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Displaying Violent Crime Trends Using Estimates from the National Crime Victimization Survey

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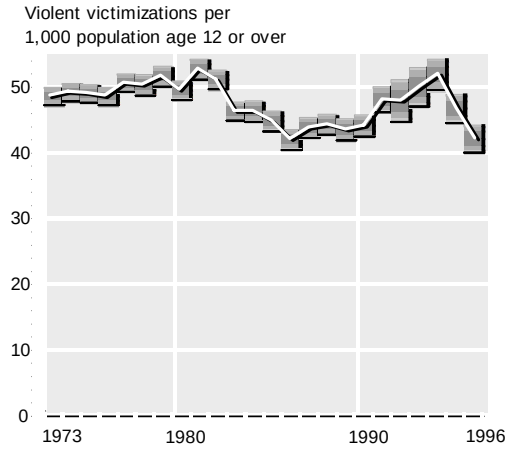
Highlights

Trends in violent victimization, 1973-96



Note: Violent crimes included are rape and sexual assault, robbery, aggravated assault, and simple assault. Data about murder are not included because they do not come from a sample survey where precision can be measured.
Source: Bureau of Justice Statistics, National Crime Victimization Survey, 1973-96.

Intended for an audience that is not trained in statistics, this report presents statistical information in a nontechnical format by using graphical displays of violent crime trends which include the degree of precision of these estimates.

In addition, it discusses —
- sampling
- statistical significance
- precision in the NCVS estimates
- statistical inference
- sample size and precision.

The National Crime Victimization Survey

Initiated in 1972, the National Crime Victimization Survey (NCVS) is an annual sample survey of households in the United States conducted by the Bureau of Justice Statistics (BJS). Currently, 45,000 households are in the sample. All household members age 12 or over, or approximately 94,000 residents, are interviewed twice yearly about incidents in which they were the victims of a crime during the previous 6 months.

The NCVS was created to obtain information on both crimes that are reported to the police and those that are not. It complements the police-reported crime data found in the FBI's Uniform Crime Reports (UCR). Because the UCR and NCVS programs are conducted for different purposes, use different methods, and focus on somewhat different aspects of crime, the information they produce together provides a more comprehensive panorama of the Nation's crime problem than either could produce alone. (For additional information about the NCVS and the UCR, see *The Nation's Two Crime Measures*.)

The NCVS measures property crimes and the violent crimes of rape and sexual assault, robbery, aggravated assault, and simple assault. Because the NCVS data are the result of interviews with victims, the survey does not provide data about the violent crime of murder. The FBI's UCR serves as the source of murder data.

Sampling

Frequently it is not possible or practical to survey everyone in a population, particularly if the population is the Nation as a whole. Sampling, a commonly used technique, gathers information from a portion of a population and develops estimates that can

be generalized to the whole population. Most reputable survey organizations select people to be interviewed at random to ensure that their sample is representative of the entire population.

The entire population need not be examined to get a good reading of its characteristics. A sample from the population would do. For example, to determine if there is enough salt in a well-stirred bowl of soup, a teaspoonful will suffice. Moreover, the sample size is independent of the population size. A single teaspoonful would also suffice to check the salt in a large vat of (well-stirred) soup.

Sampling has a number of advantages:

- Information can be collected at a fraction of the cost of interviewing everyone in the population.
- The time to collect and process the data is reduced.
- The burden of being interviewed is placed on fewer people.

Samples result in estimates of the occurrence of the behavior being measured. By definition, estimates are not exact. The precision of the estimates derived from the sample is determined by two factors. The first is sample size; a larger sample produces greater precision but at a greater cost.

The second is frequency of occurrence of the behavior being measured. For example, election-year polls are sample surveys in which a small sample of voters (usually about 2,000) is asked about their candidate preferences. A sample of this size is adequate for this purpose because most people voice a preference. But a much larger sample is needed to estimate violent crime rates such as that for robbery because, despite their frequency, the vast majority of people do not experience a violent victimization in any 6-month period. Since the sample used to estimate victimizations in the NCVS must be large enough to capture a sufficient number of incidents, the NCVS interviews 94,000 individuals.

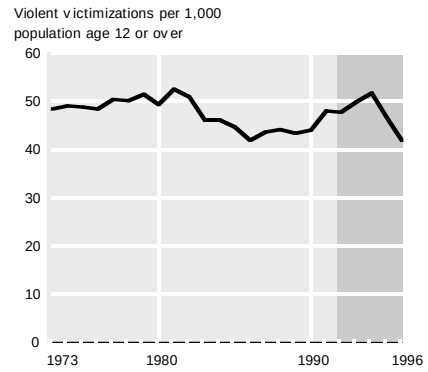
The survey is administered to a random sample of the population, which results in two benefits: first, the collected data will be more likely to reflect the characteristics of the entire population; and second, the precision of the estimates generated by the sample can be calculated, to determine how close they come to the true numbers. This precision is important in comparing two estimates from sampled data. Without knowledge of this precision, conclusions cannot be drawn from sampled data.

Statistical significance

Statistical significance is a standard applied to a comparison of two estimates. For example, surveys of voter preferences are usually reported along with their margin of error, such as "plus or minus 3 percentage points." If the survey results in one candidate receiving 46% of the expected vote and another candidate receiving 44%, it might be reported that "the election is too close to call." Given the 3 percentage point margin of error, a statistician would say that "the difference between the two candidates is **not** *statistically significant*."

For the NCVS, the number of people who report violent victimizations to interviewers can be quite small, which limits our ability to declare year-to-year changes as statistically significant. The figure on this page shows the estimated violent crime victimization rates from 1973 to 1996. In the figure, violent crime appears to be increasing from 1992-93 and 1993-94 then decreasing from 1994-95 and 1995-96. By assessing the precision of these estimates — as shown on the following pages — conclusions can be drawn that there **were** statistically significant decreases from 1994 to 1995 and 1995 to 1996. However, the individual year-to-year increases from 1992 to 1993 and 1993 to 1994 **were not** statistically significant. Therefore, a simple chart of the best estimate like the one on this page is inadequate for drawing conclusions about year-to-year changes.

Trends in violent victimization rates, 1973-96



Note: The violent crimes included are rape and sexual assault, robbery, aggravated assault, and simple assault. The light gray area indicates that because of changes made to the victimization survey, data prior to 1992 are adjusted to make them comparable to data collected under the redesigned methodology. Data for 1995 and beyond are based on collection year (see *Criminal Victimization 1996: Changes 1995-96 with Trends 1993-96*).

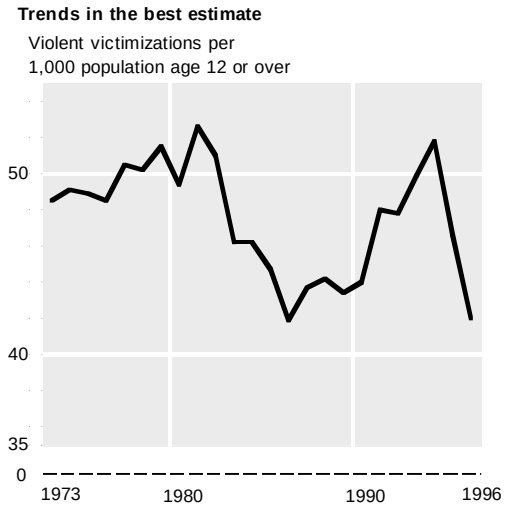
Not all *statistically significant* findings may be *substantively significant* — important in the context of the subject matter studied. For example, in 1996 the daytime theft rate was 39.7 per 1,000 households and the nighttime theft rate was 37.5. The difference between these rates is statistically significant. Substantively, however, there is really little difference since households are about as likely to experience a theft at either time of day.

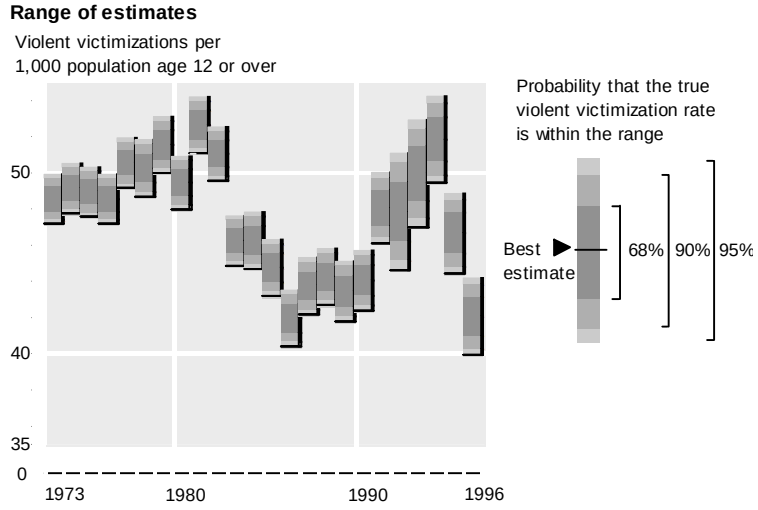
Sometimes people assume that large differences are statistically significant because they would be substantively significant if they were true. For example, the NCVS estimates that the rate for rape and sexual assault dropped considerably, about 17%, from 1995-96. A drop of this magnitude would be *substantively significant* if it were *statistically significant*. However, because it is based on a relatively small number of incidents, it is **not** statistically significant. The data do not provide sufficient evidence that this decrease occurred. (See p. 5.)

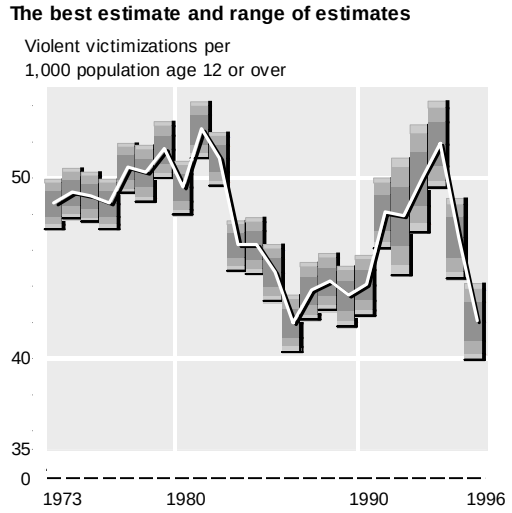
Statistical significance only has meaning when referring to a random sample, although it is often misused with samples that are not random.

How the precision of the estimates affects our assessment of crime trends

Trends in violent victimization, 1973-96







These figures depict both the NCVS estimates of violent crime and their *precision*. They display the same trend data as on page 2 but the scale is changed to highlight the trend line. The first figure depicts only the best estimates based on the NCVS sample and does not reflect the range of possible values where the actual number could fall.

Each bar in the middle figure shows the range within which the true victimization rate is likely to fall for that year. Because the estimates are based on samples, their precision depends on the sample size: the larger the sample, the better the estimate and the smaller the range bars. The samples were larger before 1992, which is why the earlier range bars are shorter than those after 1992. (The 1992 range bar is very large due to the size of the sample that year, as explained on page 8.)

The bars reflect the range within which the true rate is likely to fall. When the bars are shorter, there is a greater likelihood that the true rate will fall close to the best estimate. There is a *considerable* likelihood (68% probability) that the true victimization rate lies within the range represented by the darkest segment of the bar. There is a *greater* likelihood (90%) that the true victimization rate lies within the expanded range represented by the two darkest segments of the bar. The full bar includes the range within which the true value is *highly* likely (95%) to lie.
For example, while the best estimate in 1996 is 42 violent crime victimizations per 1,000 persons age 12 or over, there is a 95% likelihood that the true value of the victimization rate lies between 40 and 44.

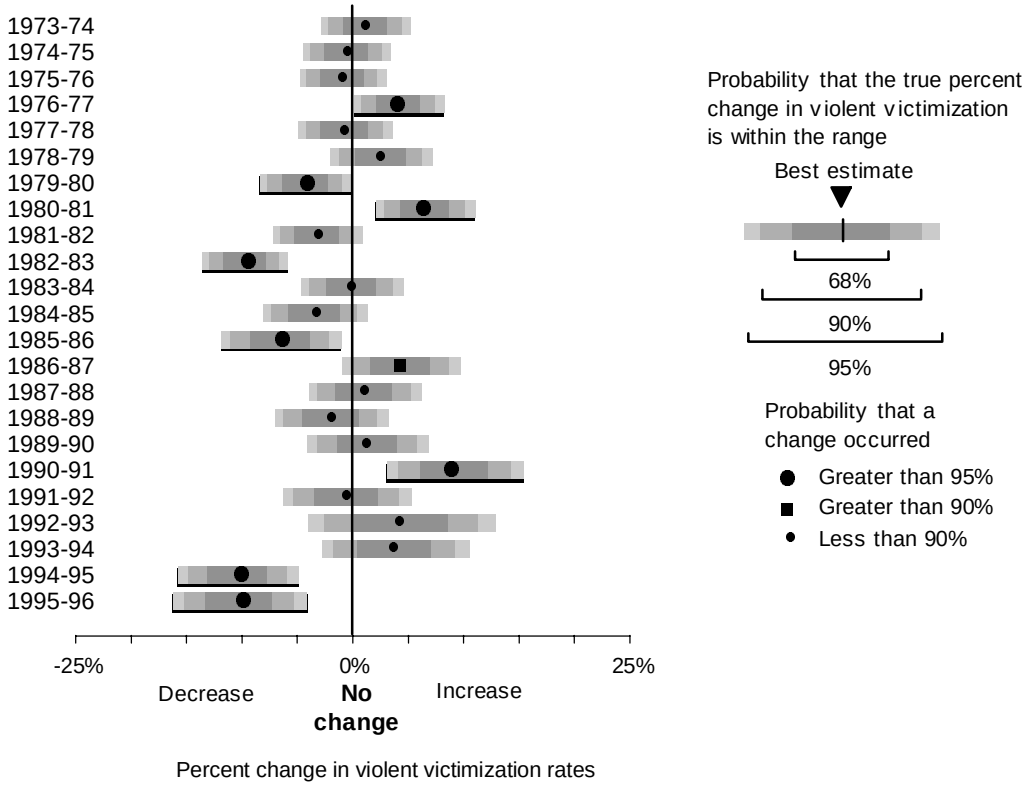
Some year-to-year changes are so large that contiguous bars do not touch (1980-81, 1982-83, 1990-91, 1994-95, and 1995-96), suggesting statistically significant increases and decreases. Where there is a lot of overlap (1973-76 and 1986-90), the year-to-year changes may be too small to be statistically significant.

The bottom figure, which overlays the range bars with the trend line, puts the trend line in context. Even though the victimization rates have a range of possible values, general trends are readily apparent. Violent crime rates increased from the early 1970's to the early 1980's, then fell until around 1986. For several years in the late 1980's, violent crime rates were stable, but increased in the early 1990's and fell after 1994 through 1996.

Source: BJS, National Crime Victimization Survey

Year-to-year changes in victimization rates and their precision

Annual percent change in violent victimization, 1973-96



Source: BJS, National Crime Victimization Survey.

To determine whether a change from year to year is statistically significant, the *precision* of the year-to-year changes must be assessed. The figure above depicts the estimated *annual percent change* in violent crime rates from 1973-74 (the top bar) through 1995-96 (the bottom bar). For example, from 1990 to 1991 violent crime increased by an estimated 9% and from 1995 to 1996 it decreased by an estimated 10%.

The range bars represent the range within which the true annual percent change from year to year is likely to fall. If a bar does not cross the *No change* line, we are reasonably certain a change occurred. If a bar crosses the *No change* line, there is a possibility that there was no change. The degree of certainty depends on how much of the bar crosses the line.

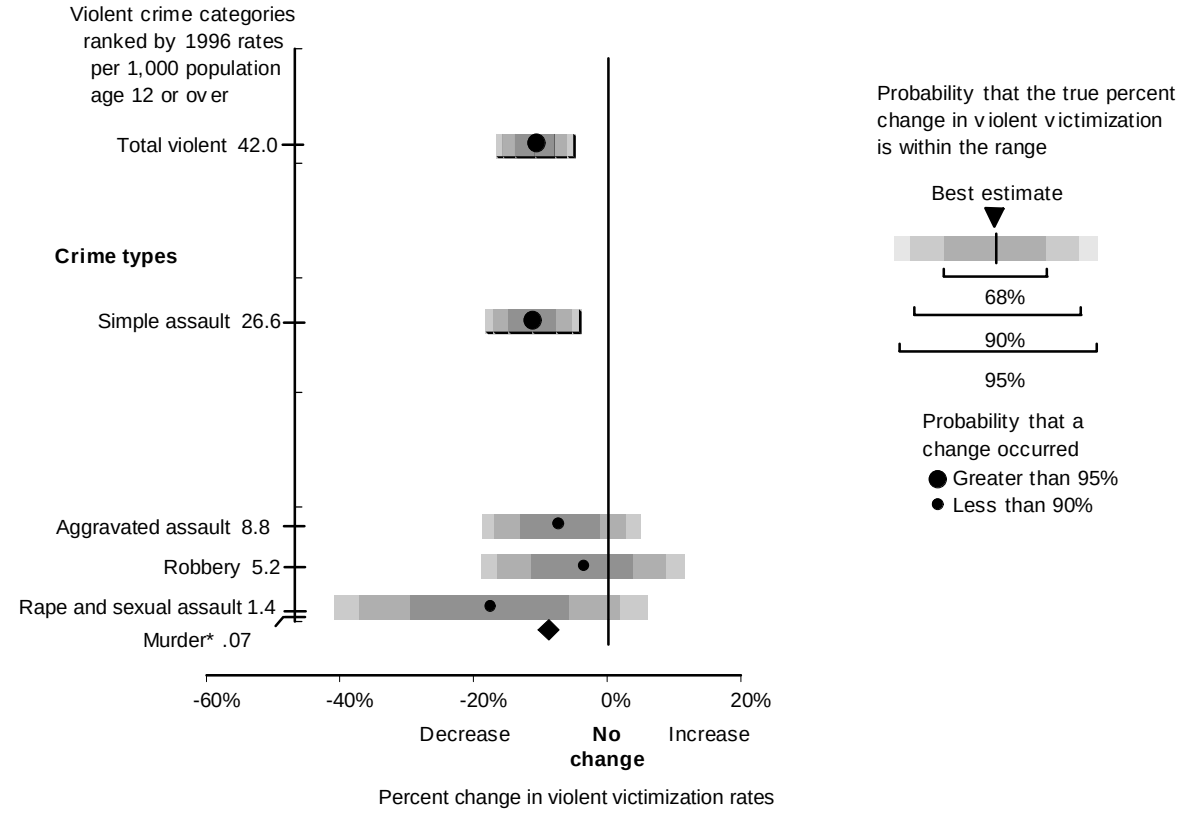
BJS standards, based on general social science practice, specify the degree of certainty that is acceptable with sampled data. For the most part, the BJS standard of confidence is 95%, meaning there is a possibility that the difference may be due to chance but that this possibility is less than 5%. BJS terms findings in the 90% range as *marginal* or as indicating *some evidence* of a change. The 68% range is presented because it is a standard used by statisticians. (See *Appendix I* for further explanation.)

Year-to-year changes in the NCVS violent crime estimates often are not statistically significant. Based on the 95% standard, there was a *statistically significant* change in the violent crime rates for 8 of the 23 periods (1976-77, 1979-80, 1980-81, 1982-83, 1985-86, 1990-91, 1994-95, and 1995-96). To highlight the significant increases and decreases, the range bars are outlined and the estimate is represented by a large dot.

There is *some evidence* that the violent crime rate increased from 1986 to 1987, but the likelihood that this change occurred is not as great as that for the other years because the last segment of the range bar (between 90% and 95%) crosses the *No change* line rather than clearing the line. If the range bar only extended to the 90% level (the two darkest segments of the bar), the bar would not cross the *No change* line. For this year, the estimate is marked with a black square.

The range bars for all of the other periods intersect the *No change* line at a segment representing less than 90% probability (within the two darkest segments). Although a change may have occurred, the probability of such a change does not meet the BJS minimum standard of certainty. Therefore, these changes are **not** *statistically significant* and these estimates are marked with a small dot.

Annual percent change in violent victimization by category, 1995-96



*The change in murder rates is presented as a point because the rates are not derived from sampled data and their precision cannot be calculated. Murder rates are for all ages.

Sources: BJS, National Crime Victimization Survey and FBI, Uniform Crime Reports

The figure above shows the 1995-96 percent change in the victimization rates for the category of total violent crime and the types of crime that comprise it: rape and sexual assault (hereafter referred to as *rape*), aggravated assault, simple assault, robbery, and murder. The crime categories are displayed vertically according to their 1996 rates. The highest rate is total violent crime (sum of all types). Among the crime types, the rate for simple assault is the highest and the rate for murder is the lowest.

As in the figure on page 4, the range bars represent the range within which the true percent change from year to year is likely to fall. Murder is included for comparison. The value for the change in murder rates is given as a point (represented by a diamond) and not a range of estimates, because murder rates are derived from nonsampled data and consequently their precision cannot be calculated.[1]

The range bar for simple assault is clear of the *No change* line, so there is a 95% likelihood that it declined from 1995 to 1996. The best estimate of the decrease was 11%. Since the *No change* line intersects the darker segments of the range bars for rape, robbery, and aggravated assault, the BJS standards of certainty are not met, so it cannot be concluded that a change in these rates occurred from 1995 to 1996.

The length of the range bars varies considerably from crime to crime, depending on the rarity of the event. There are many fewer rapes than simple assaults, and therefore the range bar for rape is much longer than that for simple assault, indicating less certainty in the estimate.

Note that even though the rape rate appears to have decreased the most (over 17%), its range bar crosses the *No change* line inside the 90% region. Therefore, the evidence for a decrease is too weak to accept, because there is sufficient likelihood that there was actually no change — or even a slim possibility of an increase.

With the current rape rate and NCVS sample size, it could not be concluded that there was a year-to-year change in the rape rate unless the change in the rape rate was greater than 23%. Conversely, for a 10% change in the rape rate to be statistically significant, a sample of over 500,000 U.S. residents, more than 5 times the current sample size, would be needed.

[1]To account for the relatively few agencies that do not provide complete data, homicide rates for the Nation as a whole must be estimated. (See page 8.)

Appendix I. Additional information on basic statistical principles

This appendix describes some of the basic principles used in this report. It is intended to be introductory rather than exhaustive.

Calculating precision in sampled data

The ranges represented by the range bars were calculated using methods based on statistical inference. The examples given below are based on a simple random sample, in which every member of the population being studied has the same probability of being in the sample.[2]

Suppose a city had an equal number of males and females. If 64 people are randomly selected, approximately 32 would be expected to be female. It would not be surprising if the sample actually contained between 27 and 37 females, but it would be extremely unlikely if all 64 turned out to be female: that would be equivalent to tossing a coin 64 times and getting tails each time.

A measure of this likelihood is the *standard error* (SE), which reflects how close to the *true* value (in this case, 32) the estimate is expected to be. It is not expected that a sample will always produce that number, but it should be close.

The probability that the estimate will fall within a range can be calculated using standard errors. According to the methods of statistical inference, if several samples were drawn from the population, 68% of them would fall within one standard error of the true value. In this example, with a sample size of 64, the standard error is 4, so 68% of the time the expected number of females in the sample would be 32 ± 4 or between 28 and 36.[3] Another way of putting it is that if 1,000 different samples of size 64 were drawn from the city's population, in about 680 of them the number of females would be between 28 and 36.

In addition, about 90% of the samples would fall within 1.645 standard errors of the true value and that 95% of the samples would fall within 1.96 standard errors of the true value. Social scientists generally report findings based on the probability that the estimate occurred within a range defined as the confidence interval. BJS usually reports two confidence intervals, the 90% and 95% ranges, to reflect its standards of confidence; in this report, we also include the 68% range to show one standard error. The table below gives the ranges in terms of the number of females expected in samples of size 64, with different levels of confidence.

Number of females expected in a sample, for different confidence levels

Population characteristic: 50% female
Sample characteristics:
Size = 64
Expected number of females = 32
Standard error = 4

Confidence level	Number of SEs	Expected range of females in the sample
68%	1.00	28 to 36
90%	1.645	25.42 to 38.58
95%	1.96	24.16 to 39.84

More often the value of interest is not the expected *number of occurrences* but the *percent of occurrences*. In this example the most likely percent of occurrences is 50% of the sample (32 of 64). Sixty-eight percent of the samples are expected to be within 1 standard error (4/64, or 6.25%) of 50%.[4] The following table shows how the expected range in frequency of occurrence varies by confidence level.

Percentage of females expected in the sample, for different confidence levels

Population characteristic: 50% female
Sample characteristics:
Size = 64
Expected percent of females = 50%
Standard error = 6.25%

Confidence level	Number of SEs	Expected range of the percent of females in the sample
68%	1.00	43.75% to 56.25%
90%	1.645	39.72% to 60.28%
95%	1.96	37.75% to 62.25%

This table shows two percentages simultaneously, but they are entirely different: the first column refers to confidence levels expressed as percentages and the third column refers to the percentages of females in the sample. The first line in the table indicates that 68% of the time a random sample is drawn, it is expected to contain between 43.75% and 56.25% females. The table also shows that 95% of such samples will include between 37.75% and 62.25% females; or conversely, that fewer than 5% of the samples will be outside this range.

Usually the sample percentage is close to the actual percentage in the population; the larger the sample the more accurate the estimate. This is as true for measuring criminal victimization as it is for population characteristics. Even though the actual percentage of people who were victims is unknown, a sufficiently large sample will produce a sample percentage quite close to the actual percentage.

The example above shows that, given the frequency of occurrence of a characteristic in the *population*, the frequency of occurrence of a characteristic in the *sample* can be estimated. The more important problem is the *inverse problem* of statistical inference: given the frequency of occurrence of a characteristic in the *sample*, what is the frequency of occurrence of that characteristic in the *population?* The question answered by the NCVS is, given the number of incidents captured by the survey, what is the crime victimization rate for the Nation as a whole?

[2]The NCVS employs a very complex, random stratified multistage cluster sample, but the general principles discussed in this report apply to it as well. See Appendix II of the BJS report, *Criminal Victimization in the United States, 1994*, for a description of the sample construction.

[3]For a simple random sample, the standard error is equal to $\sqrt{Np(1-p)}$ where N is the sample size and p is the probability of the occurrence. In this case SE = $\sqrt{(64 \cdot .5(1-.5))} = 4$.

[4]For a simple random sample, the standard error for a percentage equals $\sqrt{\frac{p(1-p)}{N}}$.

Again, the standard error is used to gauge how close the estimate is to the actual frequency of occurrence. For example, if the people in the sample experienced a rape rate of 1.4 incidents per 1,000 people, then the actual value in the population is close to this, or is at least within the relevant confidence interval. In the 1996 NCVS, about 132 of the 94,000 people sampled experienced a rape, which translates into a rate of 1.4 per 1,000 and a standard error of .14 per 1,000 people.[5] Therefore, the rate of occurrence of rape in the U.S. population is between about 1.26 and 1.54 per 1,000 at the 68% confidence level, as shown below.

Expected rate of rape victimization, for different confidence levels

Sample characteristic:
1.4 rape victims per 1,000
Sample size = 94,000
Expected frequency of rape victims = 1.4 per 1,000
Standard error = .14 per 1,000

Confidence level	Number of SEs	Likely number of rape victims in the population
68%	1.00	1.26 to 1.54 per 1,000
90%	1.645	1.17 to 1.63 per 1,000
95%	1.96	1.13 to 1.67 per 1,000

The same approach can be used in analyzing year-to-year changes. The estimated 1995-96 change in the incidence of rape was a 17.65% reduction (or -17.65%), with a standard error of 11.94%. This would produce the following confidence intervals:

Sample percent change in the rate of rape victimization, for different confidence levels

Sample characteristic:
17.65% reduction in rape rates
Expected change in rape rates = -17.65%
Standard error = 11.94%

Confidence level	Number of SEs	Likely 1995-96 change in rape incidence
68%	1.00	-29.59% to -5.71%
90%	1.645	-37.29% to +1.99%
95%	1.96	-41.05% to +5.75%

[5]The SE is larger than would be expected if the NCVS was a simple random sample; see Appendix II of the BJS report, *Criminal Victimization in the United States, 1994.*

Note that at both 90% and 95% confidence levels, the ranges include zero.[6] Therefore, the possibility that there was no true change cannot be excluded so these results are **not** *statistically significant* at those confidence levels. The apparent reduction of 17.65% in rape incidence may just reflect normal variation between the sample and the population. When the confidence interval does not include zero (as with simple assault in the figure on page 5), the year-to-year change is (statistically) distinguishable from zero and therefore **is** *statistically significant*.

Sample size

In the above examples no mention was made of the size of the population, because the sample size is not based on the size of the population from which it was drawn. Estimating the victimization rate in the United States requires the same sample size as estimating the victimization rate (at the same precision) in, say, Illinois.

To understand why this is so, suppose a jar contained black and white beans that were thoroughly mixed.[7] If a cupful of beans (the sample) was scooped from the jar, close to the same color proportions would be found in the cup as in the jar. Now suppose there was a carload full of thoroughly mixed black and white beans in the same proportions as in the jar. A cupful scooped from the carload would have close to the same color proportions as the carload, and the proportions of the two cups would be expected to be equally close to the proportions of their "parent" populations.

In other words, the size of the population does not affect the proportions in the cup, as long as the beans are thoroughly mixed. Randomly sampling people throughout the country is the logical equivalent of thoroughly mixing the beans; since people around the country cannot be "mixed" to distribute all different types of people according to the needs of the survey, the survey "moves around" to accomplish the same objective.

If the size of the sample is close to the size of the population, the precision improves. For example, suppose a sample of 94,000 (as for the NCVS) is used, but the city being sampled has a population of 94,000 as compared to the 280 million population of the United States. In this case, the sample's victimization rate would be precisely the city's true victimization rate, and the standard error would be 0 (perfect precision). Most samples are only a small fraction of the population. The standard error starts to shrink when that fraction approaches 20% of the population.[8]

The NCVS sample size is sufficiently large to permit a limited amount of disaggregation, depending on the frequency of the event; the larger the sample size, the larger the number of incidents and the greater the ability to estimate the variation in rate by subcategories. The approximately 132 rape victimizations in the 1996 sample may be adequate to furnish statistically significant differences by race, but is too small to determine whether variation by race and age is statistically significant. For simple assault, however, its rate of 26.6 per 1,000 is based on approximately 2,500 events, which is sufficiently large to estimate variation by sex, race, and age categories.

The effect of the sample size on standard error can be noted in the size of the range bars in the figures on page 3 and in the SEs given in table 1. The SE increased gradually from 1973 to 1991 as a result of decreases in the sample size for budgetary reasons. In 1992, when the NCVS was redesigned, the SE was dramatically larger than in prior years because of the use of a half-sample. For calibration

[6]This is also noted in the figure on the top of page 5, where two of the three segments of the range bar for rape (90% and 95%) cross the *No change* line.

[7]Deming, W. E. "Sample Surveys: The Field." In *The International Encyclopedia of Statistics*, Vol. 2. The Free Press, New York, 1978, pp. 867-885. Cited in Wright, T., "Sampling and Census 2000: The Concepts," *American Scientist*, 86, 3 (May-June 1998), pp. 245-253.

[8]Blalock, H. M., Jr., *Social Statistics*, 2nd Edition, McGraw-Hill, New York, 1972, p. 514.

purposes the old and new surveys were each administered to half the sample; in this way the effect of the redesign on victimization rates could be gauged. The two samples could not be combined, so the estimates were based on that half of the sample given the new survey and are less precise.

Nonsampling error

Sampling is not the only source of error in NCVS data; however, it is the only one whose magnitude can be estimated. Other sources of error in the NCVS include:

- Recall error: Respondents are unable (or may be unwilling) to recall victimizations and report them to survey interviewers.
- Recalling the exact month in which the incident took place: Respondents may be unable to place the incident in the right month (since they are interviewed every 6 months, they may remember not reporting it during the previous interview, but not remember the exact date of its occurrence).
- Misclassification: Some noncriminal incidents may be classified as crimes, and some crimes may be classified as noncrimes (or as other types of crimes).

The NCVS is designed to minimize these types of error. It seeks to reduce recall error by using a relatively short (6-month) recall period, so that incidents would be fresh in the respondents' minds, and by selecting interviewers whose race and ethnicity generally match those of the population in the area where the respondent resides (so that respondents would be more inclined to report accurately). It seeks to reduce misclassification error by performing edit checks on the data and coding procedures and by using quality control procedures such as randomly selecting interviews for callback and verification.

Other types of data collection also have error. For example, the FBI's Uniform Crime Reports (UCR) is a voluntary system and not all jurisdictions report crime data. To provide national estimates of reported crime, the FBI must account for the jurisdictions that did not provide data. They estimate the crime for the nonreporting jurisdictions based on similar jurisdictions that have reported. Since the reporting jurisdictions are likely to have experienced more crime than those that did not report, the estimated crime rate may be biased upward, but the magnitude of this bias is unknown.

Appendix II. Data used in the graphics

Table 1 contains the data used in preparing the figures on pages 1-3. The standard errors (SEs) are calculated using the formulas and procedures described in Appendix II of *Criminal Victimization in the United States 1994*. The data for *B-Value* and ρ (the Greek letter *rho*) are included for archival purposes since they were used in calculating both the SE for the violent crime victimization rate and for its year-to-year change. Note that the procedure for calculating the SE changed in 1993, the year after the NCVS underwent a major change in its collection procedures. Table 2 contains the data (calculated from the data in table 1) used to plot the figure on page 4. Table 3 contains the data used to plot the figure on page 5.

Some of the numbers in these tables may vary from other published numbers because of differing collection periods and the use of summed rather than aggregate data. For the most part, the differences do not affect the conclusions made about the data.

Table 1. NCVS violent crime estimates

						Bounds on confidence levels					
						Lower bound for —			Upper bound for —		
Year	Population, age 12+ (in thousands)	Rate estimate	SE	B-Value	ρ	95%	90%	68%	68%	90%	95%
1973	164,362.9	48.5	0.7	1603		47.13	47.35	47.80	49.20	49.65	49.87
1974	167,058.4	49.1	0.7	1603		47.73	47.95	48.40	49.80	50.25	50.47
1975	169,671.5	48.9	0.7	1603		47.53	47.75	48.20	49.60	50.05	50.27
1976	171,900.5	48.5	0.7	1603		47.13	47.35	47.80	49.20	49.65	49.87
1977	174,092.7	50.5	0.7	1603		49.13	49.35	49.80	51.20	51.65	51.87
1978	176,214.6	50.2	0.8	1986		48.63	48.88	49.40	51.00	51.52	51.77
1979	178,284.5	51.5	0.8	2256		49.93	50.18	50.70	52.30	52.82	53.07
1980	184,324.0	49.4	0.8	2142		47.93	48.17	48.65	50.15	50.63	50.87
1981	186,336.0	52.6	0.8	2073		51.03	51.28	51.80	53.40	53.92	54.17
1982	188,496.6	51.0	0.8	2073		49.53	49.77	50.25	51.75	52.23	52.47
1983	190,504.0	46.2	0.7	2073		44.83	45.05	45.50	46.90	47.35	47.57
1984	191,962.2	46.2	0.8	2318		44.63	44.88	45.40	47.00	47.52	47.77
1985	194,096.7	44.7	0.8	2597		43.13	43.38	43.90	45.50	46.02	46.27
1986	196,160.2	41.9	0.8	3478		40.33	40.58	41.10	42.70	43.22	43.47
1987	197,727.0	43.7	0.8	2755		42.13	42.38	42.90	44.50	45.02	45.27
1988	199,412.5	44.2	0.8	2790		42.63	42.88	43.40	45.00	45.52	45.77
1989	201,375.6	43.4	0.9	2958		41.73	42.00	42.55	44.25	44.80	45.07
1990	203,273.9	44.0	0.9	3196		42.33	42.60	43.15	44.85	45.40	45.67
1991	204,280.1	48.0	1.0	3743		46.04	46.36	47.00	49.00	49.65	49.96
1992	206,414.5	47.8	1.7	4157		44.57	45.09	46.15	49.45	50.51	51.03
1993	210,906.9	49.9	1.5	3253	0.22	46.94	47.41	48.39	51.41	52.39	52.86
1994	213,135.9	51.8	1.2	2008	0.31	49.43	49.81	50.59	53.01	53.79	54.17
1995	215,080.7	46.6	1.1	2008	0.31	44.38	44.74	45.47	47.73	48.46	48.82
1996	217,234.3	42.0	1.1	2096	0.22	39.88	40.22	40.92	43.08	43.78	44.12

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Table 2. Year-to-year changes in violent crime

			Bounds on confidence levels					
			Lower bound for —			Upper bound for —		
Period	Estimated change	Percent SE	95%	90%	68%	68%	90%	95%
1973-74	1.24%	1.97%	-2.62%	-2.00%	-0.73%	3.20%	4.47%	5.09%
1974-75	-0.41%	1.91%	-4.16%	-3.56%	-2.32%	1.51%	2.74%	3.35%
1975-76	-0.82%	1.90%	-4.54%	-3.94%	-2.72%	1.08%	2.31%	2.90%
1976-77	4.12%	1.96%	0.27%	0.89%	2.16%	6.09%	7.36%	7.97%
1977-78	-0.59%	2.06%	-4.62%	-3.98%	-2.65%	1.46%	2.79%	3.44%
1978-79	2.59%	2.24%	-1.79%	-1.09%	0.35%	4.83%	6.27%	6.97%
1979-80	-4.08%	2.02%	-8.04%	-7.41%	-6.10%	-2.05%	-0.75%	-0.11%
1980-81	6.48%	2.17%	2.22%	2.90%	4.30%	8.65%	10.05%	10.74%
1981-82	-3.04%	1.95%	-6.87%	-6.25%	-4.99%	-1.09%	0.17%	0.78%
1982-83	-9.41%	1.88%	-13.09%	-12.50%	-11.29%	-7.53%	-6.32%	-5.73%
1983-84	0.00%	2.24%	-4.38%	-3.68%	-2.24%	2.24%	3.68%	4.38%
1984-85	-3.25%	2.30%	-7.76%	-7.03%	-5.55%	-0.95%	0.54%	1.26%
1985-86	-6.26%	2.63%	-11.42%	-10.59%	-8.90%	-3.63%	-1.93%	-1.11%
1986-87	4.30%	2.61%	-0.82%	0.00%	1.69%	6.91%	8.59%	9.41%
1987-88	1.14%	2.50%	-3.76%	-2.97%	-1.36%	3.64%	5.26%	6.05%
1988-89	-1.81%	2.49%	-6.70%	-5.91%	-4.30%	0.68%	2.29%	3.08%
1989-90	1.38%	2.67%	-3.84%	-3.00%	-1.28%	4.05%	5.77%	6.61%
1990-91	9.09%	3.01%	3.18%	4.13%	6.08%	12.11%	14.05%	15.00%
1991-92	-0.42%	2.83%	-5.95%	-5.06%	-3.24%	2.41%	4.23%	5.12%
1992-93	4.39%	4.14%	-3.72%	-2.41%	0.26%	8.53%	11.20%	12.50%
1993-94	3.81%	3.24%	-2.55%	-1.53%	0.56%	7.05%	9.14%	10.16%
1994-95	-10.04%	2.66%	-15.25%	-14.42%	-12.70%	-7.38%	-5.66%	-4.82%
1995-96	-9.87%	2.97%	-15.69%	-14.75%	-12.84%	-6.90%	-4.99%	-4.05%

Table 3. Changes in violent crime rates, by crime type, 1995-96

	1995 data		1996 data			Percent change 1995-96	
	Rate	SE	Rate	SE	ρ	Percent change	SE of percent change
Total violent	46.6	1.1322	42.0	1.0815	0.22	-9.87%	2.97%
Simple assault	29.9	0.8607	26.6	0.8151	0.18	-11.04%	3.59%
Aggravated assault	9.5	0.4239	8.8	0.4118	0.06	-7.37%	6.03%
Robbery	5.4	0.3009	5.2	0.2994	0.03	-3.70%	7.74%
Rape and sexual assault	1.7	0.1524	1.4	0.1387	0.03	-17.65%	11.94%

	Bounds on confidence levels					
	Lower bound for —			Upper bound for —		
	95%	90%	68%	68%	90%	95%
Total violent	-15.69%	-14.75%	-12.84%	-6.90%	-4.99%	-4.05%
Simple assault	-18.07%	-16.94%	-14.63%	-7.45%	-5.13%	-4.00%
Aggravated assault	-19.19%	-17.29%	-13.40%	-1.34%	2.55%	4.45%
Robbery	-18.88%	-16.44%	-11.45%	4.04%	9.03%	11.47%
Rape and sexual assault	-41.05%	-37.29%	-29.59%	-5.71%	2.00%	5.76%

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