

**EXPLORING DIFFERENCES IN ESTIMATES OF VISITS TO EMERGENCY
ROOMS FOR INJURIES FROM ASSAULTS USING THE NCVS AND NHAMCS**

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Introduction

Researchers seeking to provide a better understanding of crime statistics tend to compare survey-based statistics such as the NCVS with data from police administrative series like the UCR. Because these two types of data collections systems are so different, simple direct comparisons are of little value regarding limitations inherent to a particular data collection system. This chapter explores the NCVS data using a different perspective that compares data from the national crime survey of population with those from a national survey of establishments—the National Hospital Ambulatory Care Survey (NHAMCS). This comparison provides an understanding of how the design, instrumentation and procedures of the NCVS may influence estimates of interpersonal violence, particularly that component of violence resulting in injuries treated in hospital emergency rooms.

The estimates of emergency room visits for injuries due to violence obtained from the NCVS are considerably smaller than those from the NHAMCS. The analyses include a series of adjustments to these estimates that explore the role of features specific to each survey in the observed differences. The household sampling frame employed in the NCVS receives special attention as a potential source of the observed differences. Investigating this source of divergence is particularly important, since many of our major social indicators on the economy and participation in government programs depend upon household surveys. If some population groups are under-represented in the household sampling frame used in Census surveys, and this under-coverage results in underestimates of violence, this finding could have implications for the use of the household frame to estimate the magnitude of other problems that disproportionately affect marginal populations, such as unemployment, poverty, drug abuse and poor health status.

The first section that follows describes the two surveys, but principally the NHAMCS, since the NCVS is described extensively in Chapter 2. The second section presents the unadjusted estimates of the rate of emergency room visits due to violent crime from the two surveys. The third section outlines a series of potential explanations for the observed rate differences and the last section includes a series of adjustments to the rates designed to test the plausibility of the various explanations.

The NHAMCS and the NCVS

The National Center for Health Statistics (NCHS) annually fields a family of surveys designed to measure utilization of health care services in a variety of provider settings. The NHAMCS estimates the level and type of outpatient medical services provided in hospital emergency departments (EDs) and outpatient departments (OPDs) nationally. Fielded for the first time in 1992, the NHAMCS supplements data on ambulatory medical care services provided in physicians' offices collected since 1973 in the National Ambulatory Medical Care Survey (NAMCS). Patients treated in hospital-based ambulatory care settings differ in certain demographic and medical characteristics from patients treated in physicians' offices, and the NHAMCS provides data on this important segment of ambulatory care services (<http://www.cdc.gov/nchs/about/major/ahcd/nhamcsds.htm>).

NHAMCS relies on a national probability sample of visits to EDs and OPDs in general (medical and surgical), short-stay (average length of stay less than 30 days) hospitals (excluding federal, military and Veterans Administration hospitals) located in the 50 states and the District of Columbia. A four-stage probability design samples in the following order from: (1) geographic-based primary sampling units (PSUs consisting of counties, county equivalents or MSAs), (2) hospitals in the selected PSUs, (3) EDs and OPDs in these hospitals, and (4) patient visits to these departments.

The NHAMCS PSUs are the probability subsample of PSUs used in the 1985-94 National Health Interview Surveys. A total of about 1,900 PSUs were stratified by socioeconomic and demographic variables within four geographic regions by MSA or non-MSA status. The selection probability was proportional to PSU size. The final sample includes a fixed panel of 600 hospitals (drawn from about 5,600 hospitals nationally) located in 112 PSUs across the country. A target number of 50 visits to each sampled ED were selected systematically—every n th visit based on the expected number of patients who will be seen in each ED—over a randomly selected 4-week reporting period during the survey year. The data used here include the samples of about 23,000 visits to hospital EDs in each year from 1995 to 1998.

Specially trained hospital staff members implement the visit sampling process and extract the information from the sampled records onto data collection forms. Census field

representatives collect these forms, check them for completeness, and perform various edit checks on the forms and keyed data. Sampling weights and non-response adjustments are applied to produce population estimates of total ED visits in the nation. The ED data include variables to identify injury visits, whether the injury was unintentional, intentionally inflicted in an assault or self-inflicted, and mechanism (weapon type) producing the injury. These variables are the basis for estimating total ED visits for assault injuries.

In contrast, the NCVS is based upon a probability sample of households residing in housing units contained in the address lists emerging from the United States decennial census. Addresses are selected from the list in a multi-stage process described in detail in Chapter 2. The households selected from the lists are visited by Census interviewers and all members of the household twelve years of age and older are interviewed about their violence and theft crime victimization experiences. Interviews are highly structured; all respondents answer the same screener questions and computer-assisted interviewing is employed in some circumstances. Respondents who mention that they were actually attacked in an incident of interpersonal violence are asked about any injuries they sustained and any medical care they received, including whether the individual was treated in a hospital emergency room or an emergency clinic.

If all things were equal between the NCVS and NHAMCS, both surveys would provide similar estimates of the number of assault victims who were treated in hospital EDs. However, there are some important differences in survey methodology, and the estimates from the two surveys differ substantially with almost five-fold more assaults treated in hospital EDs estimated from NHAMCS than from NCVS. Because adjustments can be made to the data to take account of some of the design differences, we can calibrate the contribution of specific methodological differences in the observed disparity in estimates. A series of adjustments that rely on information available in existing data reduce the divergence ratio in half to about 2.5. The analyses below suggest that only a small portion of the difference is accounted for by identifiable differences in survey methodology.

Comparing Estimates from the Surveys

Figure 1 displays national estimates of the number of assault injuries detected by the two annual surveys of crime victims and hospital emergency departments during the period 1995-98. An average annual total of 3.8 million violent injuries were detected by the NCVS and NHAMCS surveys.

(Figure 1 about here)

NCVS injuries are partitioned by whether police are informed or not and whether victims sought medical care in hospital emergency departments. The annual average count of assault injuries reported to the NCVS by victims was over 2.3 million. Victims indicate that police were informed about just over half of these injuries (1.25 million), and victims injured in violent attacks sought care in emergency departments for 376,000 violent injuries. Not surprisingly, police were more likely to be informed about an assault injury when the victim sought medical care (78 percent versus 49 percent, respectively, among ED and non-ED injuries reported to the NCVS; odds ratio=3.68 with 95 percent confidence interval ~ [2.95, 4.59] is significantly > 1.0).

Estimates of the number of violent injuries that are treated in hospital EDs are substantially different in the NCVS and the NHAMCS (Figure 1). The estimate from victim reports to the NCVS is under 400,000 violent injuries treated in EDs annually from 1995 to 1998. Estimates from NHAMCS data for the same period are nearly five times higher at 1.865 million violent injuries treated in EDs annually. If the NHAMCS estimates are taken at face value, the crime victimization survey failed to detect 80 percent—or nearly 1.5 million—of the violent injuries seen in hospital emergency departments.

These results are consistent with other estimates that find large numbers of violent injuries are missing from crime victimization surveys. Relying on several estimates of the expected ratio of nonfatal-to-fatal gunshot injuries, Cook (1985) estimated that from 1973-79 the NCS underestimated nonfatal gunshot injuries by 3-fold. More recently, Rand (1997) compared 1994 NCVS violent injury data with data from a special Study of Injured Victims of Violence (SIVV) fielded as part of the annual National Electronic Injury Surveillance System (NEISS) of injuries treated in hospital emergency departments during the same time period. Rand's study found the SIVV estimated that 1.34 million distinct violent injuries were treated nationally

compared to 0.54 million injuries treated in EDs estimated from violent victimizations using the NCVS data—a ratio of 2.5 between SIVV and NCVS estimates. The more recent data from 1995-98 presented in Figure 1 show a substantially higher 5-fold difference between estimates from the NHAMCS healthcare establishment survey and the NCVS crime victimization survey.¹

All of these findings suggest that the NCVS substantially undercounts victims of violence who incur injuries that result in treatment in hospital emergency rooms or free-standing emergency clinics. An alternate view is that some of the difference is attributable to the NHAMCS over-counting injuries due to violence. This view has some support from data in the Uniform Crime Reports (UCR) and Rand's (1997) SIVV study.

While annual national police data are available from the UCR, these data typically do not distinguish between injuries and non-injuries among violent crimes recorded by police. The Bureau of Justice Statistics (BJS, 2001), however, contrasts police- and NCVS-based estimates of serious violent crimes known to police. The vast majority of these crimes are aggravated assaults that by definition involve weapon use or injury. Figure 2 displays these alternative annual estimates from 1973 to 2000. The two estimates diverge substantially early in the period—NCVS counts of violent offenses known to police are 2.6 times larger than similar UCR counts in 1973—but steadily converge to be virtually identical at 1.25 million serious violent crimes by year 2000.² During the period 1995 to 1998 NCVS counts of serious violent crimes reported to police agreed substantially with UCR data, with NCVS counts just 1.2 times the corresponding police counts in UCR data. The increasing correspondence between NCVS and

¹ The discrepancy increases when inpatient hospital stay data are examined. In 1997, the National Hospital Discharge Survey estimated a total of 280,265 hospital stays for violent injuries (from author analysis: counts presence assault on any of seven diagnoses) and the NCVS estimated 44,449 such stays—a 7-fold undercount of violent injuries that result in inpatient hospital stays.

² This convergence is not due to changes in victim reporting to police. Annual rates of victims reporting violent victimizations to police remained relatively stable in a range from 50 to 60% for almost 30 years in NCVS data. The increase in UCR counts of serious violent crimes seems to be associated with an increase in police recording of victim reports in their count of “founded” crimes reported to the UCR. The proportion of victim-reported serious violent crimes that show up in police data increased steadily from a low of 40% in 1973 to nearly 100% recorded in year 2000. One factor contributing to convergence may be declining tendencies by police to treat violent and potentially violent incidents between family, intimates and acquaintances as private matters that are resolved informally and do not enter official police counts of violent incidents.

UCR data for a subset of similar violent incidents that are found in both data series lends some credibility to NCVS estimates more generally.

(Figure 2 about here)

The SIVV study was based on a supplement to NEISS, which employs a sample of hospital emergency rooms (Rand, 1997). Hospitals are asked to complete forms requesting information from patient records on all injuries that present at emergency rooms during a given period. As noted above, this ED data for year 1994 estimates 1.34 million ED-treated assault injuries nationally compared to an estimated 0.54 million violent injuries treated in emergency care facilities estimated from NCVS data for the same year. While these results support the argument that the NCVS underestimates these violent injuries, the fact that similar data drawn from hospital records produces different estimates (1.34 versus 1.865 million violent injuries treated in hospital emergency rooms) also supports a conclusion that NHAMCS may overestimate ED-treated violent injuries by a modest amount (NHAMCS/SIVV=1.29 compared to a ratio of 4.95 between NHAMCS and NCVS).

Relying only on comparisons of estimated total counts, it is impossible to determine which data series produces the most accurate estimates. The divergence among estimates may be attributable to an underestimate in the NCVS, an overestimate in the NHAMCS, or both. This chapter now turns to the question of why do the NHAMCS and NCVS estimates differ and how can this knowledge inform us about divergence between the NCVS and UCR.

Sources of Divergence between NCVS and NHAMCS

The most likely sources of divergence in the two surveys arise from differences in sample design, survey instrumentation and procedures, as well as the interaction of these differences with changes in the society. Differences in sample design refer to differences in the population of interest, the sampling frame and the method of selection. Instrumentation refers to the questions asked of respondents and the mode by which these questions are conveyed. Procedures include rules governing the interview and the estimation process, for example, rules on respondent selection or the number of callbacks. Rules governing the weighting of data or the treatment of missing data are examples of rules affecting the estimation process.

Interactions between survey designs and societal changes occur when the survey procedures are the same, but society changes in ways that alter the components of emergency treatment of violent injuries that surveys capture. If, for example, more and more schools and workplaces have their own clinics and equivalents of emergency rooms, then the NHAMCS sampling frame will exclude these alternative treatment facilities and exclude any visits to these facilities. However, if respondents to the NCVS regard these facilities as emergency rooms, the treated injuries will be counted in the NCVS. While the survey procedures remained constant, the societal changes would contribute to divergence between the two survey estimates.

Sample Design

One of the major differences between the NCVS and NHAMCS is the sample design. The population that the ED component of NHAMCS seeks to describe is visits to emergency rooms in non-institutional, short stay hospitals (excluding federal, military and Veterans Administration hospitals). The NCVS is designed to represent the population of criminal victimization incidents experienced by the non-institutionalized residential population of the United States. In order to produce estimates for the relevant population, the NHAMCS uses a list of hospitals and clinics in the United States. In the first stage of selection, primary sampling units (PSU) are chosen randomly. Hospitals are selected randomly within these PSUs, and emergency departments are chosen within the hospitals. Finally, patient visits are sampled systematically (every *n*th visit) from the ED records at these sites. The NCVS is also a multi-stage cluster sample, except the sampling frame is households residing in housing units included in the master address list from the decennial census. PSUs are sampled first followed by enumeration districts, census tracts and segments of housing units. The final unit of selection is the household.

These differences in sample design can affect estimates of visits to emergency rooms for treatment of assault injuries when the design results in differential inclusion of these visits. If the household frame, for example, omits marginal populations who have no permanent residence, and if this population is more prone to injuries from assaults, then the NCVS will underestimate ED visits due to assaults.

Instrumentation

The NCVS gathers information in an interview with the respondent in which questions are asked about the respondent's victimization experiences and the consequences of those victimizations, including emergency room visits. The NHAMCS, in contrast, uses data collection forms that are completed by hospital staff based upon information recorded at the time of the ED visit. These are very different data collection processes that can substantially affect the resulting data. NCVS interviews inquire directly about the victimization experiences and include a number of cuing prompts to remind respondents about potential incidents. ED records, by contrast, primarily reflect concerns about diagnosis and treatment, and so medical practitioners may not inquire about how the patient incurred the injury, and even when they do, the medical record may not include the patient's response. However, cause of injury is an important public health concern, and increasingly widespread requirements to use cause-of-injury e-codes in cases involving injuries increase the salience of cause of injury as an important component of the medical record.

In order for an emergency room visit to be included in the NCVS, the respondent must report being a victim of a crime in which they were attacked and injured. Moreover, they must also indicate that they sought treatment for that injury and that the treatment was administered in a hospital emergency room or a free-standing emergency clinic. If any of these screening events are not reported, then the visit will not be identified in the NCVS.

Perhaps the most difficult determination to be made in the NCVS is that a criminal victimization has occurred. Many events that satisfy the legal definition of an assault are not reported in the survey because they are not stereotypic crimes. Assaults by intimates or siblings, for example, are often considered "private matters" rather than crimes, and they are not reported to the NCVS (Fisher and Cullen, 2000). Similarly, assaults in which the respondent was the initial aggressor may result in an emergency room visit but not be mentioned as a crime in the NCVS. The status of injuries to bystanders who intervene may also be ambiguous. Since these injuries are collateral to victim injuries, some individuals who are injured during a crime may not consider themselves as victims because they were not the initial focus of the assault. All of these

circumstances would lead the NCVS to underestimate the number of violence-related injuries treated in the ED.

Another difference is that the NCVS relies on the respondent to identify the type of facility where the victim sought treatment, and this definition may not be consistent with the definition used in the NHAMCS. Since this level of precision is not central to the mission of the NCVS, little cuing or data checks are performed to insure that the facility type is accurate. It is not clear whether this feature of the NCVS would over- or under-estimate the number of visits. Respondents might mistake doctor's offices for emergency rooms or emergency clinics and vice versa.

The NHAMCS instrument also can be a source of estimation discrepancy. The NHAMCS relies almost entirely on the quality of the original hospital records. If the required information was not entered into the medical record at the time of the patient visit, it will not be included in the data. Because contextual features of an injury are generally not essential to medical diagnosis or treatment, information about the circumstances surrounding the injury will often be missing from medical records. The problems with relying on medical records are evident in the large amount of missing data for some variables. For example, the NHAMCS data collection form for 1995 and 1996 includes a variable for relationship between victims and offenders in an assault, but is missing in 50 percent of assault injuries those years. This variable was dropped from the data collection form in 1997-98. Other relevant variables are also missing from NHAMCS data for all study years 1995-98, including the place where injury occurred (missing in 44 percent of assault injuries) and injury type (missing in 29 percent of assault injuries).³

Assault injuries in NHAMCS data are identified by external cause of injury "e-codes" derived from information in the medical record. Since 1992 providers who seek reimbursement for medical services from publicly funded Medicare and Medicaid programs have been required to supply e-codes for all treated injuries, and these codes are rapidly becoming a standard part of medical records. These codes identify intent or manner of injury (accident, self-inflicted or

³ Place where an injury occurred refers to type of location and includes categories like inside a residence, at school, or on a street/highway. Injury type includes categories like penetrating injury, internal injury, spinal chord or nerve damage, orthopedic injuries and superficial injuries.

intentional assault) and mechanism (e.g., firearm, cutting, unarmed brawl) in injury cases. E-codes are well recorded in NHAMCS data for the study years 1995-98—only 11.2 percent of injury visits to emergency rooms either fail to include any e-codes (0.6 percent) or use e-codes that do not identify intent (10.6 percent).⁴

While information is not readily available to quantitatively assess the accuracy of intent coding in the available e-codes, this coding follows well defined protocols. Cause of injury is coded using the Supplementary Classification of External Causes of Injury and Poisoning (E-codes) from the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM). The documentation from the Public Health Service and Health Care Financing Administration provides clear protocols for how the hospital staff determines whether an injury was the result of an assault. This coding protocol is routinely used by hospital staffs as part of the medical record.

The criteria for assault in NHAMCS may differ from those used in the NCVS. If the hospital staffs who abstract the data do not distinguish between thwarted offenders and victims among patients, or between intended and unintended injuries, the NHAMCS data will overstate visits due to assault victimizations. On the other hand, if the staff uses a more stringent definition of assault, then this might understate these events. Coding practices of the NHAMCS suggest a reluctance to inappropriately designate an injury as intentional when there is inadequate information in the record. In 1995 and 1996 injuries with undetermined intent were coded as accidents, and in 1997 a new explicit code for undetermined intent was introduced. These injuries of undetermined intent potentially include uncounted assault injuries that would contribute to underestimates of assault visits to EDs in NHAMCS data.

Other differences in instrumentation across the two surveys also can contribute to divergence. The NCVS, for example, employs a special procedure for “series” incidents that involve high volume, repeat victimization. Specifically, when a respondent reports six or more crimes that cannot be dated separately and are similar in their details, the interviewer can treat them as a series incident. Detailed information is collected only for the most recent incident in a series, rather than all of them, and the total number of incidents in the series is recorded (Planty,

⁴ NHAMCS data include another variable that designates intent for the 0.6% of injury visits that do not include specific e-codes.

chapter 6). These incidents are excluded from official counts of victimization published by BJS because of concerns about the accuracy of the number of events in the series. Public use data files include these series incidents as a single incident, but do not include the respondent's report of the number of incidents in the series. Treating series victimizations as single incidents or excluding them from victimization counts will clearly lead to an underestimate of emergency room visits for injuries resulting from interpersonal violence in the NCVS relative to the NHAMCS.

It is also possible that some injured victims visit an ED more than once for the same injury. These multiple visits per injury will be counted in NHAMCS data but not in NCVS data. The victim survey only collects information on the prevalence of emergency room visits per crime and not their incidence.

The skip pattern employed by the NCVS can also contribute to divergence in the estimates of ED visits. NCVS respondents are asked about injuries to themselves and others at two different places in the survey—when the respondent reports being attacked and later if the respondent says that they or someone else took actions to protect themselves. Other injuries that are incurred during assaults—for example by victims falling down without being attacked or by wounded bystanders—will not be detected in the NCVS if there is no report of an offender attack or protective action during an incident. These exclusions will lead the NCVS to underestimate the number of visits arising from injuries sustained during assaults relative to NHAMCS estimates.

Procedures

While collected from different sources, the field procedures used in the two surveys are similar. The NCVS is collected by Census employees while the NHAMCS data are collected by hospital staff trained and supervised by Census field representatives. While NHAMCS field representatives do not actually collect the data from patient medical records, they review the emergency department logs used for visit sampling to determine if cases are missing and edit the forms completed by hospital staff for missing data. When data are missing, efforts are made to complete the data by consulting with hospital staff or reviewing relevant medical records. Quality control over NCVS data collection includes re-interviewing ten percent of the

respondents and employing centralized computer-assisted telephone interviewing (CATI). Quality control for the NHAMCS involves a similar 10 percent independent coding and verification procedure. Coding discrepancies and illegible items are reviewed and adjudicated at NCHS.⁵

Estimation procedures in the two surveys are also similar—sample counts are weighted up to obtain population counts—but the units of count differ. The unit of count in the NHAMCS is a distinct patient visit to the ED. The NCVS has several possible units of count including crime incidents, distinct victims regardless of the number of incidents they incur, and victimizations experienced by persons and households.⁶ The NCVS units most comparable to NHAMCS visits are personal victimizations that count all violent crimes experienced by all victims in an incident. Violent victimization counts are obtained by weighting reported incidents by the person weight. Incident counts are obtained by dividing the victimization weight for each incident by the number of victims in the incident and multiplying sample counts by this new weight. This is done to prevent double counts of incidents since all victims in the incident have a chance of being in the NCVS sample. To the extent that assault incidents involve more than one injured victim, using incident counts would under-represent ED visits in the NCVS compared to the NHAMCS.

In sum, the divergence in estimates from the NCVS and the NHAMCS could be due to the substantial differences between the two surveys in their sample design, instrumentation and estimation procedures. Data collection and quality control procedures are generally similar and not likely to be a major factor in the divergent estimates. Among the methodological differences, one likely source of divergence is the fact that the NCVS sampling frame excludes marginal populations that have a tenuous and fluid relationship to households and the NHAMCS does not. Survey non-response—where individuals at high risk of victimization are included in the sampling frame but do not respond to the survey—will also affect the capacity of the NCVS

⁵ Documentation of the NHAMCS is available from the world-wide web. Data collection procedures are described at <http://www.cdc.gov/nchs/about/major/ahcd/imputham.htm>. Users can also download full documentation in ftp files named “docyy.exe” (where yy = 95, 96, 97 or 98 for each data year) from website ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHAMCS/. Data collection procedures are described in the file named “DESCRIPT” obtained by executing “docyy.exe”.

⁶ Incidents are counts of distinct criminal events without regard to the number of victims. Victimizations separately count the crime for every distinct victim in an incident.

to detect victimization experiences. Another likely source of divergence comes from differences in instrumentation where differences in the definitions of victimization, emergency rooms and injury as well as differences in counting rules can produce different estimates of injuries due to violence. In the next section, we will make some adjustments to the NCVS and NHAMCS counts to estimate the size of the contribution to divergence that is attributable to quantifiable instrumentation differences.

Estimating Effects of Differences in Survey Methods

While a great deal of information is not available to fully test the effects of survey differences on divergence between the NCVS and NHAMCS, we are able to explore some of the effects of some of the most likely sources. The plausibility of the hypothesis that divergence is due to the exclusion of marginal populations can be explored by assessing the relative magnitude of the divergence across population groups that are differentially affected by census under-coverage. If the divergence is greater for groups known to be under-represented in the NCVS than for those groups that are not, this finding would lend support to the idea that under-representation of marginal groups contributes to divergence. The plausibility of instrumentation differences accounting for the divergence can be tested by comparing divergence across events that are of varying degrees of ambiguity as a crime event. If we can assume that stereotypic crime events will be less affected by discretionary judgments and differences in definitions than more ambiguous crime events, then seeing greater divergence among ambiguous crimes would support the contention that divergence is due to differences in instrumentation.⁷

Adjusting for Observable Differences in Instrumentation

Before we begin comparing divergence across groups and types of events, we first begin by assessing the impact of making the data series as comparable as possible by adjusting for sources of divergence whenever we can. Specifically, the NHAMCS rates can be adjusted by eliminating visits to EDs by persons younger than twelve years of age. Similarly, we can adjust the NCVS rates by: 1) using person weights instead of incident weights to estimate distinct persons who are victims, 2) including series incidents, 3) estimating the number of multiple ED

⁷ This is not dissimilar to the assumption made by Rosenfeld in Chapter 9 where he assesses the effects of changes in the handling of domestic violence on the UCR and NCVS aggravated assault trends.

visits for a single assault injury, 4) including certain collateral injuries sustained by bystanders or persons who intervened in the victimization incident, and 5) adjusting for the NCVS skip pattern. These adjustments do not exhaust all the differences in instrumentation between the two surveys, but they are adjustments that can be made most readily.

Excluding Visits by Persons under Twelve Years of Age

NHAMCS visits to EDs for assault injuries to persons younger than twelve years of age are outside the scope of the NCVS estimate. These ED visits by young children represented 8.35 percent of total NHAMCS visits to EDs for treatment of assault injuries in the period 1995-98. The estimated NHAMCS counts in Figure 1 and Table 2 are already adjusted to exclude these ED visits by young children.

Using Person Weights of Victims Instead of Incident Weights

When estimating assault injuries treated in EDs, the relevant units are persons. Rather than counting distinct assault incidents that involve injuries, we are interested in counting all injured persons in those incidents. This is accomplished by using the patient weight in the NHAMCS and the person weight in the NCVS. Using person weights instead of incident weights resulted in an increase of 12.5 percent in the NCVS counts of assault injuries that are treated in emergency rooms as a result of incidents that occurred in the period 1995-98. This adjustment is already reflected in the estimates shown in Figure 1 and Table 2.

Adjusting for Series Incidents

For the period 1993 to 2002 about 5.1 percent of all violent victimizations in the NCVS were reported as a series incident. While information is not available in public use NCVS files, a recent analysis of private NCVS data reports annual estimates for the number of victimizations in series incidents as follows: the mean was 22.1, the median was 9.9, the mode was 6, and the average annual maximum was 324.2 incidents in a series (Planty, chapter 6). It is obvious that the manner in which one includes series incidents makes a difference in NCVS estimates of the level of crime and crime-related injury. Just including the series as one event will produce lower estimates than using the mode, median or mean. The mean would typically be used to provide the most accurate estimate of the total volume of victimizations in all series incidents, but in this case the mean is the most unstable measure since its magnitude is affected by a small number of

extremely high values. Using either the mode (6.0) or the median (9.9) will produce less volatile estimates of the number of crimes (and possible injuries) per series incident.

Only 3 percent of NCVS injuries treated in hospital EDs are series incidents. Assuming that the typical series includes between 6 and 9.9 incidents, and the same rates of injury and treatment outcomes among all series incidents, the adjusted number of injuries and ED visits would increase by a ratio of 1.15 to 1.27. The new estimate of total violent victimizations is obtained by adding the contribution of separate incidents in each series ($N \cdot .03 \cdot 6.0$ or 9.9) to that from single incidents ($N \cdot .97 \cdot 1.0$) for N = the total number of violent victimizations before the adjustment. The adjustment factor for violent injuries treated in hospital EDs is obtained from the ratio of adjusted victimizations to unadjusted victimizations and represents between 15 and 27 percent increases in the NCVS estimates of ED visits for assault injuries.

Adjusting for Multiple Visits per Crime

Some victims will make more than one ED visit for the same assault injury. These multiple visits are included in the NHAMCS estimate but not in the NCVS estimate. Several studies using local area data provide estimates of short-term return rates following discharge from hospital EDs. All indications are that these revisit rates are low—about 3 percent of all visits are returns within 3 days after initial discharge—and revisit rates are highest for chronic conditions like asthma and lower for injuries (Keith et al., 1989; Pierce et al., 1990; Gordon et al., 1998; Lucas and Sanford, 1998). A national estimate of the multiple visit rate can be obtained from total injury visits to EDs (including initial and return visits) available from NHAMCS and total injuries (initial visit only) treated in EDs available from NEISS-AIP data.⁸ Based on national estimates from these two sources for year 2000, the average number of ED visits per injury during that year was 1.315 (40,447,000 total injury visits from

⁸ Beginning in July 2000 the US Product Safety Commission in collaboration with the National Center for Injury Prevention and Control at CDC expanded the National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP) to include injuries from all causes including violent assaults and self-inflicted harms. NEISS-AIP collects data on all non-fatal injuries treated in hospital EDs from a nationally representative sample of about 65 hospitals. The very large sample of about 500,000 injuries annually includes about 30,000 assault injuries—the largest collection of this type of injury available in a national sample. Public use NEISS-AIP data are available for download from the world-wide web at the Interuniversity Consortium for Political and Social Research (ICPSR) at the University of Michigan: <http://webapp.icpsr.umich.edu/cocoon/NACJD-SERIES/00198.xml>.

NHAMCS/30,747,000 total injuries from NEISS-AIP) (McCaig and Ly, 2002; CDC, 2001).⁹ For physical assaults the same average is 1.351 visits per assault injury (2,172,000 NHAMCS assault injury visits/1,608,000 NEISS-AIP assault injuries) (McCaig and Ly, 2002; CDC, 2002).¹⁰

Adjusting for Collateral Injuries to Others

In order for NCVS respondents to report an emergency room visit resulting from interpersonal violence, they must first report being a victim of an attack in a violent crime that resulted in injury. As described previously, there are a number of ways that violence may not be viewed as a crime by NCVS respondents but may be included in NHAMCS data of injuries sustained during an assault. The violent injuries seen in EDs in NHAMCS data, for example, might also include perpetrators, law enforcement officers and bystanders who suffer collateral injuries during crime incidents. These other injuries are included in person-weighted estimates from the NCVS only if respondents who suffer collateral injuries identify themselves as crime victims. These events may not be reported as crimes, however, because the other parties present during an assault incident were not themselves the specific focus of the original crime.

Even if collaterally injured parties fail to report these injuries as crime incidents, the volume of violent injuries that is missed is likely to be small because collateral injuries are so rare. The NCVS survey inquires about other injured parties as part of a series of questions about actions taken by victims and bystanders during crime incidents. An estimated 29,476 incidents per year (2.57 percent) involved detected injuries to other persons during an annual average of 1,148,711 violent incidents where protective actions made the situation worse. Even if each of these incidents involved an average of two collaterally injured persons who are not already estimated among NCVS victims, the resulting collateral injuries to others would increase NCVS estimates of total violent injuries treated in EDs by only 2.5 percent. At a rate of two persons

⁹ The focus by NEISS-AIP on treated injuries rather than all ED visits makes NEISS-AIP data more directly comparable to counts from the NCVS. They are not used throughout the current study because they were not available for enough years to support the analyses in this paper. Multiple years of data are preferred because the NCVS sample of ED visits is small in any single year (annual average is 131 over the 4-year period from 1995-98), and multiple years of data will produce more precise (lower variance) NCVS estimates. Published results from NEISS-AIP partial-year data for injuries in 2000 first appeared in 2001.

¹⁰ The estimate of total injuries from NEISS-AIP in the denominator is probably inflated somewhat because it annualizes data collected for summer months from July to September 2000 when injuries are likely to be higher than during other times of the year. The estimate of physical assault injuries from NEISS-AIP is less inflated because it annualizes data collected for the period July to December 2000.

collaterally injured per incident, 58,952 injuries would be added to the current NCVS estimate of 2,330,872 persons injured annually in violent incidents. Assuming that these injured persons seek care in EDs at the same 16.16 percent rate as reported by injured NCVS respondents, 9,527 injuries would be added to the current NCVS estimate of 376,633 violent injuries treated in hospital EDs.

Adjusting for the Skip Pattern

The skip pattern of items in the NCVS survey also contributes to some undercount of violent injuries. Only those respondents who report that they are victims of an actual attack are asked the additional questions about injuries they sustained during a violent incident and whether they received medical treatment. A small annual number of 18,926 ancillary injuries to respondents are elicited by questions that are asked only of the 736,401 annual victims who report that they or someone else took protective actions that made the situation worse during an incident and the victims did not already report the injuries that they sustained. If these 2.57 percent victims seek ED treatment at same 16.16 percent rate as other injured respondents, the annual NCVS count of ED visits for assault injuries to respondents increases by only 3,058 (0.8 percent above the current estimate of 376,633 ED visits annually).

Questions about ancillary injuries to victims and to other persons are asked only if respondents report that the victim or someone else present at an incident took protective actions that made the situation worse. Persons who might be injured during a crime and show up in emergency departments—for example by falling down without being attacked, or as wounded bystanders—will not be detected in the NCVS if there are no reports of offender attacks or of protective actions that made the incident worse. However, the rates of ancillary injuries that are detected when protective actions do worsen the victimization incident provide a basis for estimating how many injuries might be missed by the survey skip patterns.

Ancillary injuries of respondents and other participants each occur at a 2.57 percent rate among violent incidents in which protective actions worsen outcomes. If violent injuries to victims that are missed by the survey skip patterns occur at the same 2.57 percent rate, the number of respondent violent injuries would increase by 92,586 annually and ED visits by 14,962, a 4.0 percent increase from the already reported level of 376,633 ED visits. This

adjustment of 4 percent was computed by assuming that the candidates for undetected respondent injuries include violent victimizations that do not already involve both reported respondent injuries and reports of protective actions that worsen outcomes. There were an average of 3,602,554 such victimizations annually from 1995-98. Applying a 2.57 percent rate of ancillary respondent injuries to these victimizations yields expected increments of 92,586 respondent injuries and 14,962 ED visits ($92,586 \times 0.1616$). The combined annual increase to ED visits from ancillary assault injuries to respondents is 4.8 percent ($3,058 + 14,962$) added to the current annual average of 376,633 ED visits.

Similarly, we can estimate the number of undetected ancillary injuries to others in violent incidents that do not involve actions that worsen outcomes. The estimated annual increase is 126,024 more incidents with injuries to others and 20,365 more ED visits—a 5.4 percent increase from the currently reported annual estimate of 376,633 ED visits. This adjustment was computed by assuming that violent incidents that do not already involve reports of protective actions that worsen outcomes are candidates for undetected injuries to others. There were an average of 4,903,664 such incidents annually from 1995-98. Applying a 2.57 percent rate of ancillary injuries of others to these incidents yields an expected annual increment of 126,024 incidents with injuries of others and 20,365 of these incidents with ED visits ($126,024 \times 0.1616$).

Combining the Adjustments

The combined effects of the proposed adjustments to NCVS estimates for series crime, multiple ED visits for the same injury, collateral injuries to other parties, and ancillary injuries missed by the survey skip pattern are as follows:

Series Crimes	Multiple Visits	Collateral Injuries to Others	Ancillary Injuries to Respondents	Ancillary Injuries to Others	Total Adjustments					
1.27	*	1.351	*	1.025	*	1.048	*	1.054	=	1.94

When these adjustments are made to the NCVS estimate, the count of ED visits for injuries sustained during assaults almost doubles. The combined adjustment ratio of 1.94 does not include the 8.35 percent reduction in the NHAMCS estimate from excluding the under age 12 population, or the 12.5 percent increase in the NCVS estimate from using person weights rather

than incident weights. Since these adjustments are so straightforward, while others are less so, they are not belabored here and are simply included in the base ED visit estimates reported for the NCVS and NHAMCS in Figure 1 and in all subsequent analyses.

The near doubling of the NCVS estimate reduces the ratio of NHAMCS-to-NCVS assault injury visits from 5 down to about 2.5. This increase in the NCVS estimate of ED visits is achieved by capturing more injuries among crime incidents that victims already report to the NCVS. These adjustments do not include any of the effects of crime events that may not be reported as such by respondents in the crime survey. The adjustments made here are those that are easiest to make using information that can be obtained from existing data.

Estimating the Effects of Differences in Sample Design and Other Survey Features

Other potential sources of substantial divergence between the two data series are: (1) problems in the NCVS sampling frame that disproportionately exclude potential victims at higher rates than non-victims, (2) higher non-response rates from failure to participate in the NCVS by victims included in the sample, and (3) the failure of the NCVS to elicit reports about certain incidents as crimes. The magnitude of these sources of divergence cannot be addressed with straightforward quantitative adjustments like those explored in the previous section. Rather we infer their effects in an indirect manner by examining those respondents who are differentially affected by these features of survey design and by assessing differences in impact across various types of events. In the case of differences in sample design, their contribution to divergence is estimated by comparing estimates across groups differentially affected by under-coverage and non-response. The effects of non-reporting of crime events are evaluated by comparing events known to be differentially affected by reporting differences across surveys.

Comparing Divergence across Marginal Populations to Assess the Effects of Under-Representation of Marginal Groups in Household Surveys

The under-representation of marginal populations in household surveys comes in part from under-coverage in the Census address-list sampling frame and in part from non-response. If these marginal populations are not as well represented in household surveys as other groups, and if these excluded populations have higher rates of emergency room visits for assault injuries, this would make the NCVS estimates low relative to those from the NHAMCS.

Under-Coverage in the NCVS. The NCVS, like many other population surveys, relies on the Census Bureau's Master Address File of housing units developed from the decennial census and annually updated with data on newly constructed housing to generate nationally representative samples of persons residing in households and certain group quarters. By design, the sampling frame excludes persons living in correctional and healthcare institutions, and those residing in military vessels or barracks. For purposes of comparison with NHAMCS, the greater consequence is the exclusion of non-military, non-institutional populations who do not reside in households. This excluded population includes homeless persons who do not reside in any conventional form of living quarters (including group quarters like boarding houses and transient hotels). It also excludes other transient populations who may stay temporarily in a variety of housing units but would not be designated as household members in any of these housing units.

Unconventional and fluid living arrangements make it difficult to capture some persons in residential-based sampling frames. Populations that are difficult to sample pose an especially significant problem for NCVS crime measures because they come disproportionately from subpopulations at higher risk of violent crime victimization, most notably black males. If the ratio of NHAMCS to NCVS estimates is greater for groups known to be underrepresented in the Census address frame, then this would support the contention that under-coverage is a source of divergence in these estimates.

The Census Bureau estimates the undercount using a demographic analysis procedure that relies on estimates of births, deaths, and migration derived independently from census counts. The result is an estimate of the expected population in various demographic subgroups that can be compared to census counts. The accuracy of the resulting undercount rates depends on the accuracy of the estimates of the various population components. The procedure and estimates for 1990 and 2000 are described in Robinson et al. (1993) and Robinson and Adlakha (2002). Census estimates of under-coverage indicate that in the period 1990-2000 an average of 0.9 percent of the population was excluded from the Census address list. Under-coverage is greater for some groups as compared to others with 4.15 percent of blacks excluded, 6.65 percent of black males and 9.85 percent of young, black males (see Table 1). The under coverage rate in the address frame is greater for more marginal populations like young, black males than it is for groups in more traditional housing arrangements.

(Table 1 here)

Table 2 presents evidence relevant to the effects of differential under-coverage rates on NCVS-NHAMCS divergence. Percentages by attribute reveal differences in relative composition of different demographic groups in the two surveys. The NHAMCS-NCVS ratio addresses differences in the magnitude of estimated counts. There is no difference between NCVS and NHAMCS estimates of gender composition, with about 60 percent males among assault victims treated in hospital EDs. Adults aged 21 to 49 are slightly more likely in NHAMCS data, but the differences are not statistically significant. Both data sets also find 85 percent urban area residents among assault victims treated in EDs. Results for victim race are distinctive: blacks, and especially black males, are significantly more likely to be found in NHAMCS data of ED visits. While black males comprise 10 percent of NCVS assault victims treated in a hospital ED, they are 20 percent of NHAMCS assault injuries.

(Table 2 here)

The same pattern is evident in the ratio of estimates of ED visits from the NHAMCS to those from the NCVS.¹¹ The ratios of visits for females (4.77) and for males (5.07) are similar to the overall ratio of 4.95. However, with an NHAMCS-to-NCVS ratio of 9.8 the apparent NCVS undercount for black male victims is twice the 5-fold ratio found overall.¹² Thus the NCVS undercount is considerably greater for groups with higher census under-coverage rates than for those with lower under-coverage rates.

Just as black males contribute disproportionately to the undercount in decennial censuses, they are also difficult to capture in household-based samples. The estimated overall undercount rate has declined in every census since 1940 reaching a level of only 0.1 percent in 2000 (Table 1). While also declining, black males—especially adult black males—continue to suffer from the highest undercount rates of any demographic subgroup (Robinson et al., 2002: Table 7).

¹¹ The results from the two measures need not be similar. For example, the magnitude of count estimates for a demographic group could be similar in the two surveys, while their relative composition varies with differences in the estimated total population of ED visits.

¹² It is not advisable to apply the single overall adjustment factor of 1.94 to individual population groups since it is reasonable to expect differences across population groups in rates of series crimes, multiple ED visits per injury, corollary and ancillary injuries to respondents and other participants. The differences among victims that lead to sharp departures from an overall ratio of 4.95 are likely to have similarly varying effects on the adjustment factors for individual population groups.

Revised estimates of the undercount rate suggest that nearly 10 percent of adult black males were not counted in the 2000 census. The independent data from hospital administrative records indicating that large numbers of black males are treated for assault injuries in hospital EDs but go undetected in NCVS household surveys provides further indirect confirmation of the difficulties in accurately accounting for this subpopulation.

The NCVS (and most other household surveys) addresses the general problem of Census under-coverage through post-stratification adjustments to the weights used to develop the national estimates. The adjustments increase weights to account for the differential under-coverage across population subgroups. They, however, do not capture any distinctive victimization risks faced by the under-covered population. The adjustment among adult black males, for example, scales up from the victimization experiences of those black males who do respond to the NCVS. If respondents from this population subgroup are less vulnerable to violent victimization than black males who are excluded from the original sampling frame, the adjusted national estimate of assault victims will still underestimate black male assault victims. Unfortunately, there is no easy and direct way to test the assumption that the victimization, injury and ED visit rate for those included in the sample frame are the same as those who are not.

One way to estimate whether under-coverage could produce the observed differences in the estimates of emergency room visits across the two surveys is to see how high a visit rate would be required for the under-covered population to account for these differences. If this number is reasonable, then this would support arguments that this is the source of divergence in the estimates. If the number is implausibly high or low, then the household sampling frame becomes a less plausible source of divergence.

The imputation procedures used by the Census to correct for under-coverage assume that persons responding to the survey are like those who are under-covered with respect to their victimization, injury and use of EDs. Given this assumption, the contribution of covered and uncovered populations should be in proportion to their size. So, for example, between 1990 and 2000 approximately 93.5 percent of the total black male population were in the census sample frame used by the NCVS and they produced an estimated 34,545 assaults treated in EDs annually. Under current imputation procedures, the approximately 6.5 percent of black males

who were under-covered in the sampling frame contribute about 2,402 incidents, for a total of 36,947 ED visits. With an NHAMCS estimate of 363,408 ED visits by black males, this leaves a total of 326,461 ED visits missing from the NCVS estimate

The NCVS undercount ratio of 9.84 for black males is about twice the overall ratio of 4.95. It is not unreasonable to assume that black males are similarly twice as vulnerable to series incidents, multiple visits to EDs and injuries to other participants as the overall population. Greater involvement in risky behaviors like alcohol and drug consumption, illicit drug markets, gang activities, gun carrying and gun use by young black males are all likely to increase their experiences of repeated series victimizations, more serious injuries that require multiple visits for treatment, and multiple offenders or victims in violent incidents ((Elliott et al., 1989; Huizinga and Jacob-Chien, 1998; Browning and Huizinga, 1999; Loeber et al., 1999; Lizotte and Shepherd, 2001; Loeber et al., 2001; Thornberry et al., 2003). A doubling increases the adjustment ratio for these factors from the overall ratio of 1.94 to 3.88 for black males, and the adjusted NCVS ED visits become 134,035 and 9,320, respectively, for a total of 143,355. The increase of 106,408 ED visits from instrumentation adjustments for black males represents 33 percent of the 326,461 missing ED visits.

When the 143,355 incidents are subtracted out from the 363,408 total missing visits this leaves 220,053 ED visits that must be accounted for by the 6.5 percent of black males who are under-covered in the sampling frame. When we divide this balance of missing NHAMCS visits by the estimated 9,320 ED visits contributed by under-covered black males, the resulting ratio is 24. This means that the visit rate for the under-covered black males would need to be 24 times that of the black male population covered in the NCVS sample in order to explain the differences in visit counts estimated for the NCVS and NHAMCS surveys. Such an annual rate of visits to EDs for assault injuries is implausibly high even for individuals who are very prone to assault injuries.

In looking for an alternative estimate of the differences in ED visit rates between the more and less marginal populations, it may not be unreasonable to use the ratio of the black male homicide rate to the white male homicide rate. This estimate is not the product of a household survey and should not be affected by census under-coverage. In the period 1990 to 2000 the

black male homicide rate is about 7 times that of white males (Fox and Zawitz, 2005). If we multiply this factor of 7 times the adjusted NCVS estimate of 9,320 ED visits by under-covered black males, the estimate of NCVS ED visits attributable to this group increases by 55,920 to 65,240 accounting for 17 percent of the 326,461 NHAMCS visits that are missing from the NCVS. Thus the effects of under-coverage on divergence in a highly undercounted population group are of respectable size when reasonable assumptions are made about differential experience of under covered groups with respect to victimization, injury and ED visits.

It is worth noting, however, that the differences between the NCVS and NHAMCS estimates of visits are very large even for non-marginal groups. The estimate of visits in the NHAMCS for white women, for example, is 4.5 times that of estimates from the NCVS, yet less than 0.1 percent of the white female population is omitted from the census address frame. Furthermore, the increment of 55,920 ED visits for under-covered black males is only a small 4 percent share of 1,488,664 total missing ED visits overall (1,865,297-376,633). While demographic groups with higher proportions of under-coverage in the census address frame also have high divergence ratios of NHAMCS to NCVS estimates of ED visits, it is unlikely that under-coverage accounts for a great deal of this difference.

Assessing the Effects of Non-Response. Non-response differs from under-coverage in that the potential respondent is known to live in a sampled unit and the potential respondent is known to be eligible for inclusion in the survey, but the interviewer cannot make contact with this individual during the prescribed field period or the respondent refuses to participate. Non-response in the NCVS is generally quite low by current survey standards with a household response rate of 95 percent and the individual response rate of 89 percent (Simon and Mercy, 2001). This response rate varies across demographic and survey treatment groups. Table 3 summarizes the non-response rates (expressed as a percentage) for these groups in survey year 1999.

(Table 3 about here.)

The most notable result is not in the table: 31 percent of sampled black males ages 24 to 34 who are not reference persons failed to respond.¹³ As with under-coverage, non-response is highest among those population groups who are traditionally considered to be most marginalized. And in the case of young black males, non-responders are also most likely to be at risk of violent victimization and presumably contribute at very high rates to emergency room visits for assault injuries. One crucial difference between under-coverage and non-response is the fact that non-response in these marginal groups is two to three times as large as under-coverage—9.85 percent under-coverage for young black males in the 2000 census versus 31 percent non-response to the NCVS in survey year 1999. For black males generally the figures are similar—5.2 percent compared to 17.4 percent.

Like under-coverage, weighting takes account of non-response to some extent in the NCVS, so that groups like adolescent males who have relatively high non-response rates will have adjustments to their basic weights to compensate for non-response.¹⁴ As in the case of under-coverage the adequacy of these weights requires the assumption that persons who respond to the survey are like those who do not, at least in terms of their victimization, risk of injury and use of EDs. Some support for this assumption is offered by Biderman and Cantor (1984) in their study of bounding in the NCS. They monitored the reporting of persons over time in the survey and found that persons interviewed in two consecutive six-month periods in the NCS did not differ in their victimization rates from persons who were non-respondents in time one and respondents in time two. The only exception was the first interview, which always produced higher reporting rates than in subsequent interviews.

This study does not include respondents who never return to the survey, but episodic non-respondents should be closer to complete non-respondents than to complete respondents. Bates and Creighton (2000) attempt to test the similarity of respondents and non-respondents by

¹³ Reference persons are the persons in a household relative to whom all other persons' relationships are determined, e.g. son, spouse, sibling. The Census tries very hard to get at least one person in a household so as to maintain their household response rate. If only one person in the household is contacted that person will be the reference person. As a result non-reference persons have much higher non-response rate than reference person.

¹⁴ In some cases proxy interviews are used to deal with non-response. For example, respondents who do not speak common languages or are away from home during the interview period can be interviewed by proxy.

comparing respondents interviewed in the normal field period to those “late responders” who are interviewed late in the field period after several attempts to contact. While late responders differ from early responders on some demographic characteristics (late responders tended to have a higher income, were younger, and more likely to be black), their victimization rates are not that different.

When we utilize the same sensitivity analysis with non-response that we did with under-coverage we see that non-response also cannot account for the large differences in ED visits between the two surveys, but it can account for more of the difference than under coverage. The non-response rate of black males is 17.4 percent and under the assumption that non-respondents have the same victimization, injury and ED visit rates, the non-respondents should account for 6,429 of the total estimated 36,947 visits by black males in the NCVS. Applying the same assumptions used in the case of under-coverage, we assume the instrumentation adjustment for series crimes, multiple visits and injuries to others is twice the overall ratio of 1.94. At 3.88 this adjustment increases the black male non-respondent count of NCVS ED visits to 24,945 and the total count for black males to 143,355 ED visits. The total increment of 106,408 ED visits by black males from the instrumentation adjustment is 33 percent of the 326,641 missing NHAMCS ED visits by black males.

As before, the difference between NHAMCS counts and the adjusted NCVS counts is 220,053 ED visits that must be accounted for by the 17.4 percent of sampled black males who fail to respond to the NCVS. When we divide this balance of missing NHAMCS visits by the estimated 24,945 ED visits already contributed by non-respondent black males, the visit rate for assault injuries by black male non-respondents would have to be 9 times the visit rate of black male respondents. This is within a reasonable range. For example, when we assume that the rate of ED visits for assault injuries by black male non-responders is 7 times that of responders, then non-response accounts for an additional 149,670 ED visits by this population group. This increment represents 46 percent of the total observed difference of 326,461 ED visits for assault injuries by black males estimated by the NHAMCS and NCVS. This is a considerable effect on the divergence of the two estimates within this category of high non-responders. Furthermore, the potential contribution by black male non-responders would account for 10 percent of total missing ED visits across all population groups.

Summary. While the adjustments made here are ad hoc and somewhat imprecise, they provide a rough estimate of the potential importance of under representation of marginal populations in the NCVS for estimating victimizations, assault injuries and ED visits for these injuries in those population groups. Non-response seems to be more consequential for these estimates than under-coverage. The effects of these sources of under representation on national estimates for the entire population will not be as large because these marginal populations are a relatively small component of the overall population.

Comparing Divergence across Clear and Ambiguous Crime Events

The previous section examines factors that affect the composition of respondent samples. These sample design issues are not likely to fully explain the discrepancy between NHAMCS and NCVS counts of assault injury visits to EDs. We next consider the contribution of victimizations, injuries and ED visits that are missed by the NCVS when respondents fail to report all their victimization experiences.

Respondent Non-Reporting of Crime Victimization. Rand (1997) discusses the potential role of respondent non-reporting as a factor in the 2.5-fold difference in ED visits estimated from 1994 NCVS data and SIVV data for the same year. Rand notes that violent injuries that show up in hospital ED data will be missed by the NCVS if respondents do not regard some violent encounters as crimes. This tendency by victims to view some violence as falling outside the scope of crimes reported to the NCVS was an important motivation for the NCVS survey redesign implemented in 1992. The changes—designed to better elicit reports about especially sensitive incidents involving sexual assaults and crimes by intimates and family members—were successful in increasing the numbers of reported interpersonal violent incidents by 49 percent and household property crimes by 23 percent (Kindermann, et al. 1997). Furthermore, larger increases were observed for less serious forms of crime. Among violent crimes these included crimes involving non-strangers, attempts rather than completed crimes, crimes not reported to police, and assaults that did not involve weapons or injuries.

The continuing large differences between violent injuries detected by the NHAMCS and by the redesigned NCVS suggest that non-reporting by some victims continues to contribute to an undercount of violent injuries in NCVS data. If we assume, as Rosenfeld did in chapter 9,

that less serious and less stereotypic crime events will be more affected by differences in the respective data collection systems, then we should see smaller differences between the two systems in estimated visits for more serious events

One indicator of the seriousness of a violent event is whether a weapon is used in the assault that leads to injury. Events involving weapons should be reported more completely in both series because there is less likely to be ambiguity with regard to the determination that this is a crime event. The results in Table 2 indicate that compared to NHAMCS data, NCVS data contain a significantly lower percentage of ED visits that do not involve weapons and corresponding higher percentage of visits that involve weapons. Likewise, the undercount ratio of NHAMCS ED visits to NCVS visits is higher (5.7) for events that do not involve weapons and lower (3.5) for events involving weapons.

Involvement of offenders who are known to victims might also introduce ambiguity for victims about whether these incidents are crimes and result in lower reporting of these events to the NCVS. Compared to NHAMCS data, the percentage of ED visits for assault injuries by strangers is significantly higher in NCVS data and the percentage for assault injuries inflicted by offenders who are known to victims is lower in NCVS data. The NHAMCS-to-NCVS undercount ratios for stranger and non-stranger assault injuries are uniformly lower than the 5-fold ratio observed over all ED visits for assault injuries. This anomaly is due to the large share of missing relationship data in 50 percent of NHAMCS ED visits for assault injuries. However, the relative size of the ratios is as expected among the events that do include information about relationship: the NCVS undercount is larger in incidents that do not involve strangers than in those involving strangers.

These findings are compatible with concerns about varying levels of discretion and differences in instrumentation that contribute to reporting differences across the surveys. The greater divergence among ambiguous crimes and lower divergence among stereotypic crimes is consistent with a pattern of greater discretionary judgments and differences in definitions about what types of events are crimes that favor failure to report some events in the NCVS, less restrictive standards for defining events as crimes in EDs, or both. Unfortunately, the available

data will not allow us to distinguish between the relative contributions of underestimates in the NCVS and overestimates in the NHAMCS.

Conclusion

The NHAMCS offers an opportunity to learn more about how the design of the NCVS can affect the data from that survey. Specifically, the fact that the NCVS is a household sample and the NHACMS is based upon a sample of hospital emergency departments provides the opportunity to assess the effects of under-coverage in the household frame and non-response by sampled entities on estimates of serious violence in the NCVS. Through a series of rough adjustments for differences between the two surveys and simple simulations, we were able to see that the under-coverage is not a major factor in explaining the differences in estimates of ED visits for assault injuries. With reasonable assumptions about the victimization experience of under-covered population groups, under-representation of marginal populations in the household frame has only a small impact on estimates of ED visits. Non response in highly victimized groups is likely to have a more sizable effect on estimates than under-coverage.

It is more difficult to assess the effects of differences in instrumentation and procedures on the divergence of estimates from the two surveys. The influence of some of these differences, such as the exclusion of persons under 12 or the use of incident weights (rather than victim weights) is relatively easy to estimate, but these differences do not account for the differences in the size of the estimates. Adjustments for other design differences, such as the exclusion of series incidents in the NCVS or the fact that the NCVS does not collect data on multiple visits for a single assault injury, are more speculative, but they suggest that these differences are more consequential in explaining differences in the estimates.

The fact that the estimates from the two surveys are most similar for more serious events, i.e. injuries involving weapons or offenders who are strangers, and least similar for less serious events is intriguing and open to a number of interpretations. One implication is that statistical series dealing with crime and its consequences will produce more similar results when the crime events are serious and unambiguous. This is what Rosenfeld (chapter 9) found in his comparisons of the NCVS and the UCR. There is simply less opportunity for discretion in the

definitions and procedures of the data collection systems to affect the resulting data. This is somewhat reassuring.

Another interpretation is that the large differences between the NHAMCS and NCVS estimates of visits for less serious events is due to the under representation of less serious and less stereotypic crime events in the NCVS. The controversies about surveying rape and domestic violence certainly indicate that victims are less likely to consider these events “crimes” because they are committed by familiars rather than strangers or there is ambiguity regarding provocation and consent (Fisher and Cullen, 2000). Surveys that define themselves as “health” surveys are much more likely to elicit these events because patients do not filter out “non-crime” incidents. The work surrounding the NCVS redesign also showed that additional cuing and explicitly soliciting these grey area events substantially increased the reporting of more minor events in the survey (Cantor and Lynch, 2000; 2005).

The results also support the contention that non-trivial amounts of the difference in estimates of ED visits are due to under representation in the NCVS of collateral injuries to perpetrators, bystanders and police officers, as well as collateral injuries to respondents that do not require an offender attack. It is also possible that hospital staffs are not filtering out intentional injuries that are not crimes. Sorting this out requires more information on the criteria used by hospital personnel to determine whether an injury was the result of a criminal act, and how reliably these criteria are applied for variables that are peripheral to medical concerns with diagnosis and treatment of the physical and mental health consequences of an injury.

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Table 1. Estimated Undercount Rate in Decennial Census of U.S. Population from 1940 to 2000 ^a

Year	Total Population	Black Population	Black Males	Adult Black Males
1940 ^b	5.6	10.3	----	----
1950 ^b	4.4	9.6	----	----
1960 ^b	3.3	8.3	----	----
1970 ^b	2.9	8.0	----	(14.0) ^d
1980 ^b	1.4	5.9	----	(11.0) ^d
1990 ^c	1.7	5.5	8.1	11.3
2000 ^c	0.1	2.8	5.2	8.4

^a The undercount rate is calculated from $100*(DA-C)/DA$ where DA is the population estimated from a demographic analysis procedure and C is the count from the decennial census.

^b Under-count rates for 1940 to 1980 censuses are from Fay, et al. (1988) republished in Anderson and Fienberg (1999: Table 4.1).

^c Under-count estimates for 1990 and 2000 rely on “revised” demographic analysis results (released October 2001). These address concerns about underestimation of immigration in earlier DA estimates. Rates for black males are from Robinson and Adlakha (2002: Table 3). Rates for total population and adult black males ages 20-64 are from Robinson et al. (2002: Table 7).

^d The rates for adult black males in 1970 and 1980 are approximations based on graphed values over age presented in Robinson, et al. (1993: Figure 4a).

Table 2. NCVS and NHAMCS Estimates of Violent Injuries Treated in Hospital Emergency Departments: Variation by Attributes of Violent Incidents: Annual Averages in United States, 1995-98 ^a

Victim and Incident Attributes	NCVS		NHAMCS		Percent by Attribute ^e		NHAMCS -to-NCVS Ratio
	Population Estimate	Sample	Population Estimate	Sample	NCVS	NHAMCS	
Total	376,633	(524)	1,865,297	(1,823)	100.0	100.0	4.95
(90% Confidence Interval)	(301,279 451,987)		(1,591,412 2,139,182)				
Victims:							
Males	226,431	(304)	1,148,991	(1,142)	60.1	61.6	5.07
Females	150,202	(220)	716,306	(681)	39.9	38.4	4.77
Ages 12-20	121,525	(162)	442,968	(428)	32.3	23.7	3.65
21-29	96,264	(124)	542,094	(511)	25.6	29.1	5.63
30-49	133,128	(198)	762,822	(759)	35.3	40.9	5.73
50+	25,716	(40)	117,412	(125)	6.8	6.3	4.57
Black	79,586	(97)	595,532	(636)	21.1	31.9 *	7.48
White	281,841	(407)	1,213,628	(1,121)	74.8	65.1 *	4.31
Black, Females	42,639	(55)	232,124	(240)	11.3	12.4	5.44
White, Females	103,965	(160)	455,276	(411)	27.6	24.4	4.38
Black, Males	36,947	(42)	363,408	(396)	9.8	19.5**	9.84
White, Males	177,876	(247)	758,352	(710)	47.2	40.7	4.26
Incidents:							
Weapon ^b	112,966	(157)	393,246	(407)	30.0	21.1	3.48
No Weapon	241,664	(336)	1,388,087	(1,346)	64.2	74.4 *	5.74
Missing	22,003	(31)	83,964	(70)	5.8	4.5	NA
Urban Area	319,311	(448)	1,580,472	(1,635)	84.8	84.7	4.95
Not Urban	57,322	(76)	285,149	(188)	15.2	15.3	4.97
Relationship ^c							
Stranger	167,534	(124)	286,860	(144)	44.8	28.2**	1.71
Not Stranger	206,281	(151)	730,676	(329)	55.2	71.8**	3.54
Missing ^d	57,322	(7)	1,021,602	(498)	NA	NA	NA
Place of Injury							
Residence	140,719	(200)	429,473	(379)	37.4	40.6	3.05
Street	122,755	(168)	302,558	(331)	32.6	28.6	2.46
Other	113,160	(156)	325,112	(311)	30.0	30.8	2.87
Missing ^d	0	(0)	808,154	(802)	NA	NA	NA

Table 2 Notes:

^a Data are from annual National Crime Victimization Surveys (NCVS) and National Hospital Ambulatory Care Surveys (NHAMCS) for years 1995 to 98. NCVS data are weighted by person weights to reflect national estimates of the number of injured victims, rather than the number of incidents that involve injuries usually reported for NCVS data. NHAMCS data are weighted by patient visit weights to reflect national estimates of total patient visits to hospital emergency departments. For comparability with NCVS data, NHAMCS estimates exclude visits by children under age 12.

^b Weapons in both surveys include firearms, knives, other sharp instruments, and blunt objects.

^c NHAMCS collected data on offender-victim relationship in 1995-96 and dropped the variable in 1997-98. For comparability, the NCVS data for the offender relationship are restricted to the same years. The average annual counts are 384,489 in the NCVS and 2,039,138 in the NHAMCS for years 1995-96.

^d Offender relationship and place where the incident occurred are missing in substantial numbers of ED visits for assault injuries in the NHAMCS (50 percent missing relationship and 44 percent missing place). For greater comparability between the NCVS and NHAMCS, the percentages for these variables are renormalized to exclude missing cases. There is no similar adjustment for missing data in the counts and the large share of NHAMCS visits with missing data lowers the NHAMCS-to-NCVS ratios for these variables uniformly below the overall ratio of 4.95.

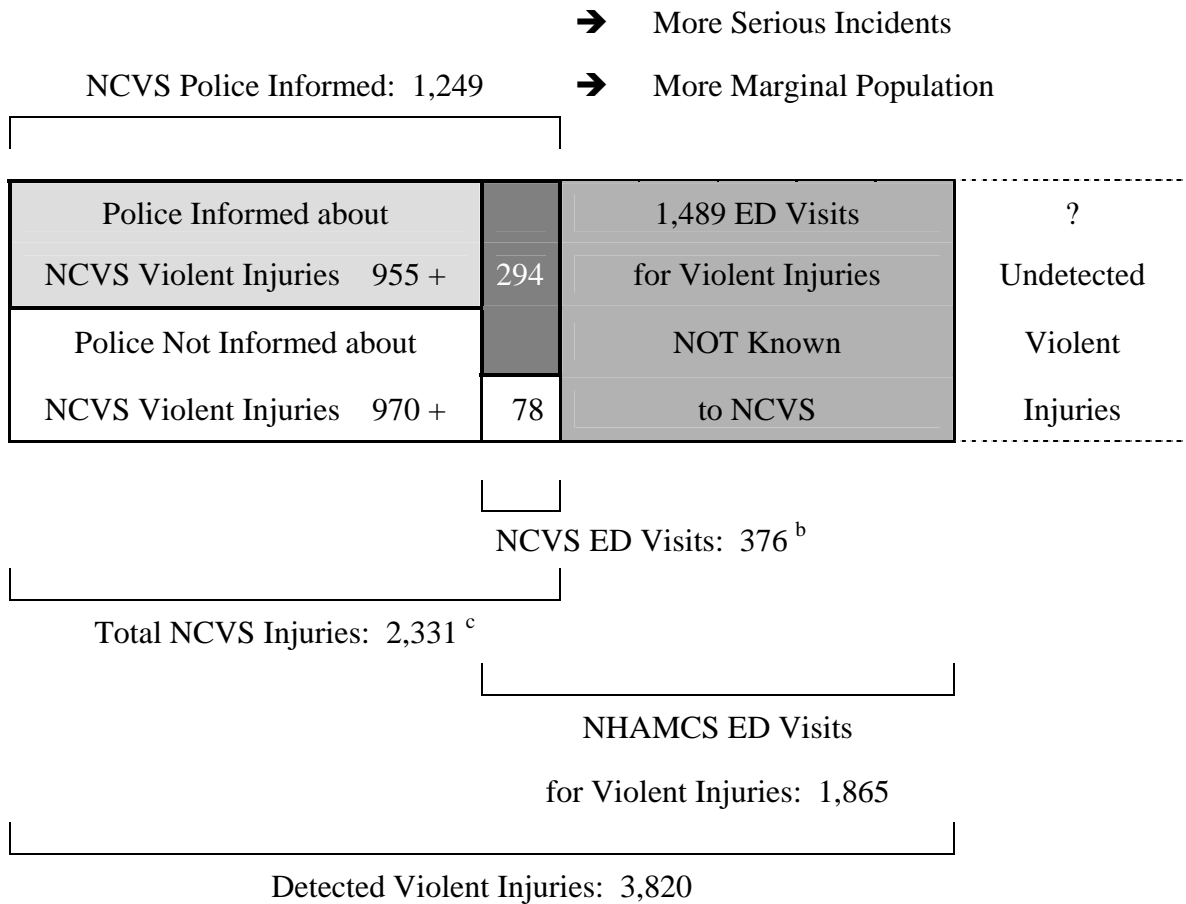
^e Tests for significant differences contrast NCVS and NHAMCS estimates of population proportions of each attribute among violent injuries treated in hospital emergency departments. Estimates of standard errors rely on procedures recommended by each survey (pages xlv-liv of NCVS codebook available from ICPSR, and RSE file in annual documentation files provided with NHAMCS). The significance levels for differences in proportions in a two-tail test are: * $p < .05$ and ** $p < .01$.

Table 3: Person Non-Response Rates in the NCVS by Respondent Characteristics (Collection Year 1999)^a

Respondent Attributes	Non-Response Rate (Percent)
Respondent Status	
Reference Person	7.5
Other	19.8
Race	
Black	13.2
Non-Black	10.4
Age	
12-34	14.3
35-49	10.1
50-64	9.0
65+	5.2
Race and Age	
Black, 12-34	17.4
Non Black, 12-34	13.9
Black, 35-49	12.1
Non Black, 35-49	9.3
Black, 50-64	9.1
Non Black, 50-64	9.8
Black , 65+	6.5
Non Black, 65+	5.1
Race and Gender	
Black, Males	17.4
Black, Females	10.2
Non-Black, Males	12.9
Non-Black, Females	8.1

^a Rates calculated from data provided in Peterson (1999).

Figure 1.
 Detected Violent Injuries in the NCVS and NHAMCS:
 Annual Averages for the United States, 1995-98 (000's)^a



^a NCVS estimates come from semi-annual surveys of crime victimization experiences during years 1995-98. Violent incidents include crime types 1 to 15 and 17. Estimates for the total resident population of United States apply person weights to sample data. NHAMCS estimates come from annual surveys of hospital emergency departments about patient visits during the same years 1995-98. "External cause of injury" codes (i.e., E-codes) identify visits for treatment of violent injuries. Total population estimates apply patient-visit weights to sample data.

^b Total NCVS violent injuries treated in emergency departments include an additional 4,000 visits with unknown police status.

^c Total NCVS violent injuries include an additional 34,000 visits with unknown police status.

Figure 2
NCVS and UCR Serious Violent Crimes Known to Police: United States, 1973-2000^a

