Method**

The current method of estimating prevalence is to create an indicator for whether a person was victimized at any point in the year for a given crime type. This indicator is merged onto all records for the individual for the year—whether they had been victimized in one or both time periods. Then, to estimate the number of victims and prevalence rate in a year, WGTPERCY or WGTHHCY is used to estimate both the total and rate.

#### **2.2.2 One-Interview Adjustment Method**

Not all respondents in the NCVS are interviewed in two time periods in a year. This can be due to a number of reasons, including nonresponse, sample design, person aging into sample, and person or household moving. For respondents who respond in only one interview in the year and are not victimized during that reference period, whether they were victimized in the other half of the year remains unknown. This method adjusts estimates for those with only one interview by creating a one-interview adjustment method (OIAM) factor using data from respondents who responded in both periods. The OIAM factor is applied to all respondents who are victims. Next, a bounding factor is calculated to account for telescoping for victims in TIS-1. Finally, the weights are calibrated for the non-victims so that the sum of the prevalence weights is equal to the sum of WGTPERCY/WGTHHCY for all respondents.

#### **2.2.3 One-Victimization Adjustment Method**

In a given year, most people who are victims in the NCVS are victimized only once. However, the number of victims under the current estimation method for those who are victimized only once is a different estimate than the number of victimizations for those same people. This is because victimizations are calculated using WGTVICCY and not WGTPERCY/WGTHHCY. This method calibrates weights of

people/households who had only one victimization in the year to be the same as the sum of the WGTVICCY for those individuals who were victimized only once in the year. Additionally, this weight is further calibrated so that the sum of the weight is the same as WGTPERCY.

### 2.3 Comparison of Methods

Table 6 compares the two methods for annual prevalence. This table describes only person/violent prevalence rates, but the same features exist for property crimes.

**Table 6. Comparison of Prevalence Rate Estimation Methods**

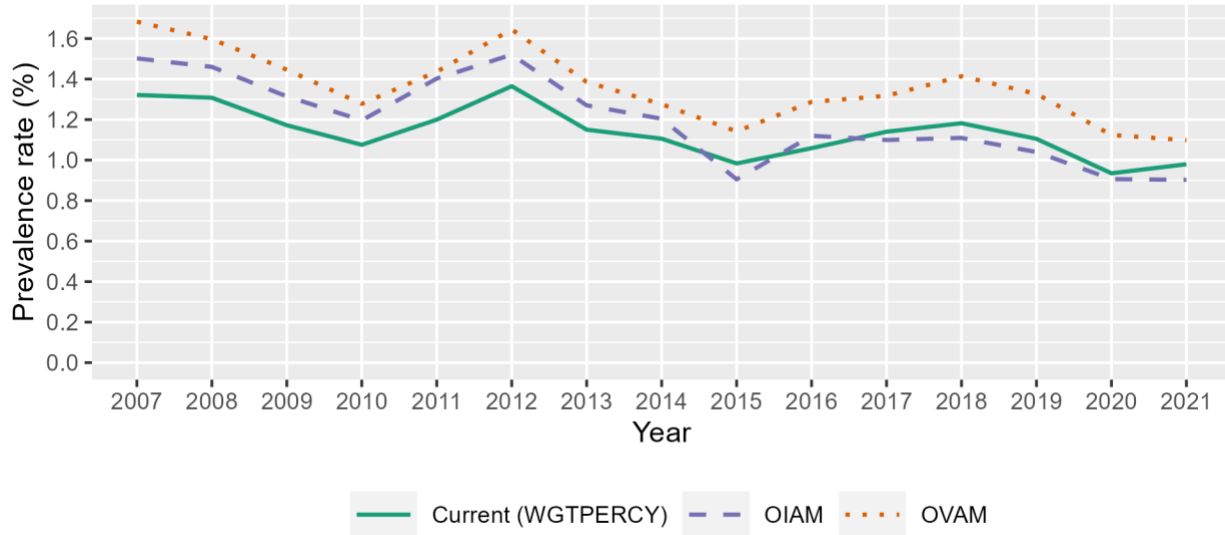
Feature	Current Method	OVAM	OIAM
<b>Base weight</b>	Person weight	Victimization weight	Person weight
<b>Consistency</b>	None	For people with only one victimization, sum of PREV_WGT is same as sum of WGTVICCY. Sum of PREV_WGT is same as sum of WGTPERCY for all persons.	Sum of PREV_WGT is same as sum of WGTPERCY for all persons
<b>Bounding</b>	No bounding factor for telescoping is used	Prevalence bounding is implicitly treated as the same as victimization bounding adjustment	Prevalence bounding is calculated on its own and bounding factor is closer to 1 than victimization bounding factor, illustrating that telescoping may be less of an issue for prevalence than it is for victimization
<b>Cases with only one interview in year and no victimization</b>	Treated same as person with two interviews and no victimization	Treated same as person with two interviews and no victimization	Adjusts weight to reflect the probability that victimization may have occurred in other 6 months, using data for people with two interviews
<b>Estimation of standard errors</b>	Direct estimation can be computed with Taylor Series Linearization (TSL); existing Balanced Repeated Replication (BRR) weights can be used for BRR estimation	Direct estimation can be computed with TSL; new BRR weights would be required for BRR estimation because of prevalence-specific weight and could be generated by the analyst from the existing replicate weights	Direct estimation can be computed with TSL; new BRR weights would be required for BRR estimation because of prevalence-specific weight and could be generated by the analyst from the existing replicate weights

The one-victimization adjustment method (OVAM) produces violent prevalence rate estimates higher than the current method, and the OIAM estimates are higher than the current method through 2014 and then are lower or very similar to the current method beginning in 2015. When looking at rates from

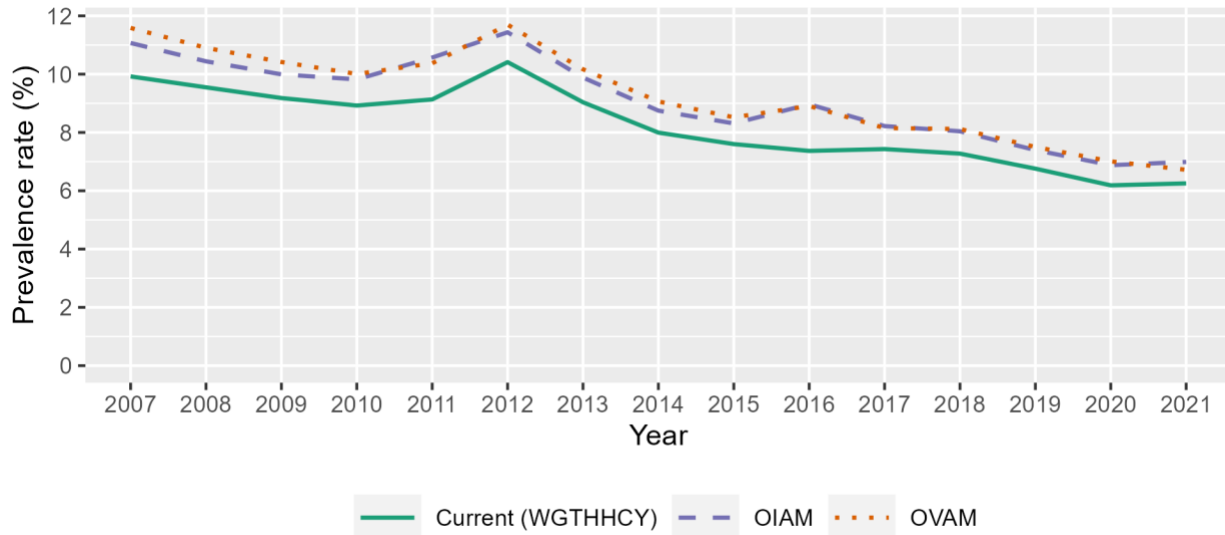
Prevalence Estimation Methods

2007 through 2021, generally the OVAM is higher than the OIAM violent prevalence rates. Property prevalence rates are similar between the OVAM and OIAM (see **Figure 6** and **Figure 7**).

**Figure 6. Violent Prevalence Rates by Method, 2007–2021**



**Figure 7. Property Prevalence Rates by Method, 2007–2021**



A comparison of the rates and standard errors is included in **Appendix A**. Estimated prevalence rates and their standard errors are presented for each method for both violent and property crimes in Tables A-1 and A-2. In Tables A-3, A-4, A-5, and A-6, the estimated number of victims of violent and property crimes and their standard errors are included for each method. Finally, Tables A-7 and A-8 present the number of violent and property crime victims by number of victimizations.



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## Chapter 3: Detailed Methodology for Alternative Prevalence Methods (Phase 2)

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### 3.1 OVAM Detail

*Method summary:* This method adjusts weights so that, for people victimized only once in the year, the sum of the victimization weight is the same as the sum of the prevalence weight.

The PREV\_WGT is assigned in three high-level steps.

Step 1 assigns initial values from WGTVICCY or WGTPERCY, depending on how many interviews had an incident report for each unique person:

- If the person never reported a crime during the year, then  $PREV\_WGT = WGTPERCY$  for all records on the file for this person (whether there are one or two interviews does not matter).
- If the person had only one interview during the year and had an incident report in that interview, then  $PREV\_WGT = WGTVICCY/2$  for that interview.
- If the person had two interviews during the year and had an incident report in only one of those interviews, then  $PREV\_WGT = WGTVICCY/2$  for both interview records, where the WGTVICCY value comes from the interview with the incident report. So, both interviews will have the same PREV\_WGT value that comes from the interview with the incident report.
- If the person had two interviews during the year and had an incident report in both of them, then  $PREV\_WGT = WGTVICCY/2$  for each interview. So, the PREV\_WGT values will be different for the two interviews because the WGTVICCY is different due to separate weighting adjustments for the two interviews.

After the initial creation of PREV\_WGT, Step 2 is to calibrate the weights so the sum of PREV\_WGT for persons with just one victimization matches the sum of WGTVICCY for persons with just one victimization. Therefore, adjust PREV\_WGT as follows:

- If the person did not report any crimes during the year, keep the original PREV\_WGT value without any adjustment.
- For all persons who reported any crime during the year, set

$$PREV\_WGT = PREV\_WGT * \frac{\sum WGTVICCY(\text{reported just 1 victimization})}{\sum PREV\_WGT(\text{reported just 1 victimization})}$$

Step 2 makes an adjustment based on persons with only one victimization in the year, but it is applied to all persons with any victimizations. It is expected that this adjustment inflates the weights for the victims (across all years 2007–2021, the violent crime factor ranged from 1.31 to 1.41), which is appropriate for all victims to account for the persons who may have been victims (once or more than once) but were not measured because of having only one interview in the year.

Step 3 of PREV\_WGT creation is to calibrate the weights so all cases have the sum of PREV\_WGT equal to the sum of WGTPERCY. Therefore, adjust PREV\_WGT as follows:

- If the person did not report any crimes during the year, set:

$$PREV\_WGT = PREV\_WGT * \frac{\sum WGTPERCY(all\ persons) - \sum PREV\_WGT(persons\ with\ crimes)}{\sum PREV\_WGT(persons\ with\ no\ crimes)}$$

- For all persons who reported any crime during the year, keep the PREV\_WGT value from Step 2 without any further adjustment.

After this last adjustment, the PREV\_WGT will sum to WGTVICCY for persons with only one victimization, and PREV\_WGT will sum to WGTPERCY for all persons on the file.

Creating this weight for a 6-month prevalence would be far simpler and merely use the victimization weight without needing to account for number of interviews and number of victimizations.

## **3.2 OIAM Detail**

*Method Summary:* This method begins with the person/household weight, then adjusts prevalence to account for those with only one interview in the survey year, and it adjusts for telescoping using a prevalence-specific bounding adjustment for TIS-1 interviews.

### **3.2.1 OIAM Factor**

As **Table 7** shows, persons in Group 1 and Group 2 participated in only the first interview period of the year, and persons in Group 7 and Group 8 participated in only the second interview period of the year.

**Table 7. Victimization Response Patterns**

<b>Group</b>	<b>Response Pattern</b>	<b>Period 1 Victimization</b>	<b>Period 2 Victimization</b>	<b>Annual Victimization</b>
1	P1 only	1	Unknown	1
2	P1 only	0	Unknown	Unknown
3	P1 and P2	1	1	1
4	P1 and P2	1	0	1
5	P1 and P2	0	1	1
6	P1 and P2	0	0	0
7	P2 only	Unknown	1	1
8	P2 only	Unknown	0	Unknown

For those in Group 1 or Group 7, it is known the respondent was a victim during the year. Therefore, when computing a prevalence, whether they were a victim in the second period does not need to be known. However, because those in Group 2 and Group 8 did not report a victimization in their one interview, an estimate of the likelihood that they did experience a victimization in the second period of the year is needed. Those in Groups 3–6 reported in both periods and, therefore, their victimization status is known with certainty for purposes of computing a prevalence.

From **Table 7**, it can be seen that those in Group 2 are similar to those in Group 5 and Group 6 in that they responded in the first interview period and did not report a victimization. Similarly, those in Group 8 are similar to those in Group 4 and Group 6 in that they responded in the second interview period of the year and did not report a victimization during this period. Using these relationships, the estimated probability that a person in Group 2 or Group 8 was victimized in the reporting period they missed can be calculated.

$$\widehat{p}_2 = \frac{\sum w_i I_i(\text{Group 5})}{\sum w_i I_i(\text{Group 5 or 6})}$$

$$\widehat{p}_8 = \frac{\sum w_i I_i(\text{Group 4})}{\sum w_i I_i(\text{Group 4 or 6})}$$

where  $w_i$  is WGTPERCY or WGTHHCY for personal crimes and household crimes, respectively. Using these estimated probabilities, the total number of persons who experienced at least one victimization during the year can be estimated as

$$\widehat{T}_{unbounded} = \sum w_i I_i(\text{Group 1, 3, 4, 5, or 7}) + \widehat{p}_2 \sum w_i I_i(\text{Group 2}) + \widehat{p}_8 \sum w_i I_i(\text{Group 8})$$

This alternative method is related to the current method used by BJS to estimate prevalence because the current method is equivalent to the first term in the total; that is

$$\widehat{T}_1 = \sum w_i I_i(\text{Group 1, 3, 4, 5, or 7})$$

The OIAM factor is calculated as

$$OIAM_{factor} = \frac{\widehat{T}_{unbounded}}{\widehat{T}_1}$$

Then an unbounded prevalence rate is estimated as

$$\widehat{r}_{unbounded} = \frac{\widehat{T}_{unbounded}}{\sum w_i}$$

### 3.2.2 Adjust for Telescoping in TIS-1

To adjust for telescoping of TIS-1 cases, a similar method of bounding is applied to prevalence as was done for victimization before 2016. A bounding factor (BF) for TIS-1 cases is calculated as the ratio of the mean rate for non-TIS-1 cases with the rate of TIS-1 cases; that is

$$BF = \frac{\sum_{t=2}^7 \hat{r}_{t,unbounded}}{6\hat{r}_{1,unbounded}}$$

where  $\hat{r}_{t,unbounded}$  is the unbounded prevalence rate at TIS-t for  $t = 1, \dots, 7$ . An analyst could follow these steps to create adjustment factors for prevalence rates. Alternatively, a weight that can be added to a dataset and used easily by anyone can be constructed. A weight that incorporates both the bounding factor and the OIAM is calculated as

$$w_{i,prev} = w_i \times OIAM_{factor} \times BF$$

where  $w_i$  is the person- or household-level weight and both the OIAM factor and bounding factor are 1 for non-victims. Then an estimate of prevalence is calculated as

$$\widehat{T}_{victims} = \sum w_{i,prev} v_i$$

$$r_{prevalence} = \frac{\widehat{T}_{victims}}{\sum w_{i,prev}}$$

where  $v_i$  is an indicator of victimization at some point in the year. The sum of prevalence weights is not the same as the person weights.

At this stage, the sum of the prevalence weights is the product of the sum of the person weights times a multiplier to account for the fact that some people are interviewed only once. The bounding adjustment is then applied to TIS-1 cases and decreases the weight of those in TIS-1. Thus, the weights cannot be easily compared to either the victimization or person weights and do not remain consistent with either.

### **3.2.3 Calibrating the Weights**

A final step is applied to calibrate the prevalence weights to the person or household weights.

Creating this weight for a 6-month prevalence would require calculation of a bounding factor for prevalence, and no OIAM factor would be necessary because there is not an issue with not having a response for the entire lookback period as it is only 6 months in the NCVS survey.



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## **Chapter 4: Evaluation of a Hybrid Method (Phase 3)**

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### **4.1 Hybrid Method Details**

To create a hybrid method between the OVAM and OIAM, the OVAM needs to be the base methodology in order to ensure that single victims account for only one victimization. The OIAM is added into the OVAM process before the OVAM calibration steps to create a hybrid method.

If the hybrid method successfully blends the OVAM and OIAM, it will have the following features:

1. Each person with only one victimization would equal one victim in the prevalence weight.
2. The weights would be properly adjusted to account for the unknown annual prevalence when only one interview is completed.
3. A prevalence-specific bounding adjustment would be applied to the rate rather than to the victimization-specific bounding adjustment.
4. The violent and property prevalence weights should sum to the person and household weights, respectively.

However, as illustrated in Exhibit ES1, it is not possible for both the Base Weight feature and the Bounding feature to hold because, in order for the prevalence weight to equal the victimization weight for cases with one victimization, the victimization bounding adjustment must be used. That said, it may still be possible to maintain the other three desired features of a hybrid design.

The following sections illustrate how the hybrid method would be implemented. To ensure that the estimated count of single-victim persons equals the estimated number of victimizations experienced by these same persons, the hybrid method uses the OVAM as the base for the hybrid method. The steps of the OVAM are briefly described in the next section. Then, how the OIAM can be integrated into the OVAM to adjust for one-interview persons is detailed. After that, an example of the combined, hybrid approach is illustrated. Finally, a comparison of the OVAM, OIAM, and hybrid estimates for the years 2007–2021 is presented, along with a final determination of whether the hybrid method was successful in achieving its goals.

#### **4.1.1 OVAM Detail**

For the OVAM, a simplified description of the steps is as follows:

1. Initial values: Create an initial prevalence weight ( $PREV\_WGT_0$ ) as follows, based on  $WGTVICCY$  and  $WGTPERCY$ —

Group	Criteria	Initial PREV_WGT
1	No violent crime reported	$PREV\_WGT_0 = WGTPERCY$
2	One interview, violent incident reported	$PREV\_WGT_0 = WGTVICCY / 2$
3	Two interviews, violent incident reported in only one	$PREV\_WGT_0 = WGTVICCY/2$ of the violent incident, assigned to both interviews
4	Two interviews, violent incident reported in both	$PREV\_WGT_0 = WGTVICCY/2$ for each interview, independently

2. Calibration 1: Calibrate  $PREV\_WGT_0$  so the sum of the weight for persons with just one victimization matches the sum of  $WGTVICCY$  for persons with just one victimization. This adjustment is applied to all persons with at least one victimization.

$$PREV\_WGT_1 = (PREV\_WGT_0) * \frac{\sum WGTVICCY \times I_{1\_VIC}}{\sum PREV\_WGT_0 \times I_{1\_VIC}}$$

3. Calibration 2: Calibrate  $PREV\_WGT_1$  so the sum of  $PREV\_WGT$  for all persons is the sum of  $WGTPERCY$  for all persons. This adjustment is applied only to the persons who had no victimizations in the year.

$$PREV\_WGT = (PREV\_WGT_1) * \frac{\sum WGTPERCY - (\sum PREV\_WGT_1 \times I_{VIC})}{\sum PREV\_WGT_1 \times I_{0\_VIC}}$$

#### 4.1.2 Adding a One-Interview Adjustment to OVAM

After the prevalence weight is adjusted in Step 1, and before Calibration 1, an adjustment is added to account for those who have only one interview and an unknown annual victimization. There are eight possible outcomes in a year (groups) for a combination of response and victimization, as follows.

Group	Response Pattern	Period 1 Victimization	Period 2 Victimization	Annual Victimization
1	H1 only	1	Unknown	1
2	H1 only	0	Unknown	Unknown
3	H1 and H2	1	1	1
4	H1 and H2	1	0	1
5	H1 and H2	0	1	1
6	H1 and H2	0	0	0
7	H2 only	Unknown	1	1
8	H2 only	Unknown	0	Unknown

Note: H1 is the first half of the year (quarter 1 and quarter 2), and H2 is the second half of the year (quarter 3 and quarter 4).

After initial values ( $PREV\_WGT_0$ ) are assigned, the total number of victims could be estimated as the sum of the  $PREV\_WGT_0$  for those in Groups 1, 3, 4, 5, and 7 as follows:

$$\hat{T}_{0,unadj} = \sum PREV\_WGT_0 I_i (\text{Group 1, 3, 4, 5, or 7})$$

This undercounts those who are in Group 2 or Group 8 who may have had a victimization in the other 6-month reference period. The proportion of people who would be victims if they had two interviews can be estimated, given they had no victimization in one period, and then use this to estimate the larger total as follows:

$$\hat{p}_2 = \frac{\sum PREV\_WGT_0 I_i (\text{Group 5})}{\sum PREV\_WGT_0 I_i (\text{Group 5 or 6})}$$

$$\hat{p}_8 = \frac{\sum PREV\_WGT_0 I_i (\text{Group 4})}{\sum PREV\_WGT_0 I_i (\text{Group 4 or 6})}$$

Then, the number of victims can be estimated as follows:

$$\hat{T}_{0,adj} = \sum PREV\_WGT_0 I_i (\text{Group 1, 3, 4, 5, or 7}) + \hat{p}_2 \sum PREV\_WGT_0 I_i (\text{Group 2}) + \hat{p}_8 \sum PREV\_WGT_0 I_i (\text{Group 8})$$

The ratio of the adjusted value to the unadjusted value is calculated and creates an adjustment that is then applied to all victims by multiplying  $PREV\_WGT_0$  by the OIAM.

$$OIAM = \frac{\hat{T}_{0,adj}}{\hat{T}_{0,unadj}}$$

Then, the two calibration steps from the OVAM are applied.

### 4.1.3 Example Calculation Using 2021 Data

Using the 2021 data from the NCVS, an example is worked out using this hybrid method.

#### 4.1.3.1 Initial Values ( $PREV\_WGT_0$ )

The initial values of  $PREV\_WGT$  ( $PREV\_WGT_0$ ) are assigned using either  $WGTVICCY$  or  $WGTPERCY$ , depending on whether a person had one or two interviews during the year, and whether they reported a violent incident at either or both. The victimization weights ( $WGTVICCY$ ) are divided by 2 to change from a 6-month weight to an annual weight. **Table 8** displays the sums of  $WGTPERCY$  (current method) and initial  $PREV\_WGT_0$  by Interview/Incident group.

## Interview/Incident Groups

Group	Criteria	Initial PREV_WGT
1	No violent crime reported	$PREV\_WGT_0 = WGTPERCY$
2	One interview, violent incident reported	$PREV\_WGT_0 = WGTVICCY / 2$
3	Two interviews, violent incident reported in only one	$PREV\_WGT_0 = WGTVICCY/2$ of the violent incident, assigned to both interviews
4	Two interviews, violent incident reported in both	$PREV\_WGT_0 = WGTVICCY/2$ for each interview, independently

Table 8. 2021 WGTPERCY and PREV\_WGT<sub>0</sub> by Interview/Incident Group

Group	WGTPERCY	PREV_WGT <sub>0</sub>
1	276,453,869	276,453,869
2	949,662	750,047
3	1,694,416	1,495,786
4	90,625	80,164
Total	279,188,573	278,779,866

## 4.1.3.2 One-Interview Adjustment

The one-interview adjustment step adjusts the weights to account for the people interviewed only once in the year who may have been victimized in the other half.

The OIAM estimates the proportion of people who would be victims if they had two interviews, given they have no victimization in one period, and then uses this to estimate a larger total.

$$\widehat{p}_2 = \frac{\sum w_i I_i(\text{Group 5})}{\sum w_i I_i(\text{Group 5 or 6})} = \frac{815,101}{173,395,276} = 0.00470$$

$$\widehat{p}_8 = \frac{\sum w_i I_i(\text{Group 4})}{\sum w_i I_i(\text{Group 4 or 6})} = \frac{680,685}{173,260,860} = 0.00393$$

Then, using those proportions, the number of people in Group 2 and Group 8 who would have been victims if they had been interviewed in the other period to get a new total estimate is estimated.

$$\begin{aligned} \widehat{T}_{0,adj} &= \sum w_i I_i(\text{Group 1, 3, 4, 5, or 7}) + \widehat{p}_2 \sum w_i I_i(\text{Group 2}) + \widehat{p}_8 \sum w_i I_i(\text{Group 8}) \\ &= 2,325,997 + .00470 * 55,477,263 + .00393 * 48,396,432 \\ &= 2,776,919 \end{aligned}$$

Next, the OIAM is calculated as the ratio of this adjusted total and the initial total as follows:

$$OIAM = \frac{\hat{T}_{0,adj}}{\hat{T}_{0,unadj}} = \frac{2,776,919}{2,325,997} = 1.1939$$

Group	Response Pattern	Period 1 Victimization	Period 2 Victimization	Annual Victimization	PREV_WGT <sub>0</sub>	PREV_OIAM
1	H1 only	1	Unknown	1	319,502	381,441
2	H1 only	0	Unknown	Unknown	55,477,263	55,477,263
3	H1 and H2	1	1	1	80,164	95,704
4	H1 and H2	1	0	1	680,685	812,644
5	H1 and H2	0	1	1	815,101	973,119
6	H1 and H2	0	0	0	172,580,175	172,580,175
7	H2 only	Unknown	1	1	430,545	514,011
8	H2 only	Unknown	0	Unknown	48,396,432	48,396,432
Total					<b>272,052,639</b>	<b>272,556,674</b>

#### 4.1.3.3 Calibration 1

The first calibration adjusts the PREV\_OIAM weight so that it sums to WGTVICCY for persons with exactly one victimization.

	WGTVICCY	PREV_WGT <sub>0</sub>	PREV_OIAM	PREV_WGT <sub>1</sub>
Persons with one victimization	2,574,066	1,952,836	2,331,417	2,574,066
Persons with more than one victimization	582,141	373,160	445,502	491,869

#### 4.1.3.4 Calibration 2

The second calibration adjusts PREV\_WGT<sub>1</sub> so that the weight sums to WGTPERCY across all persons but retains the first calibration.

	Σ WGTPERCY	Σ WGTVICCY	Σ PREV_WGT
All persons	279,188,573	3,156,207	279,188,573
One victimization	2,290,813	2,574,066	2,574,066
More than one victimization	443,890	582,141	491,869

#### 4.1.4 Comparison of Results to Alternative Prevalence Methods

The OVAM, OIAM, and hybrid prevalence rates and victim totals were calculated with data from 2007 through 2021. It is demonstrated that the estimates using OVAM are the same as those using the hybrid method (see table below). This indicates that the inclusion of the OIAM is undone by the OVAM calibration steps and, therefore, does not produce a different prevalence rate.

This finding enables us to conclude that it is not possible to implement a hybrid design that achieves any of the OIAM features.

Year	Prevalence rate (%)				Victims			
	Current	OVAM	OIAM	Hybrid	Current	OVAM	OIAM	Hybrid
2007	1.32	1.68	1.50	1.68	3,308,009	4,214,134	3,760,262	4,214,134
2008	1.31	1.60	1.46	1.60	3,298,915	4,027,932	3,683,095	4,027,932
2009	1.17	1.45	1.31	1.45	2,978,166	3,674,792	3,340,446	3,674,792
2010	1.08	1.28	1.20	1.28	2,753,159	3,270,651	3,062,339	3,270,651
2011	1.20	1.44	1.40	1.44	3,089,720	3,700,194	3,612,431	3,700,194
2012	1.36	1.65	1.52	1.65	3,575,902	4,309,904	3,983,391	4,309,904
2013	1.15	1.39	1.27	1.39	3,041,167	3,663,619	3,358,287	3,663,619
2014	1.11	1.28	1.20	1.28	2,948,537	3,402,069	3,210,876	3,402,069
2015	0.98	1.14	0.90	1.14	2,650,665	3,077,312	2,439,110	3,077,312
2016	1.06	1.29	1.12	1.29	2,882,324	3,503,722	3,048,949	3,503,722
2017	1.14	1.32	1.10	1.32	3,106,336	3,589,439	2,995,198	3,589,439
2018	1.18	1.41	1.11	1.41	3,254,253	3,893,095	3,055,002	3,893,095
2019	1.10	1.33	1.04	1.33	3,059,063	3,673,646	2,878,363	3,673,646
2020	0.93	1.12	0.91	1.12	2,599,624	3,125,905	2,520,456	3,125,905
2021	0.98	1.10	0.90	1.10	2,734,703	3,065,934	2,519,805	3,065,934

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## Chapter 5: Examples of Current and Alternative Prevalence Methods (Phase 4)

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### 5.1 Step-by-Step Example of Current Method

This example uses simplified fictitious data to demonstrate the calculation steps of the current method for estimating prevalence using WGTPERCY. This same approach can be applied to households and property crimes using household weight (WGTHHCY) in place of person weight (WGTPERCY) and the property crime indicator (PROPERTY) in place of the violent crime indicator (VIOLENT).

First, the incident file is collapsed into one record per person per quarter by summing  $WGTSERIES \times VIOLENT$  for each person-by-quarter:

$$VICTIM_Q = \sum_Q WGTSERIES \times VIOLENT$$

where  $Q$  = quarter 1 to 4, WGTSERIES is the ratio of the NCVS SERIES\_WEIGHT to WGTVICCY, and VIOLENT is a 0/1 indicator of whether a reported incident was a violent crime. For data years other than 2016, this results in one or two records per person per year. **Table 9** displays a simplified example of single-year incident data for six respondents. **Table 10** shows the collapsed person-by-quarter data for the same six respondents.

**Table 9. Sample Incident Data (Single Year)**

	<i>Quarter</i>	<i>VIOLENT</i>	<i>WGTSERIES</i>	<i>VIOLENT x WGTSERIES</i>
Person 5	2	1	2	2
Person 5	2	1	1	1
Person 5	4	0	1	0
Person 100	4	0	3	0
Person 100	4	0	1	0
Person 100	4	1	1	1
Person 100	4	0	2	0
Person 199	1	1	2	2
Person 199	1	0	1	0
Person 199	3	0	2	0

(continued)

**Table 9. Sample Incident Data (Single Year) (continued)**

	<i>Quarter</i>	<i>VIOLENT</i>	<i>WGTSERIES</i>	<i>VIOLENT x WGTSERIES</i>
Person 531	2	0	2	0
Person 531	2	1	3	3
Person 531	4	0	2	0
Person 531	4	1	1	1
Person 531	4	0	1	0
Person 944	1	0	1	0
Person 944	1	0	2	0
Person 1100	2	0	1	0
Person 1100	2	0	2	0
Person 1100	4	0	2	0
Person 1100	4	0	1	0

**Table 10. Collapsed Person-by-Quarter (Single Year)**

	<i>Quarter</i>	<i>VICTIM<sub>q</sub></i>
Person 5	2	3
Person 5	4	0
Person 100	4	1
Person 199	1	2
Person 199	3	0
Person 531	2	3
Person 531	4	1
Person 944	1	0
Person 1100	2	0
Person 1100	4	0



If a person reported a violent incident at any time during the year, the person is classified as a victim for that year:

$$VICTIM_Y = \begin{cases} 0 & \text{if } \sum_{Q=1}^4 VICTIM_Q = 0 \\ 1 & \text{if } \sum_{Q=1}^4 VICTIM_Q > 0 \end{cases}$$

where Y = year, Q = quarter, and  $VICTIM_Q = \sum_Q WGTSERIES \times VIOLENT$ .

The final step is to merge the person-by-quarter incident dataset (one record per person per quarter per year) and the  $VICTIM_Y$  indicators (one per person per year) onto the person-level dataset (one record per person per year). This assigns the  $VICTIM_Y$  status to all records for a person in year Y.

**Table 11** shows the sample person-by-quarter dataset with  $WGTPERCY$  and Victim status attached to the records. There are many persons in the person-level file without a record in the incident file, meaning no incidents of crime were reported. These persons are assigned  $VICTIM = 0$ .

**Table 11. Person-Level Dataset for Estimating Prevalence (Single Year)**

	Quarter	VICTIM <sub>Q</sub>	WGTPERCY	VICTIM <sub>Y</sub>
Person 4	1	-	1601.3	0
Person 4	3	-	1601.3	0
Person 5	2	3	876.2	1
Person 5	4	0	876.2	1
Person 6	1	-	965.7	0
Person 6	3	-	965.7	0
Person 7	4	-	1387.4	0
Person 8	1	-	1401.1	0
Person 8	3	-	1401.1	0
Person 99	2	-	1202.8	0
Person 99	4	-	1202.8	0
Person 100	4	1	1532.7	1
Person 101	1	-	589.2	0
Person 101	3	-	589.2	0
Person 102	1	-	1687.3	0
Person 102	3	-	1687.3	0

(continued)

**Table 11. Person-Level Dataset for Estimating Prevalence (Single Year)  
(continued)**

	Quarter	VICTIM <sub>q</sub>	WGTPERCY	VICTIM <sub>y</sub>
Person 198	2	-	999.4	0
Person 198	4	-	999.4	0
Person 199	1	2	962.8	1
Person 199	3	0	962.8	1
Person 200	1	-	1234.5	0
Person 200	3	-	1234.5	0
Person 201	1	-	987.6	0
Person 530	2	-	521.2	0
Person 530	4	-	521.2	0
Person 531	2	3	1895.1	1
Person 531	4	1	1895.1	1
Person 532	1	-	1591.8	0
Person 532	3	-	1591.8	0
Person 533	2	-	753.6	0
Person 533	4	-	753.6	0
Person 933	1	-	963.2	0
Person 933	3	-	963.2	0
Person 944	1	0	1345.3	0
Person 945	3	-	741.8	0
Person 946	2	-	852.3	0
Person 946	4	-	852.3	0
Person 1099	1	-	1099.1	0
Person 1099	3	-	1099.1	0
Person 1100	2	0	344.3	0
Person 1100	4	0	344.3	0
Person 1101	2	-	1206.9	0
Person 1101	4	-	1206.9	0

Note: a dash means there was no record in the incident file.

Once the victim status for each person is established, the prevalence estimates can be calculated using WGTPERCY as the sample weight. The number of victims is estimated as the weighted sum of the VICTIM indicator, and the prevalence rate is estimated as the weighted average using WGTPERCY as the weight. The new methods **OIAM** and **OVAM** use this same VICTIM indicator to estimate prevalence using a new PREV\_WGT in place of WGTPERCY. **Table 12** shows the Victims and Prevalence estimates of WGTPERCY, PREV\_WGT by OVAM, and PREV\_WGT by OIAM for 2007 through 2021.

**Table 12. Victims and Prevalence Estimates for Violent Crimes, by Method, 2007–2021**

	<i>WGTPERCY (Current Method)</i>		<i>OIAM</i>		<i>OVAM</i>	
	<i>Victims</i>	<i>Prevalence</i>	<i>Victims</i>	<i>Prevalence</i>	<i>Victims</i>	<i>Prevalence</i>
2007	3,308,009	1.3	3,760,262	1.5	4,214,134	1.7
2008	3,298,915	1.3	3,683,095	1.5	4,027,932	1.6
2009	2,978,166	1.2	3,340,446	1.3	3,674,792	1.4
2010	2,753,159	1.1	3,062,339	1.2	3,270,651	1.3
2011	3,089,720	1.2	3,612,431	1.4	3,700,194	1.4
2012	3,575,902	1.4	3,983,391	1.5	4,309,904	1.6
2013	3,041,167	1.2	3,358,287	1.3	3,663,619	1.4
2014	2,948,537	1.1	3,210,876	1.2	3,402,069	1.3
2015	2,650,665	1.0	2,439,110	0.9	3,077,312	1.1
2016	2,882,324	1.1	3,048,949	1.1	3,503,722	1.3
2017	3,106,336	1.1	2,995,198	1.1	3,589,439	1.3
2018	3,254,253	1.2	3,055,002	1.1	3,893,095	1.4
2019	3,059,063	1.1	2,878,363	1.0	3,673,646	1.3
2020	2,599,624	0.9	2,520,456	0.9	3,125,905	1.1
2021	2,734,703	1.0	2,519,805	0.9	3,065,934	1.1

## 5.2 Step-by-Step Example of OVAM

This example uses 2021 violent crime as an example to demonstrate the calculation steps of the OVAM for estimating prevalence. This same approach can be applied to households and property crimes, using household weight (WGTHHCY) in place of person weight (WGTPERCY).

OVAM adjusts weights as follows:

- For persons victimized once during the year, the sum of the victimization weights equals the sum of the prevalence weights.
- For all persons, the sum of the prevalence weights equals the sum of person weights.

The current method for estimating prevalence uses WGTPERCY, but this method creates a new weight for prevalence rates, PREV\_WGT, which is calculated in three steps beginning with WGTPERCY and WGTVICCY.

### 5.2.1. Initial Values (PREV\_WGT<sub>0</sub>)

The initial values of PREV\_WGT (PREV\_WGT<sub>0</sub>) are assigned using either WGTVICCY or WGTPERCY, depending on whether a person had one or two interviews during the year and whether they reported a violent incident at either or both. The incident weights (WGTVICCY) are divided by 2 to change from a 6-month weight to an annual weight. **Table 13** displays the sums of WGTPERCY (current method) and initial PREV\_WGT<sub>0</sub> by Interview/Incident group.

#### Interview/Incident Groups

Group	Criteria	Initial PREV_WGT
1	No violent crime reported	$PREV\_WGT_0 = WGTPERCY$
2	One interview, violent incident reported	$PREV\_WGT_0 = WGTVICCY / 2$
3	Two interviews, violent incident reported in only one	$PREV\_WGT_0 = WGTVICCY / 2$ of the violent incident, assigned to both interviews
4	Two interviews, violent incident reported in both	$PREV\_WGT_0 = WGTVICCY / 2$ for each interview, independently

**Table 13. 2021 WGTPERCY and PREV\_WGT<sub>0</sub> by Interview/Incident Group**

<i>Group</i>	$\Sigma$ <i>WGTPERCY</i>	$\Sigma$ <i>PREV_WGT<sub>0</sub></i>
1	276,453,869	276,453,869
2	949,662	750,047
3	1,694,416	1,495,786
4	90,625	80,164
Total	279,188,572	278,779,866

### 5.2.2 Calibration 1 (PREV\_WGT<sub>1</sub>)

In the second step, PREV\_WGT<sub>0</sub> is calibrated so that the sum of PREV\_WGT for persons with just one victimization in the year matches the sum of WGTVICCY for persons with just one victimization. This adjustment is based on persons with a victimization in only one period in the year but is applied to all persons with any victimizations. The expectation for this adjustment is that it will inflate the weights to account for persons who may have been victims but were not measured because of having only one interview in the year. For persons with no violent crime reported, no adjustment is made and PREV\_WGT<sub>1</sub> = PREV\_WGT<sub>0</sub>.

For all persons reporting any violent incident during the year, PREV\_WGT is adjusted using the following formula:

$$PREV\_WGT_1 = (PREV\_WGT_0) * \frac{\Sigma WGTVICCY \times I_{1\_VIC}}{\Sigma PREV\_WGT_0 \times I_{1\_VIC}}$$

$$= (PREV\_WGT_0) * \frac{2,574,066}{1,952,836} = (PREV\_WGT_0) * 1.31812$$

where  $I_{1\_VIC}$  is an indicator that the respondent reported one victimization in the year. **Table 14** confirms that the sums of PREV\_WGT and WGTVICCY are equal for persons experiencing one victimization. Note that it also increases the sum for those with more than one victimization compared to PREV\_WGT<sub>0</sub>.

**Table 14. 2021 PREV\_WGT Before and After the First Calibration**

	$\Sigma$ <i>WGTVICCY</i>	$\Sigma$ <i>PREV_WGT<sub>0</sub></i>	$\Sigma$ <i>PREV_WGT<sub>1</sub></i>
Persons with one victimization	2,574,066	1,952,836	2,574,066
Persons with more than one victimization	582,141	373,160	491,869

### 5.2.3 Calibration 2 (Final PREV\_WGT)

The third step is to calibrate PREV\_WGT<sub>1</sub> so that the sum of PREV\_WGT for all persons equals the sum of WGTPERCY for all persons. This adjustment is applied only to people who had no victimizations in the year. The following formula achieves this objective:

$$PREV\_WGT = (PREV\_WGT_1) * \frac{\sum WGTPERCY - (\sum PREV\_WGT_1 \times I_{VIC})}{\sum PREV\_WGT_1 \times I_{0\_VIC}}$$

$$= (PREV\_WGT_1) * \frac{279,188,572 - 3,065,935}{276,453,869} = (PREV\_WGT_1) * 0.99880$$

where  $I_{VIC}$  is an indicator for whether at least one victimization was reported in one or both interviews during the year and  $I_{0\_VIC}$  is an indicator that the respondent did not report any victimization during the year. **Table 15** confirms equal PREV\_WGT and WGTPERCY for all persons and the relationship between WGTVICCY and PREV\_WGT from Step 2 is unchanged.

**Table 15. 2021 Final PREV\_WGT vs WGTPERCY and WGTVICCY**

	$\Sigma$ WGTPERCY	$\Sigma$ WGTVICCY	$\Sigma$ PREV_WGT
All persons	279,188,573	3,156,207	279,188,573
One victimization	2,290,813	2,574,066	2,574,066
More than one victimization	443,890	582,141	443,890

### 5.2.4 Summary

For 2021, the current method using WGTPERCY estimates 2,734,703 victims with a prevalence rate of 0.98%. Using the OVAM PREV\_WGT, the estimates increase to 3,065,934 victims and a prevalence rate of 1.10%. **Table 16** displays the estimates at each step in the calculations of the new PREV\_WGT and confirms again that the overall population estimate remains unchanged from the current method.

**Table 16. 2021 Population, Victims, and Prevalence**

<i>Weight</i>	<i>Population</i>	<i>Victims</i>	<i>Prevalence (%)</i>
WGTPERCY (current method)	279,188,573	2,734,703	0.98
WGT_PREV <sub>0</sub>	278,779,866	2,325,997	0.83
WGT_PREV <sub>1</sub>	279,519,804	3,065,934	1.10
WGT_PREV (OVAM)	279,188,573	3,065,934	1.10

### 5.3 Step-by-Step Example of OIAM

This example uses 2021 as an example to demonstrate the calculation of the OIAM and BF for prevalence.

Group	Response Pattern	Period 1 Victimization	Period 2 Victimization	Annual Victimization	Estimated Cases (sum WGTPERCY)
1	P1 only	1	Unknown	1	387,251
2	P1 only	0	Unknown	Unknown	55,477,263
3	P1 and P2	1	1	1	90,625
4	P1 and P2	1	0	1	880,980
5	P1 and P2	0	1	1	813,437
6	P1 and P2	0	0	0	172,580,175
7	P2 only	Unknown	1	1	562,411
8	P2 only	Unknown	0	Unknown	48,396,432
Total					279,188,573

The current method of estimating the number of victims sums Groups 1, 3, 4, 5, and 7 and estimates 2,734,703 victims. Then, the prevalence rate is estimated as  $2,734,703/279,188,573 * 100 = 0.98\%$ .

The OIAM estimates the proportion of people who would be victims if they had two interviews, given they have no victimization in one period, and then uses this to estimate a larger total.

$$\hat{p}_2 = \frac{\sum w_i I_i(\text{Group 5})}{\sum w_i I_i(\text{Group 5 or 6})} = \frac{813,437}{173,393,611} = 0.47\%$$

$$\hat{p}_8 = \frac{\sum w_i I_i(\text{Group 4})}{\sum w_i I_i(\text{Group 4 or 6})} = \frac{880,980}{173,461,154} = 0.51\%$$

Then, using those proportions, the number of people who would have been victims in Group 2 and Group 8 if they had been interviewed in the other period to get a new total estimate is estimated.

$$\begin{aligned} \hat{T}_{unbounded} &= \sum w_i I_i(\text{Group 1, 3, 4, 5, or 7}) + \hat{p}_2 \sum w_i I_i(\text{Group 2}) + \hat{p}_8 \sum w_i I_i(\text{Group 8}) \\ &= 2,734,703 + 0.47\% * 55,477,263 + 0.51\% * 48,396,432 \\ &= 3,240,759 \end{aligned}$$

The OIAM is then calculated as the ratio of this adjusted total and the original total:

$$OIAM = \frac{\hat{T}_{unbounded}}{T_{current}} = \frac{3,240,759}{2,734,703} = 1.1851$$

An intermediate weight,  $PREV\_WGT_0$ , is calculated for each person.  $PREV\_WGT_0 = WGTPERCY$  if the person is not a victim in the year and  $PREV\_WGT_0 = WGTPERCY * OIAM$  if the person is a victim in the year. One can then use this weight to calculate a victimization rate. Note that  $WGTPERCY$  is no longer used in the denominator for the rate; instead, it is the sum of  $PREV\_WGT_0$ .

For each TIS, a prevalence rate is estimated using the  $PREV\_WGT_0$  to then calculate the bounding factor.

$$BF = \frac{\sum_{t=2}^7 \hat{r}_{unbounded}}{6\hat{r}_{unbounded}}$$

For 2021, the following rates were calculated using  $PREV\_WGT_0$  in each TIS:

TIS	1	2	3	4	5	6	7	Mean 2-7
Rate	0.0168	0.0138	0.0090	0.0065	0.0070	0.0073	0.0053	0.0082

Then the bounding factor is

$$BF = \frac{\sum_{t=2}^7 \hat{r}_{unbounded}}{6\hat{r}_{unbounded}} = \frac{0.0082}{0.0168} = 0.4860$$

This bounding factor is applied only to TIS-1 cases for people who reported victimizations in the year, so  $BF = 1$  if it is not a TIS-1 case or the person is not a victim.

$PREV\_WGT_1$  is calculated for each person as follows:

- If the person is not a victim,  $PREV\_WGT_1 = WGTPERCY$
- If the person is a victim and not in TIS-1,  $PREV\_WGT_1 = WGTPERCY * OIAM$
- If the person is a victim and in TIS-1,  $PREV\_WGT_1 = WGTPERCY * OIAM * BF$

At this point, the sum of  $PREV\_WGT_1$  for the respondents is not the same as the sum of  $WGTPERCY$ , so a final calibration step is applied to adjust the weights of non-victims such that the entire sum is the same as the sum of  $WGTPERCY$ . The  $CAL\_ADJ$  is calculated as follows:

$$\begin{aligned} CAL\_ADJ &= \frac{\sum WGTPERCY \text{ (all persons)} - \sum PREV\_WGT_1 \text{ (victimized persons)}}{\sum PREV\_WGT_1 \text{ (non-victimized persons)}} \\ &= \frac{279,188,573 - 2,519,805}{276,453,869} \\ &= 1.0008 \end{aligned}$$

Then  $PREV\_WGT_2$ , the final prevalence weight is calculated as follows:

- If the person is not a victim,  $PREV\_WGT_2 = WGTPERCY * CAL\_ADJ = WGTPERCY * 1.0008$



- If the person is a victim and not in TIS-1,  $PREV\_WGT_2 = WGTPERCY * OIAM = WGTPERCY * 1.1851$
- If the person is a victim and in TIS-1,  $PREV\_WGT_2 = WGTPERCY * OIAM * BF = WGTPERCY * 1.1851 * 0.4860$

Then the total number of victims and the prevalence rate are calculated using this new weight. For 2021, this is 2,519,805 victims with a population estimate of 279,188,573 and a prevalence rate of 0.90% compared with a prevalence rate of 0.98% under the current method.

The OIAM is a constant, so the intermediate  $PREV\_WGT_0$  is not interesting to look at by TIS, but the details by TIS for  $PREV\_WGT_1$  and  $PREV\_WGT_2$  are provided in **Table 17**. For TIS-1, the number of victims is less, whereas in other TISs, the estimated number of victims is higher. Note that the population totals are the same using  $WGTPERCY$  and  $PREV\_WGT_2$  because of the calibration step.

**Table 17. Population and Victims by TIS Calculations**

TIS	WGTPERCY		PREV_WGT1		PREV_WGT2	
	Population	Victims	Population	Victims	Population	Victims
1	83,344,585	1,183,583	82,842,653	681,650	82,906,520	681,650
2	62,440,858	728,396	62,575,648	863,186	62,623,619	863,186
3	36,706,316	280,533	36,758,228	332,446	36,786,544	332,446
4	30,119,546	164,694	30,150,023	195,171	30,173,308	195,171
5	28,420,237	167,879	28,451,303	198,945	28,473,265	198,945
6	22,560,763	139,632	22,586,602	165,470	22,604,031	165,470
7	15,596,267	69,986	15,609,218	82,937	15,621,287	82,937
Total	279,188,573	2,734,703	278,973,674	2,519,805	279,188,573	2,519,805



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## Chapter 6: Conclusions

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The research into alternative methods for estimating prevalence rates for the NCVS identified two viable options to the current methodology used by BJS. The key findings are as follows:

- Both alternative methods produce larger prevalence rates than the current method prior to 2015, with the OVAM method consistently producing the highest rates. After 2015, the rates from the OIAM method are similar and sometimes slightly lower than the current method.
- The alternative methods require the creation of a new weight that is specifically for prevalence rate estimation. These weights are complicated to produce, but both can be programmed using standard statistical software. Additionally, once created, the process of estimating the prevalence rates is similar to the current method.
- The two alternative methods focus on different priorities BJS has for prevalence rate estimation. The OVAM focuses on ensuring that single-victimization respondents represent only one victim in the prevalence rate. The OIAM focuses on accounting for persons with only one interview during the year and on creating a prevalence-specific bounding adjustment.
- A hybrid method that incorporates the best aspects of the OVAM and OIAM is not possible because the last step in the OVAM cancels out the OIAM adjustments, leading to prevalence estimates that are equal to those produced via the OVAM.

Given the key findings, *RTI recommends BJS transitions to calculating prevalence rates using the OVAM rather than the current method and instead of the OIAM.* We recommend the OVAM over the other methods considered for the following reasons:

- The OVAM produces weights that are more appropriate for the estimation of a prevalence rate. Specifically, victims with only one victimization only represent single victim persons in the estimation of prevalence. This is not the case with the current method or the OIAM.
- The OVAM produces the highest prevalence rate of the methods considered. While the true prevalence rate is unknown, due to the design of the NCVS (i.e., the focus on incident rates), it is likely that the prevalence rate is being underestimated. While both the OVAM and OIAM result in higher prevalence rates compared to the current method, the higher rate produced by the OVAM is likely more accurate because of how it treats single and multi-victim persons in the estimation of prevalence.



## Appendix A: Tables

**Table A-1. Estimated Prevalence Rates**

Year	Prevalence Rate (%)					
	Violent			Property		
	Current Method (WGTPERCY)	OVAM	OIAM	Current Method (WGTHHCY)	OVAM	OIAM
2007	1.3	1.7	1.5	9.9	11.4	11.1
2008	1.3	1.6	1.5	9.5	10.7	10.4
2009	1.2	1.4	1.3	9.2	10.2	10.0
2010	1.1	1.3	1.2	8.9	9.8	9.8
2011	1.2	1.4	1.4	9.1	10.2	10.6
2012	1.4	1.6	1.5	10.4	11.6	11.4
2013	1.2	1.4	1.3	9.0	10.0	9.9
2014	1.1	1.3	1.2	8.0	8.9	8.7
2015	1.0	1.1	0.9	7.6	8.4	8.3
2016	1.1	1.3	1.1	7.4	9.0	9.0
2017	1.1	1.3	1.1	7.4	8.3	8.2
2018	1.2	1.4	1.1	7.3	8.2	8.0
2019	1.1	1.3	1.0	6.8	7.6	7.4
2020	0.9	1.1	0.9	6.2	7.1	6.9
2021	1.0	1.1	0.9	6.3	6.8	7.0

Table A-2. Estimated Prevalence Rates – Standard Errors

Year	Prevalence Rate (%)					
	Violent			Property		
	Current Method (WGTPERCY)	OVAM	OIAM	Current Method (WGTHHCY)	OVAM	OIAM
2007	0.05	0.07	0.06	0.16	0.19	0.18
2008	0.05	0.06	0.05	0.20	0.23	0.22
2009	0.05	0.06	0.05	0.19	0.21	0.20
2010	0.05	0.06	0.05	0.17	0.19	0.19
2011	0.04	0.06	0.05	0.20	0.23	0.23
2012	0.05	0.06	0.05	0.18	0.20	0.19
2013	0.04	0.05	0.04	0.16	0.17	0.17
2014	0.04	0.05	0.05	0.16	0.18	0.18
2015	0.04	0.05	0.04	0.17	0.18	0.18
2016 <sup>a</sup>	0.04	0.05	0.04	0.14	0.17	0.17
2017	0.04	0.05	0.04	0.12	0.14	0.14
2018	0.04	0.05	0.04	0.12	0.13	0.13
2019	0.04	0.04	0.04	0.12	0.13	0.13
2020	0.04	0.05	0.04	0.12	0.14	0.14
2021	0.03	0.04	0.03	0.11	0.12	0.12

<sup>a</sup> In all years except 2016, the standard errors were calculated using TSL. For 2016, BRR weights were constructed using the publicly released replicate weights. For OIAM, each WGTPERCY replicate weight was multiplied by the ratio of the OIAM weight to the WGTPERCY to create OIAM replicates. Similarly, for OVAM, each WGTHHCY replicate weight was multiplied by the ratio of the OVAM weight to the WGTPERCY to create OVAM replicates. This was similarly done with WGTHHCY for property rates.

**Table A-3. Estimated Number of Violent Crime Victims**

Year	Population (Persons Age 12+)	Number of Violent Crime Victims		
		Current Method (WGTPERCY)	OVAM	OIAM
2007	250,344,870	3,308,009	4,214,134	3,760,262
2008	252,242,523	3,298,915	4,027,932	3,683,095
2009	254,105,607	2,978,166	3,674,792	3,340,446
2010	255,961,936	2,753,159	3,270,651	3,062,339
2011	257,542,238	3,089,720	3,700,194	3,612,431
2012	261,996,322	3,575,902	4,309,904	3,983,391
2013	264,411,702	3,041,167	3,663,619	3,358,287
2014	266,665,162	2,948,537	3,402,069	3,210,876
2015	269,526,470	2,650,665	3,077,312	2,439,110
2016	272,204,185	2,882,324	3,503,722	3,048,949
2017	272,468,482	3,106,336	3,589,439	2,995,198
2018	275,325,387	3,254,253	3,893,095	3,055,002
2019	276,872,468	3,059,063	3,673,646	2,878,363
2020	278,082,265	2,599,624	3,125,905	2,520,456
2021	279,188,573	2,734,703	3,065,934	2,519,805

**Table A-4. Estimated Number of Property Crime Victims**

Year	Population (Households)	Number of Property Crime Victims		
		Current Method (WGTHCY )	OVAM	OIAM
2007	119,503,534	11,857,080	13,616,656	13,227,968
2008	121,141,058	11,565,959	12,948,829	12,647,445
2009	122,327,660	11,230,348	12,492,921	12,224,935
2010	122,885,157	10,966,403	12,070,055	12,067,182
2011	123,038,566	11,236,741	12,571,251	13,004,844
2012	125,920,476	13,111,934	14,607,609	14,401,124
2013	127,622,317	11,531,422	12,801,717	12,613,407
2014	129,492,743	10,352,525	11,545,992	11,329,091
2015	131,962,257	10,030,505	11,099,206	10,966,854
2016	133,365,274	9,825,064	11,942,458	11,957,533
2017	123,085,789	9,145,690	10,202,681	10,117,253
2018	124,824,664	9,080,494	10,266,779	10,036,646
2019	126,433,889	8,545,774	9,682,531	9,350,860
2020	127,945,770	7,915,497	9,086,231	8,799,913
2021	129,319,232	8,087,073	8,812,621	9,037,821



**Table A-5. Estimated Number of Violent Crime Victims – Standard Errors**

Year	Number of Violent Crime Victims		
	Current Method (WGTPERCY)	OVAM	OIAM
2007	126,892	165,012	145,156
2008	114,895	145,292	129,934
2009	122,033	152,111	137,188
2010	126,713	154,048	141,198
2011	127,676	161,603	150,046
2012	127,219	155,660	141,523
2013	108,609	134,392	121,354
2014	112,101	131,048	122,662
2015	114,796	139,241	113,043
2016	98,610	128,548	109,861
2017	105,403	127,223	105,243
2018	106,453	133,408	108,467
2019	101,966	127,899	100,013
2020	108,881	129,697	108,478
2021	97,722	113,092	96,707

**Table A-6. Estimated Number of Property Crime Victims – Standard Errors**

Year	Number of Property Crime Victims		
	Current method (WGTHHCY Method)	OVAM	OIAM
2007	213,820	246,040	239,451
2008	266,212	306,547	293,079
2009	243,043	276,554	265,044
2010	222,096	250,910	244,965
2011	303,993	363,248	352,653
2012	245,281	278,876	270,314
2013	228,264	255,427	248,624
2014	230,653	264,009	253,332
2015	243,226	274,974	267,145
2016	188,207	235,836	228,295
2017	166,394	193,191	185,646
2018	169,072	191,532	186,197
2019	163,275	186,788	179,297
2020	176,573	208,025	196,705
2021	153,085	173,520	172,400

**Table A-7. Estimated Number of Violent Crime Victims by Number of Victimization**

	One Victimization in Year				Two or More Victimations in Year			
	Violent Victimations	Number of Violent Crime Victims			Violent Victimations	Number of Violent Crime Victims		
		Current Method (WGTPERCY)	OVAM	OIAM		Current Method (WGTPERCY)	OVAM	OIAM
2007	3,325,576	2,608,954	3,325,576	2,965,649	3,488,607	699,055	888,558	794,613
2008	3,260,296	2,663,474	3,260,296	2,978,165	3,133,174	635,440	767,635	704,930
2009	3,045,669	2,468,469	3,045,669	2,768,861	2,623,568	509,697	629,123	571,585
2010	2,708,825	2,274,895	2,708,825	2,531,082	2,227,158	478,263	561,826	531,256
2011	3,018,546	2,493,279	3,018,546	2,919,119	2,793,976	596,440	681,648	693,312
2012	3,494,155	2,890,534	3,494,155	3,222,299	3,348,438	685,368	815,749	761,092
2013	2,933,785	2,415,948	2,933,785	2,677,118	3,192,639	625,218	729,834	681,168
2014	2,768,247	2,383,404	2,768,247	2,603,658	2,591,323	565,133	633,822	607,218
2015	2,504,221	2,151,836	2,504,221	1,991,196	2,502,394	498,829	573,091	447,914
2016	2,835,253	2,311,904	2,835,253	2,458,254	2,518,563	570,419	668,469	590,696
2017	2,882,995	2,495,047	2,882,995	2,421,368	2,729,672	611,289	706,444	573,830
2018	3,112,518	2,597,184	3,112,518	2,462,667	3,272,997	657,069	780,577	592,335
2019	2,935,778	2,445,009	2,935,778	2,306,975	2,877,631	614,055	737,868	571,388
2020	2,584,197	2,127,638	2,584,197	2,085,287	1,973,957	471,986	541,708	435,170
2021	2,574,066	2,290,813	2,574,066	2,122,353	2,024,240	443,890	491,869	397,452

**Table A-8. Estimated Number of Property Crime Victims by Number of Victimization**

	One Victimization in Year				Two or More Victimations in Year			
	Property Victimations	Number of Property Crime Victims			Property Victimations	Number of Property Crime Victims		
		Current Method (WGTHHCY)	OVAM	OIAM		Current Method (WGTHHCY)	OVAM	OIAM
2007	10,783,032	9,361,387	10,783,032	10,453,454	7,733,402	2,495,693	2,833,624	2,774,514
2008	10,528,820	9,390,576	10,528,820	10,273,179	6,748,838	2,175,383	2,420,009	2,374,266
2009	10,205,724	9,153,248	10,205,724	9,969,947	6,017,252	2,077,100	2,287,197	2,254,988
2010	9,969,372	9,034,717	9,969,372	9,952,408	5,442,238	1,931,686	2,100,683	2,114,774
2011	10,192,509	9,097,363	10,192,509	10,529,678	6,870,639	2,139,378	2,378,742	2,475,166
2012	11,597,871	10,424,090	11,597,871	11,447,296	8,025,106	2,687,845	3,009,738	2,953,828
2013	10,449,363	9,385,507	10,449,363	10,276,786	6,324,725	2,145,915	2,352,354	2,336,621
2014	9,353,117	8,387,717	9,353,117	9,176,182	5,935,350	1,964,808	2,192,875	2,152,909
2015	9,082,074	8,182,072	9,082,074	8,954,791	5,528,968	1,848,433	2,017,132	2,012,063
2016	9,567,782	7,909,423	9,567,782	9,663,034	6,247,531	1,915,640	2,374,676	2,294,499
2017	8,243,582	7,355,960	8,243,582	8,151,929	5,096,634	1,789,730	1,959,099	1,965,324
2018	8,391,313	7,415,343	8,391,313	8,205,950	5,111,524	1,665,152	1,875,467	1,830,697
2019	7,906,777	6,962,494	7,906,777	7,628,814	4,911,218	1,583,280	1,775,754	1,722,046
2020	7,300,606	6,336,177	7,300,606	7,058,569	4,784,559	1,579,321	1,785,625	1,741,344
2021	7,099,060	6,495,318	7,099,060	7,265,176	4,582,996	1,591,755	1,713,561	1,772,645