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Final report

Clients of Prostitute Women: Deterrence, Prevalence, Characteristics, and Violence

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<u>Executive summary</u>

Prostitution is often associated with illegal drug markets, crime, violence, other
negative impacts on neighborhoods, and sexually transmitted disease. Despite the
problems of public safety, order, and health linked to prostitution, there is remarkably
little good empirical information on key facets of the problem, especially regarding male
clients of prostitute women. We carried out a multi-stranded project to address some of
these gaps in knowledge. The goals of this project were to:

1) assess the specific deterrent effect of arrest for patronizing a prostitute;

2) estimate the prevalence of clients overall and the subset of clients who are violent
toward prostitutes;

3) compare clients with the general population of men in terms of demographics and
geography; and

4) compare clients who are violent toward prostitute women with clients overall in terms
of demographics, geography, and criminal history.

We discuss the project components and results corresponding to each of these goals in
turn.

Goal 1: Assess the specific deterrent effect of arrest for patronizing a prostitute (chapter 1)

Prior research suggests that arrest, compared with no police detection, of some types of offenders does not decrease the chances they will reoffend. We assessed the specific deterrent effect of arrest for patronizing a street prostitute in Colorado Springs by comparing the incidence of arrest for clients of prostitutes first detected through public health surveillance with the incidence of rearrest for clients first detected by police arrest. Although these sets of clients were demographically and behaviorally similar, arrest reduced the likelihood of a subsequent arrest by approximately 70%. In other areas of the US, arrest did not appear to displace a client's patronizing. Thus, our results suggest that apprehending clients decreases their patronizing behavior substantially. Given the large specific deterrent effect of arrest, any special post-arrest intervention or extra penalty for patronizing (such as "john school" programs) may not have a noticeable impact, as there may be little additional deterrence that could be achieved.

Goal 2: Estimate the prevalence of clients overall and the subset of clients who are violent toward prostitutes (chapter 2)

The only prior estimates of client prevalence have been based on surveys, although methodological investigations indicate that men substantially underreport patronizing. Therefore, we sought to use alternate methods, such as capture-recapture techniques, for this estimation problem. Capture-recapture methods are often used to estimate the size of populations that are difficult or impossible to find and count. One basic capture-

recapture approach involves observing one sample of individuals over a period of time and noting the number of times each individual in the sample is encountered or "captured". Features of the frequency distribution of captures can indicate the number of individuals in the population not observed, thus providing the means to estimate the overall population size. Arrest data constitute this sort of one-sample capture-recapture data.

We requested prostitution arrest data from approximately 30 local US jurisdictions and all 50 states. We analyzed suitable data on men arrested for patronizing a prostitute from 6 metropolitan communities (Dallas county, TX, Harris and Galveston counties, TX, Indianapolis, IN, Kansas City, MO, Portland, OR, and Yakima, WA). We applied a capture-recapture analytic method that can incorporate a deterrence factor (we used our estimate of the specific deterrent effect of arrest for patronizing, as reported in chapter 1). We supplemented these capture-recapture estimates with a prevalence estimate from Colorado Springs derived algebraically from a unique combination of local data on the prevalence of prostitutes, their number of clients, and clients' number of prostitute sex partners. We also compared these estimates to those from the General Social Surveys (GSS), a regular national probability sample household survey. In addition, we analyzed data on reported frequency and settings of patronizing from a Colorado Springs study that included many clients.

Client arrests occurred in the same areas as prostitute arrests, confirming other indications from police arrest and sting procedures that arrested clients constitute a representative sample of clients of street prostitutes, weighted by frequency of patronizing. Capture-recapture analyses of arrest data indicated that about 2-3% of

local male residents in large metropolitan areas in the US patronized local street prostitutes during observation periods of 2 to 5 years. The independent estimate from Colorado Springs, based on the prevalence of local prostitutes, their mean number of their client sex partners, and clients' mean number of prostitute sex partners, showed a similar client prevalence of 3.5% for a 1-year period. These prevalence estimates were almost twice as large as those based on self-reports in the GSS, adjusted for the size and type of municipalities in the corresponding local metropolitan areas. The capture-recapture estimate for the smallest metropolitan area, Yakima, pointed to a client prevalence about half that of the larger communities, and the GSS estimate for a small metropolitan area was also substantially lower than GSS estimates for larger communities. There was no increasing or decreasing trend in client prevalence over the last two decades in either the capture-recapture and survey estimates. Almost three-quarters of clients identified in a Colorado Springs study patronized on the street, suggesting that the off-street sector accounts for a fairly small portion of commercial sexual partnerships. Furthermore, the very large majority of the clients were not arrested during observation periods as long as 10-years.

Our results bolster prior methodological research that men underreport their patronizing activity in surveys. Furthermore, not only do capture-recapture analyses of arrest data appear to produce more accurate estimates of client prevalence, such procedures are much quicker and far less costly to implement than large-scale probability sample population surveys. Given that most clients were not arrested, especially intensive enforcement against patronizing (with the corresponding large deterrent effect of arrest on subsequent patronizing) and/or wider publicity about the risk

and consequences of arrest may be necessary to reduce the extent of prostitution substantially.

We were unable to estimate the prevalence of clients who are violent toward prostitutes because the data we gathered for this objective were too incomplete for meaningful analysis.

*Goal 3: Compare clients with the general population of men in terms of demographics and geography (*chapter 3)

One of the first steps toward understanding the forces that underlie prostitution is to determine factors that differentiate men who patronize prostitutes from those who do not. Prior research on this topic has involved inadequate sampling and ascertainment of clients. Thus, we compared clients arrested for patronizing in several US metropolitan communities (Dallas county, Texas; Harris and Galveston counties, Texas; Marion county, Indiana; Jackson county, Missouri; Multnomah county, Oregon; and Yakima county, Washington) with men in the general population (as reflected by local Census and GSS and other probability sample survey data). As we demonstrate in chapters 1 and 2, arrested clients can be considered representative samples of clients, weighted by patronizing activity. Our comparisons were based on temporally and geographically comparable men, and included characteristics not assessed in previous research. We also compared self-reported clients in the GSS with other men, and relate arrested and self-reported clients' distinguishing characteristics to GSS data on sexual behavior. Furthermore, using data from the Colorado Springs study that

involved many clients, we compared the characteristics of clients of street prostitutes to those clients who patronized prostitutes only in offstreet settings.

Young men were overrepresented among clients of prostitute women in US metropolitan communities, and they also accounted for a disproportionate number of heterosexual sexual partnerships nationally. Clients were much more likely to be Hispanic, somewhat more likely to be black, had substantially less education, were less likely to be married, and weighed a few pounds less on average than men in the general population, but clients did not deviate from the norm in terms of height. Clients also resided closer to their arrest locations and drove modestly newer vehicles, which were somewhat more likely to be cars, than expected for males in their communities. Furthermore, our analyses of data from the Colorado Springs study that included many clients showed that clients who patronized street prostitutes had similar demographics and patronizing behavior as those who patronized prostitutes only in offstreet settings.

The disproportionately large representation of Hispanics among clients may be due to the unbalanced adult sex ratio in this ethnic group (male:female sex ratios in Hispanics ranged from 1.18 to 1.44 for the communities and time periods we examined). Such imbalances, coupled with the strong tendency toward racially and ethnically homophilous sexual partnerships in the US, likely reduced the availability of non-commercial sex partners for Hispanic men, and consequently diverted some to patronize prostitutes.

Several of clients' characteristics suggest features of *demand* for prostitution (the disproportionate representation of young, Hispanic, and unmarried men). That clients resided closer to their arrest locations than expected for men overall in their

communities also may suggest the influence of a *supply* mechanism. Street prostitutes

probably choose the areas in which they solicit according to where they are most

tolerated and that are in relatively close proximity to large numbers of prospective

clients. In the US, these conditions are often met in the central parts of a metropolitan

area. Proximity likely leads to men having increased exposure to prostitutes and

opportunity (and convenience) to patronize. Extrapolating our results to the ecological

level, we hypothesize that the prevalence of clients is higher in communities and

countries marked by lopsided sex ratios (more men than women), a high proportion of

male migrants, low rates of premarital sex, relatively old average age at first marriage,

and easy access to prostitutes.

Goal 4: Compare clients who are violent toward prostitute women with clients overall in

terms of demographics, geography, and criminal history (chapters 4 and 5)

Prostitute women have the highest homicide victimization rate of any set of women

ever studied (Potterat et al., 2004). We analyzed nine diverse homicide data sets to

examine the extent, trends, and perpetrators of prostitution-related homicide in the U.S.

Most data sources substantially underascertained prostitute homicides. As estimated

from a conservative capture-recapture analysis based on the overlap of prostitute

homicides identified in different data sources, 2.7% of female homicide victims in the

U.S. between 1982 and 2000 were prostitutes. Frequencies of recorded prostitute and

client homicides increased substantially in the late 1980s and early 1990s; nearly all of

the few observed pimp homicides occurred before the late 1980s. These trends may be

linked to the rise of crack cocaine use. Prostitutes were killed primarily by clients,

clients were killed mainly by prostitutes, and pimps were killed predominantly by pimps. Another conservative estimate suggests serial killers accounted for 35% of prostitute homicides. (Note: a slightly revised version of chapter 4 was published in the Journal of Forensic Sciences, 2006, volume 51, number 5, pages 1101-8).

Most objective, empirical offender profiles are summaries of offenders and their offenses and thus lack a comparative basis. Without comparison to non-offenders, it is difficult to know how offenders differ from the general or other relevant reference population. Comparisons between offenders and non-offenders indicate the characteristics that most distinguish offenders and can narrow the range of potential suspects to investigate more effectively than offender summaries alone.

Effective methods for profiling perpetrators of violence against prostitutes are urgently needed. Violent crimes against prostitutes are difficult to solve and involve low clearance rates. A number of prostitute serial homicide investigations included tens of thousands to millions of persons as potential suspects, severely hampering the efficiency of these investigations.

To improve offender profiles, we conducted a matched case-control study in which we compared clients who assaulted, raped, and/or killed prostitute women (identified from an extensive national search of media sources) with clients arrested for patronizing prostitutes in the same jurisdictions and time periods. Our analyses focused on observable characteristics or those that can be readily assessed by police. We sought to identify characteristics that differentiate violent clients from other clients and also define subsets of men who are particularly likely to include perpetrators. Moreover, we

estimated the potential for violence in patronizing interactions based on information in prostitution arrest records.

Violent clients usually picked up their victims in the same areas where police arrested clients for patronizing. Cleared violent crimes against prostitutes involved long periods of time between the perpetrator's (first) attack and his arrest (e.g., a median of almost 7 months for prostitute killers). Violent clients and controls were similar in terms of age and distance between their residences and victim encounter/arrest locations. However, violent clients were less likely than controls to be white, be underweight or severely/morbidly obese, and drive cars (as opposed to other types of motorized vehicles). Violent clients were also much more likely to have a criminal history of violent, rape, and property offenses, and substantially less likely to have a criminal history of miscellaneous other (non-violent, non-property, non-sex, non-patronizing) offenses than controls. Men with a criminal history of violent and/or rape offenses comprise a pool that would include 40% of prostitute killers (47% of serial prostitute killers). In addition, meaningful proportions of clients arrested for patronizing in two jurisdictions had less money in their possession than they price they had agreed to pay for sex or carried weapons at the time of arrest, suggesting the potential for violence in clients' interactions with prostitutes.

There are many men with violent and/or rape offense histories, even if defined only by a state criminal history database. It might be possible to prioritize suspects in this pool by developing a statistical model that contrasts violent clients from other violent offenders, and integrating the results with other facts from the investigation. Nevertheless, the criminal history criterion incompletely identifies potential suspects.

Our results indicate that prostitutes are an important source of intelligence on violent clients, and that perpetrators caught with prostitutes' assistance or known by prostitutes to be violent tended not to have had a violent or rape offense criminal history. Wider and more systematic implementation of programs to collect reports of violent clients from prostitute women on an ongoing basis may ultimately provide crucial investigative information.

We have also undertaken related studies that will complement the work described in the following chapters. Specifically, in future publications, we will report the process, outcomes, and obstacles of seeking criminal histories and incident reports from local and state criminal justice agencies. This description should inform researchers about the challenges of obtaining such information and enlighten public officials and policymakers about actual records disclosure practices. In addition, we are collaborating with colleagues in Sweden who have obtained data that will allow us to perform analyses parallel to those reported in chapters 2 and 3.

We wrote each chapter to stand alone. Therefore, figures, tables, and references for each chapter appear at the end of each chapter, and small parts of some chapters may be somewhat redundant with material presented in another chapter.

Chapter 1

A Large Specific Deterrent Effect of Arrest for Patronizing a Prostitute*

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Criminologists have long studied the effect that penalties for criminal behavior have on the subsequent offending of those penalized. This focus on specific deterrence has included evaluations of the impact of incarceration (e.g., Bartell and Winfree, 1977; Brennan and Mednick, 1994; DeJong, 1997; Weisburd, Waring, and Chayet, 1995), fines (e.g., Brennan and Mednick, 1994), restitution (e.g., Schneider, 1986), and other penalties (e.g., Deyoung, 1999; McArthur and Kraus, 1999) among charged or convicted offenders. Researchers have also

investigated the specific deterrent effect of arrest, compared with less severe interventions, such as warnings, on offenders who have been contacted by the police about their apparent criminal behavior (Bazemore, Stinchcomb, and Leip, 2004; Sherman, 1992; Smith and Gartin, 1989).

Yet surprisingly little is known about the specific deterrent effect of arrest relative to no contact by the police. It is widely assumed that, even for minor crimes, offenders who are arrested are less likely to reoffend than those who escape police detection. Past research , though, indicates that arrest of juvenile and young adult offenders, compared with no police detection, may have no specific deterrent effect, and may even have a slight escalatory effect, on subsequent delinquent and criminal behavior generally (Bernburg and Krohn, 2003; Gold, 1969, 1970; Huizinga et al., 2004) and for marijuana-related offenses in particular (Fergusson, Swain-Campbell, and Horwood, 2003). However, only young offenders and a limited range of offenses have been examined in prior work on this dimension of specific deterrence. In this investigation, we aim to improve understanding of this fundamental aspect of crime control by assessing the specific deterrent effect of arrest—relative to no police detection—for patronizing a prostitute.

METHODS

We compared the annual incidence rates of arrest for patronizing a prostitute for two groups of clients of prostitute women identified in Colorado Springs, Colorado, between 1970 and 2000. One group included clients first detected through arrest by the police; the other included clients first detected through public health activities and research. If the two groups were otherwise comparable, a lower arrest rate for clients first identified through arrest would imply that arrest has a specific deterrent effect on patronizing.

POLICE SURVEILLANCE OF CLIENTS

Clients identified by the police were all men arrested for patronizing, typically caught in stings in which female police officers posed as decoys. In Colorado Springs, as elsewhere in the US, client stings were conducted on the street in areas of high prostitution activity, as determined by complaints from community members and locations of prostitute arrests (Brewer, Muth et al., 2005). There is little a client can do to detect a decoy or avoid arrest once a negotiation for a sex act and price has been completed; similarly, police exercise very little discretion or control over which clients are ultimately arrested. Consequently, arrested clients approximate a representative sample of clients of street prostitute women, weighted by frequency of patronizing activity. Colorado Springs police indicated that virtually all arrested clients were convicted, and that sentences typically involved fines and/or probation. Therefore, arrest involved little or no physical incapacitation beyond the arrest episode.

For police-detected clients, the year of detection was the year of arrest. (Year of arrest was unknown for 398 clients who were arrested at some point before 1995, but none were rearrested, so their exclusion inflates our estimate of the rearrest rate for police-detected clients). One factor may depress our estimates of police-detected clients' rate of rearrest very slightly. A decoy's usual term of service in client stings was approximately 2 years and 5-8 decoys served at any one time. Therefore, if an arrested client continued patronizing unabated after arrest, recognized a decoy working a subsequent sting, and consequently avoided her, he would be, on average, 13-20% less likely to be rearrested during the first year after his initial arrest than if he had not recognized the decoy. However, the impact of this potential circumstance on estimation of police-detected clients' rearrest rate would be quite small given the long period of observation following each client's first arrest and decoys' comparatively short terms of service.

Furthermore, Colorado Springs police reported to us that some arrested clients had prior contact with decoys in non-vice situations and yet still solicited the same officers as decoys. We also have found instances of clients being arrested multiple times by the same decoy in patronizing arrest data from other communities in the US (see section on "Data sets for assessing displacement" for a description of some of these data sets).

PUBLIC HEALTH SURVEILLANCE OF CLIENTS

Public health surveillance of clients occurred between 1985 and 2000 and focused on clinic-based HIV testing and a study of local prostitutes, drug injectors, and their close personal contacts, including sex partners. Clients identified through HIV testing were men who acknowledged having sex with a prostitute since 1978. Ninety-six percent of clients detected through HIV testing had either voluntarily sought testing or were screened at the recommendation of a health care provider. The others were tested as part of HIV contact tracing efforts (locating, counseling, and testing sex and needle-sharing partners of HIV-infected persons) or in response to court orders (none connected to patronizing arrests). We excluded those clients identified from HIV testing who reported ever having just male sex partners or whose records indicated they had sex with male prostitutes. The locale in which clients patronized was recorded only in the first few years of HIV testing. We excluded clients who reported patronizing only outside of Colorado Springs. We included all other clients identified through HIV testing in many analyses, even though some may have patronized only outside of the local area.

In the study of prostitutes, drug injectors, and their contacts, local clients were recruited between 1988 and 1992 from the county STD and HIV clinics, outreach in areas of prostitution, and jail, and also were identified by other respondents (Klovdahl et al., 1994). Self-reported

clients were men who acknowledged having sex with a local prostitute woman in the last 5 years (nearly all of whom reported patronizing within the 6 months before the first time they were interviewed).

For public health-detected clients, year of first detection was year of last reported patronizing (for HIV testing patients whose records included this information), year of interview or third-party identification (for study participants or those identified by them), or year of HIV testing (for HIV testing patients whose records did not specify date of last patronizing). Two clients who tested for HIV reported last patronizing in the same year they were arrested. These clients were conservatively coded as being first detected by the police. Nine other clients who tested for HIV reported last patronizing 5 or more years before their tests. We excluded these clients from our analyses because they appeared to be former clients only.

DATA SETS FOR ASSESSING DISPLACEMENT

We also sought to assess displacement of patronizing behavior from one jurisdiction to another and from the street to the off-street sector of patronizing subsequent to arrest. There were no data available to examine displacement for clients arrested in Colorado Springs. However, to assess geographic displacement, we obtained statewide prostitution arrest records for Texas (from the Department of Public Safety), Virginia (from the Department of State Police), Connecticut (from the Connecticut State Police), and Washington state (from various local jurisdictions) that indicated the jurisdiction of arrest and jurisdiction of arrestee residence. Because Texas does not have a patronizing-specific prostitution charge, we defined clients as males arrested for prostitution on dates in which 5 or more males were arrested within the same jurisdiction (presumably reflecting clients arrested in stings). We assessed the validity of this rule in arrest data from 8 large jurisdictions elsewhere in the US (Albuquerque, NM; Bronx County, NY; Indianapolis, IN; Kings County [Brooklyn], NY; Minneapolis, MN; New York County [Manhattan], NY; Queens County, NY; Seattle, WA) which indicated whether an arrestee bought or sold sex. Excluding Manhattan, we found that between 91-97% (median = 94%) of males arrested in these jurisdictions on dates in which 5 or more males were arrested on prostitution (buying or selling) charges were clients of prostitute women. (Manhattan's very low percentage, 51%, may stem from its much higher volume of prostitution arrests per year than other jurisdictions and likely higher proportion of male/transvestite prostitutes). We defined clients in the Virginia data as men charged with patronizing specifically or, when the arrest offense was listed as a nonspecific prostitution charge, according to the rule we used for Texas. The Connecticut records included only patronizing convictions.

We sought prostitution arrest records from all cities in Washington state with populations greater than 25,000 residents (or counties with an incorporated city with more than 15,000 residents). Most jurisdictions and arrests indicated patronizing specific charges, but for those few that listed only nonspecific prostitution charges, we applied the rule for defining clients that we used for Texas. The ten jurisdictions that provided suitable data and the years covered by the data were the police departments of Bellingham (1997-2003), Bremerton (1996-2003), Federal Way (1997-2003), Lakewood (2002-4), Lynnwood (1996-2003), Renton (1998-2003), Seattle (1949-2004), Tacoma (2002-4), and Yakima (1981-2003) and the sheriff's offices of King (1998-2003) and Pierce (2002-4) counties. For the Yakima arrest data, we modified the Texas rule for defining clients by treating men arrested for prostitution on dates with 3 or more such male arrests as clients. Yakima has a small population (71,845 in the 2000 Census) and the possibility of many male prostitutes working there on the same day seems remote. (Indeed, in the other small Washington cities which have data on specific prostitution charges [Bremerton and Lakewood], all males arrested on dates when 3 or more males were arrested on prostitution charges were clients of prostitute women). The jurisdictions with known proactive vice operations against clients that did not respond to our requests or were unable or unwilling to provide suitable data were the police departments of Edmonds, Everett, Fife, Kent, Pasco, and Spokane, and the Spokane County Sheriff's Office.

To investigate displacement of patronizing from the street to off-street sectors of prostitution, we obtained patronizing arrest records for Frederick and Hagerstown, Maryland, by searching the online archives of the newspaper serving the area (Herald-Mail; http://www.herald-mail.com), which has routinely published reports of arrests made by local police. We also acquired from the City of Frederick the records of clients who patronized a Frederick escort

agency between September 3, 1996, and December 2, 1999. This agency served as a main

source of off-street prostitution in the area of these cities during this period. These records were

made public as a result of criminal judicial proceedings against the agency's owner. The list of

agency clients includes only first and last names and no further identifying information.

RESULTS

COMPARABILITY OF POLICE- AND PUBLIC HEALTH-DETECTED CLIENTS

Police- and public health-detected clients were similar in terms of demographics, locality of

residence, and patronizing behavior. Police-detected clients from 1970-2000 were, on average,

several years younger than public health-detected clients from 1985-2000 (Table 1). However,

this difference may be due to a cohort effect (increasing average age of clients over time),

because the difference nearly vanishes for police- and public health-detected clients drawn from

the same 1985-2000 period. Similarly, the slight differences in race and active Army status

between all police-detected and public health-detected clients disappear when the comparisons

are restricted to those identified in 1985-2000 (Tables 2 and 3). Table 4 shows that public

health-detected clients were mildly more likely than police-detected clients to reside locally (i.e.,

within El Paso and Teller Counties, the service area for the local health department). Other

analyses, detailed in the following section, though, suggest that clients who were local residents

were not more likely to be rearrested than clients who resided elsewhere.

The available evidence also suggests that police- and public health-detected clients were

comparable in terms of patronizing behavior. Four clients of prostitute women who were

interviewed in the study of local prostitutes, drug injectors, and their partners were first arrested

for patronizing in Colorado Springs after participating in the study. Three of these clients

reported the number of prostitutes in Colorado Springs they had patronized in the 5 years before

the study. The mean and median numbers reported by these clients (4.3 and 3.0) were close to those reported by clients of prostitute women in the study who were never arrested for patronizing in Colorado Springs during the observation period ($\underline{n}$ = 114, mean = 7.3, median = 3.0).

COMPARING RATES OF (RE)ARREST

Figure 1 displays the distribution of first detections over time by source. According to Colorado Springs police, the dip in number of arrests in 1992-3 was due to diverting police effort toward enforcement against the crack cocaine trade, and the decline in patronizing arrests in the late 1990s was a result of increasingly charging clients with indecent exposure (catching them exposed in public while committing prostitution) rather than conducting stings and charging clients with prostitution.

Because police ascertainment of clients began before public health identification of clients, we sought to eliminate different lengths of observation from confounding our analyses. For the period of overlapping police and public health surveillance of clients (1985-2000), police-detected and public health-detected clients known to have patronized locally both had 10.5 person-years of observation on average. Therefore, we constructed a moving cohort of clients first detected by the police before 1985, and followed each for a 10.5 year observation window subsequent to his arrest. Our calculations of incidence are based on following a client until he was arrested for the first time (for public health-detected clients) or rearrested (for police-detected clients). Each client who was not arrested or rearrested was followed until either the end of his 10.5 year observation window or the end of 2000 (when all active observations were censored).

The rearrest rate for police-detected clients is just a fraction of the arrest rate for public health-detected clients, although both rates are quite low in absolute terms (Tables 5 and 6). The ratios of the crude rates range from 0.29 to 0.48 for different sets/subsets of police- and public-health detected clients. The risk of arrest, however, changed over the observation period, as illustrated by fluctuations in the number of clients arrested (Figure 1). Therefore, we measured the time-varying risk of arrest that a given set of clients faced by the mean number of arrests in the person-years observed for those clients. When the arrest rates are adjusted to account for the risk of arrest (increasing the public health-detected clients' rate proportionate to the police-detected clients' higher risk of arrest), the rate ratios decrease to 0.14-0.43.

The difference in arrest rates does not appear to be due to the modest difference between police- and public health-detected clients in local residence. Fifty-three clients (45 police-detected, 8 public health-detected) were known to have resided outside the local area. One of the 45 police-detected clients was rearrested, and none of the eight public health-detected clients was arrested. One of 317 police-detected clients who were known to reside locally was rearrested. The crude rearrest rate is much lower for local residents (26 per 100,000 person-years) than for nonlocal residents (160 per 100,000 person-years) despite more arrests in the observed person-years for the local residents (mean = 39) than nonlocal residents (mean = 31). The rearrest rates, adjusted for arrest risk relative to police-detected clients overall, are 24 per 100,000 person-years for local residents and 186 per 100,000 person-years for nonlocal residents. Although these estimates may be unreliable because they are each based on a numerator of one, it seems unlikely that locality of residence accounts for much of the large difference in (re)arrest rates by first detection source.

The similarity of the crude rearrest rates for all police-detected clients and those first detected between 1985 and 2000 (Table 5) is somewhat unexpected given that these sets of clients faced substantially different risks of rearrest on average. However, the corresponding adjusted rates are within the range of sampling variability. The estimated incidence rate of rearrest for clients first detected by the police between 1985 and 2000, adjusted for arrest risk relative to all police-detected clients, is 108 per 100,000 person-years. The 95% confidence interval for this rate (Agresti and Coull, 1998; Boik, 2005), 46 to 255 per 100,000 person-years, includes the estimated incidence rate of rearrest for all police-detected clients, 62 per 100,000 person-years. An increase in the rearrest rate could signal a decrease in client prevalence over time. However, it is unlikely that the population of local clients was larger before 1985 because the prevalence of prostitute women in Colorado Springs showed no discernible declining trend in the 1980s (Potterat et al., 1990). Even if the proportion of Colorado Springs men who were clients declined during the observation period, the absolute number of local clients likely would not have decreased, as the overall county population increased from 235,972 in 1970 to 516,929 in 2000 (http://www.factfinder.census.gov).

SURVIVAL ANALYSIS OF THE SPECIFIC DETERRENT EFFECT OF ARREST

We also estimated the specific deterrent effect of arrest with discrete-time survival analysis models (Allison, 1982; Myers, Hankey, and Mantel, 1973) (Table 7). Each model includes first detection source, discrete time and time^2 (representing the possibility of an inverted U-shaped risk of arrest over time due to outmigration, behavior change, death, etc.), and the natural logarithm of the number of arrests in a person-year. The natural logarithm of arrests term represents a potential multiplicative relationship with (re)arrest in the same way our adjustments of the rate ratio for arrest risk do. We added one arrest for the year 1971 to allow calculation of

the natural logarithm of the number of arrests for each year in the observation period. The survival analysis results should be treated as approximate, because this analytic approach is sensitive to small numbers of events (few (re)arrests in our case).

In the base model, the adjusted odds ratio for first detection source (with public health as the reference category) for all clients is 0.18 (95% CI 0.06-0.65), indicating a strong specific deterrent effect of arrest. Models analogous to the other comparisons in Table 6 and those that also included race or age have adjusted odds ratios for first detection source ranging from 0.13 to 0.37 (Table 7). In these latter models, the associations between age and race and (re)arrest are slight. The substantial independent relationship between the natural logarithm of number of arrests in a person-year and (re)arrest in all models underlines the necessity of adjusting the rate ratios for arrest risk. We did not estimate models that included active Army status or locality of residence because the loss of sample size (including (re)arrest events) from missing data was too severe.

ASSESSING DISPLACEMENT

Data from other parts of the US suggest that our main result is not likely caused by displacement of arrested clients' patronizing to other jurisdictions or sectors of prostitution. Table 8 shows that only a very few clients rearrested for patronizing in 4 states were arrested in multiple local jurisdictions, and many of these resided in the arrest jurisdiction at each arrest (i.e., they moved their residence from one arrest jurisdiction to another). Thus, the share of rearrested clients whose patronizing could possibly have been displaced geographically seems to be less than 10%. Some clients so classified may not have actually been displaced, as the multiple arrest jurisdictions could reflect their pre-existing ranges for patronizing.

The available evidence also suggests that displacement of arrested clients' patronizing to off-street prostitution may have been rare. Eighty-nine men were arrested for patronizing on the street in the cities of Frederick and Hagerstown, Maryland, during the period of the Frederick escort agency records. Nine hundred thirty-one clients appear in the agency records. Only one client arrested in this period was listed in the escort agency records and his first encounter with the agency predated his arrest for patronizing on the street. There were 152 person-years in total between the arrested clients' arrest dates and the end of the period of the escort agency's records.

DISCUSSION

We compared clients of prostitute women in Colorado Springs first detected by the police and those first detected by public health in terms of their rates of arrest. Our analyses indicate that arrest reduces the likelihood of a future patronizing arrest by about 70%. Clients first detected by the two sources were similar in demographics, locality of residence, and patronizing behavior, and these factors could not account for the large difference in arrest incidence by first detection source. Moreover, evidence from other parts of the US indicates little displacement of patronizing to other jurisdictions or sectors of prostitution following an arrest for patronizing a street prostitute. Taken together, our results suggest that apprehending clients decreases their patronizing behavior substantially.

Our findings contrast starkly with prior reports of no specific deterrent effect of arrest among young offenders for other types of offenses (Bernburg and Krohn, 2003; Fergusson, Swain-Campbell, and Horwood, 2003; Gold, 1969, 1970; Huizinga et al., 2004). Arrest may be a significant deterrent for clients because they generally are otherwise law-abiding men (Brewer, Dudek et al., 2005; Monto and Garcia, 2002) who could suffer loss of reputation and marital or romantic relationship conflict as a consequence of arrest. Indeed, such themes are often apparent

in clients' comments at arrest, both as others have noted (Christensen, 2001; Matthews, 1993) and we have observed in arrest narratives from several jurisdictions. Our results also suggest that arrest, with the attendant criminal and judicial processing, typically did not cause clients to internalize an official label of "client" that served to perpetuate their patronizing (Becker, 1973). Labeling might not have occurred because one key element thought to be crucial in the labeling process—association with deviant groups following official processing (Becker, 1973)—may be absent, as clients seem to interact rarely with each other as clients. In fact, 75% of arrested clients in an Edmonton sample had never told anyone about their patronizing behavior (Diotte, 1998).

Given the large specific deterrent effect of arrest for patronizing, any special post-arrest intervention or extra penalty for patronizing may not have a noticeable impact, as there may be little additional deterrence that could be achieved. Indeed, convicted clients who attended "john school" (a program where clients are presented with information on the harms of prostitution to prostitutes, communities, and clients) following a court order in Portland, Oregon, had a similar patronizing reconviction rate as temporally-matched convicted clients who were not ordered to attend but were apparently otherwise similar (Monto and Garcia, 2002). Similarly, john school in Toronto did not change clients' intentions to patronize in the future, which were already quite low after arrest but before john school (Wortley, Fischer, and Webster, 2002).

The low rate of recidivism we observed in both groups was produced mostly by the low absolute risk of arrest and primarily reflects the large population of clients (Roberts and Brewer, in press). Specific deterrence probably has a limited impact on the overall prevalence of clients as we estimate that only 7-18% of clients in a community are ever arrested for patronizing over periods as long as 5 years (Brewer et al., 2004). Colorado Springs detectives independently

reported to us their perception that arrest had a substantial specific deterrent effect but only a mild, temporary effect on overall local patronizing activity. Nonetheless, active and potential clients' awareness of the law against patronizing and the possibility of its enforcement likely promote general deterrence, even though most vice operations are conducted covertly and not well-publicized (in Colorado Springs and many US communities). Indeed, the introduction of a law against patronizing in Sweden and enforcement of it appears to have dramatically reduced street prostitution, based on informal assessments (Ekberg, 2004). Priority topics for future investigation include general replication of our findings, evaluation of whether expanded, intensified, and high profile enforcement of laws against patronizing can reduce the level of prostitution further, and examination of the specific deterrent effect of arrest for other offenses.

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Table 1. Clients' Age at First Detection by First Detection Source.

First detection source	N	Mean	SD	$\underline{r}^a$
All				
Police	923	29.7	10.2	-.26*
Public health	1269	35.2	10.0	
1985-2000				
Police	437	34.2	10.5	-.05
Public health	1269	35.3	10.0	
1985-2000 clients known to have patronized locally				
Police	437	34.2	10.5	-.04
Public health	219	35.0	10.5	

Note: 0% of police-detected clients and 0.1% of public health-detected clients had missing data on age at first detection.

[a]Point biserial correlation coefficient comparing first detection sources.

*$p < .001$

Table 2. Crosstabulation of First Detection Source by Race (Row Percentages in Parentheses).

First detection source	White	Hispanic	Black	Other	Tau[a]
All					
Police	566 (62)	95 (11)	232 (25)	17 (2)	
					.01*
Public health	746 (71)	112 (11)	175 (17)	24 (2)	
1985-2000					
Police	275 (64)	59 (14)	87 (20)	7 (2)	
					.01
Public health	746 (71)	112 (11)	175 (17)	24 (2)	
1985-2000 clients known to have patronized locally					
Police	275 (64)	59 (14)	87 (20)	7 (2)	
					.00
Public health	125 (61)	25 (12)	51 (25)	4 (2)	

Note: 1% of police-detected and 17% of public health detected-clients overall had missing data on race; none of the public health-detected clients known to have patronized locally had missing data on race. Some row percentages do not sum to 100 because of rounding error.

[a]Goodman and Kruskal's tau (Goodman and Kruskal, 1949; Agresti and Finlay, 1986) with first detection source as the dependent variable and Pearson $\underline{X}^2$ for the test of association.

*$p < .001$

Table 3. Summary of First Detection Source by Active Army Status.

First detection source	% (fraction) active Army	Phi[a]
All		
Police	10 (96/921)	
		.04
Public health	7 (14/192)	
1985-2000		
Police	7 (31/436)	
		.00
Public health	7 (14/192)	
1985-2000 clients known to have patronized locally		
Police	7 (31/436)	
		.00
Public health	8 (14/183)	

Note: Virtually none (0.2%) of police-detected clients but most (85%) of public health-detected clients had missing data on active Army status; however, only 16% of public health-detected clients known to have patronized locally had missing data on this variable.

[a]Phi correlation.

Table 4. Summary of First Detection Source by Locality of Residence.

First detection source	% (fraction) local residents	Phi[a]
All		
Police	88 (317/362)	
		.13*
Public health	96 (170/178)	
1985-2000		
Police	82 (173/210)	
		.20**
Public health	96 (170/178)	
1985-2000 clients known to have patronized locally		
Police	82 (173/210)	
		.21**
Public health	96 (167/174)	

Note: 61% of police-detected and 85% of public health-detected clients had missing data on locality of residence; 21% of public health-detected clients known to have patronized locally had missing data on locality of residence.

[a]Phi correlation and Pearson X^2 as test of association.

*$p < .01$

**$p < .001$

Table 5. Crude Incidence Rates per 100,000 Person-Years of (Re)Arrest for Police- and

Public Health-Detected Clients.

Detection source	No. of clients	No. of (re)arrests	Person-years	Crude incidence rate	Mean no. arrests/ person-year[a]
Police					
All	923	6	9,632	62	36
1985-2000	437	3	4,544	66	22
Public health					
All	1,272	14	10,262	136	20
Known locals[b]	219	5	2,354	212	17

[a]Mean number of arrests made by police in the person-years observed for a given set of

clients, which indicates the risk of arrest that set of clients faced.

[b]Clients known to have patronized locally.

Table 6. Ratios of Police-Detected Clients' Rearrest Rate to Public Health-Detected

Clients' Arrest Rate.

Police rate	Public health rate	
	All	Known locals[a]
All	0.46 (0.18-1.15)	0.29 (0.09-0.90)
1985-2000	0.48 (0.15-1.57)	0.31 (0.08-1.18)
All, adjusted for arrest risk	0.25 (0.07-0.40)	0.14 (0.04-0.24)
1985-2000, adjusted for arrest risk	0.43 (0.13-1.39)	0.24 (0.07-0.86)

Note: 95% confidence intervals (Graham, Mengersen, and Morton, 2003) are shown in parentheses. Rate ratios adjusted for arrest risk computed by increasing the public health-detected clients' rate proportionate to the police-detected clients' higher mean number of arrests per person-year.

[a]Clients known to have patronized locally.

Table 7. Survival Analysis Results.

Parameter	Models (sets of cases)					
	1 (all)	2 (all)	3 (all)	4 (known locals)	5 (1985-2000)	6 (known locals, 85-00)
Intercept	-11.18 (1.52)	-12.44 (1.74)	-11.20 (1.57)	-12.28 (2.42)	-10.59 (1.69)	-11.40 (3.39)
Time	0.49 (0.29)	0.46 (0.29)	0.44 (0.29)	0.66 (0.47)	0.42 (0.31)	0.57 (0.56)
Time^2	-0.04 (0.02)	-0.04 (0.02)	-0.03 (0.02)	-0.04 (0.03)	-0.04 (0.02)	-0.04 (0.04)
Ln arrests[a]	1.13 (0.36)	1.15 (0.36)	1.07 (0.36)	1.24 (0.47)	1.02 (0.39)	1.13 (0.65)
Age	---	0.03 (0.02)	---	---	---	---
White race[b]	---	---	0.59 (0.56)	---	---	---
First detection by police[c]	-1.69 (0.62)	-1.43 (0.63)	-1.78 (0.60)	-2.04 (0.80)	-1.00 (0.79)	-1.35 (0.97)
	0.18 (0.06-0.65)	**0.24 (0.08-0.92)**	**0.17 (0.05-0.55)**	**0.13 (0.02-0.58)**	**0.37 (0.13-1.65)**	**0.26 (0.06-0.97)**
-2 log likelihood	283.29	280.88	276.05	145.17	238.21	101.12

Note: Unless otherwise noted, cells indicate estimated coefficients with standard errors in parentheses. The analyses are based on 2,195 (model 1), 2,192 (model 2), 1,966 (model 3), 1,142 (model 4), 1,709 (model 5), and 656 (model 6) clients.

[a]Natural logarithm of the number of arrests in a given person-year

[b]Coded as white/nonwhite (with nonwhite as reference category)

[c]The adjusted odds ratio (with public health detection as the reference category) and corresponding bias-corrected 95% confidence interval (obtained from 5,000 sampled data sets for which the model could be estimated (Manly, 1997)) appear in bold.

Table 8. Summary of Rearrested Clients whose Patronizing Possibly Could Have Been Displaced from One Jurisdiction to Another Subsequent to Arrest.

State (years)	No. rearrested	No. arrested in multiple local jurisdictions	No. rearrested who resided in same jurisdiction as arrest	No. possibly displaced (%)
CT (1976-2003)	32	8	2	6 (19)
VA (1996-2004)	3	0	0	0 (0)
TX (1988-2004)	34	1	1	0 (0)
WA (1949-2004)[a]	236	6[b]	3[c]	3 (1)
Total	305	15	6	9 (3)

Note: Clients arrested in multiple jurisdictions are a subset of those rearrested. Clients arrested in multiple jurisdictions who resided in the same jurisdiction as the arrest (i.e., moved residences from one arrest jurisdiction to another) and those who are possibly geographically displaced are the two subsets of those arrested in multiple local jurisdictions.

[a]Based on data from 10 of 17 jurisdictions with known proactive vice operations against clients; time periods vary for particular local jurisdictions (see text).

[b]9 clients were arrested in multiple local jurisdictions but had missing residence data that prevented assessment of geographic displacement.

[c]2 clients did not reside in their respective arrest jurisdictions at either arrest. After their first arrests, they moved (changed residence jurisdictions). At the second arrest, each resided closer to his second arrest jurisdiction than his first arrest jurisdiction.

Figure Legend

Fig. 1. Number of Clients First Detected per Year over Time by Each Source. (A) Police-

detected Clients. (B) Public Health-detected Clients Known to Have Patronized Locally.

(C) Public Health-detected Clients Whose Patronizing Locality was Unknown.

A Police-detected

B Public health-detected, known locals

**C Public health-detected,
unknown locality**
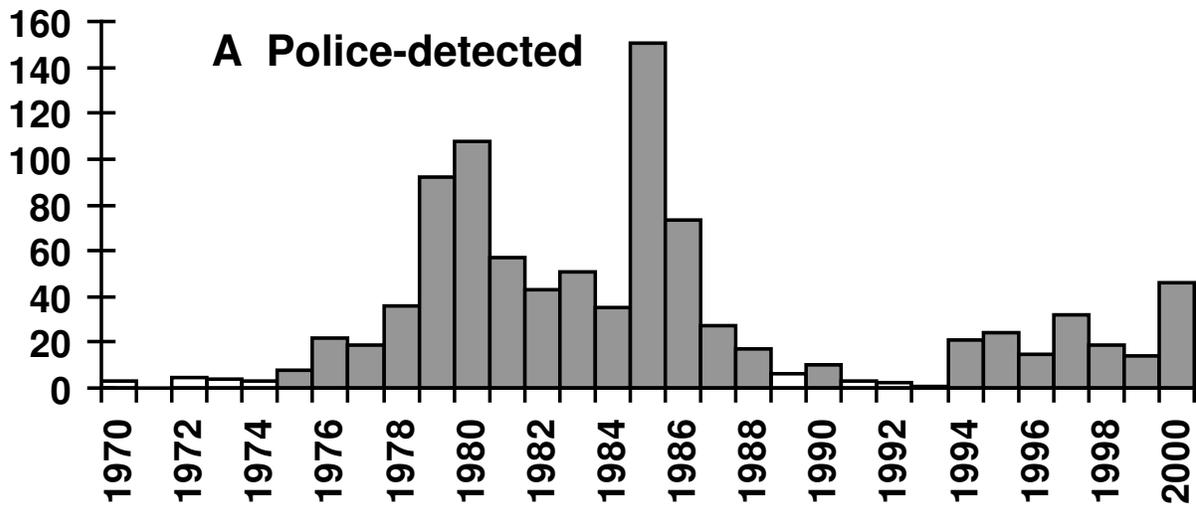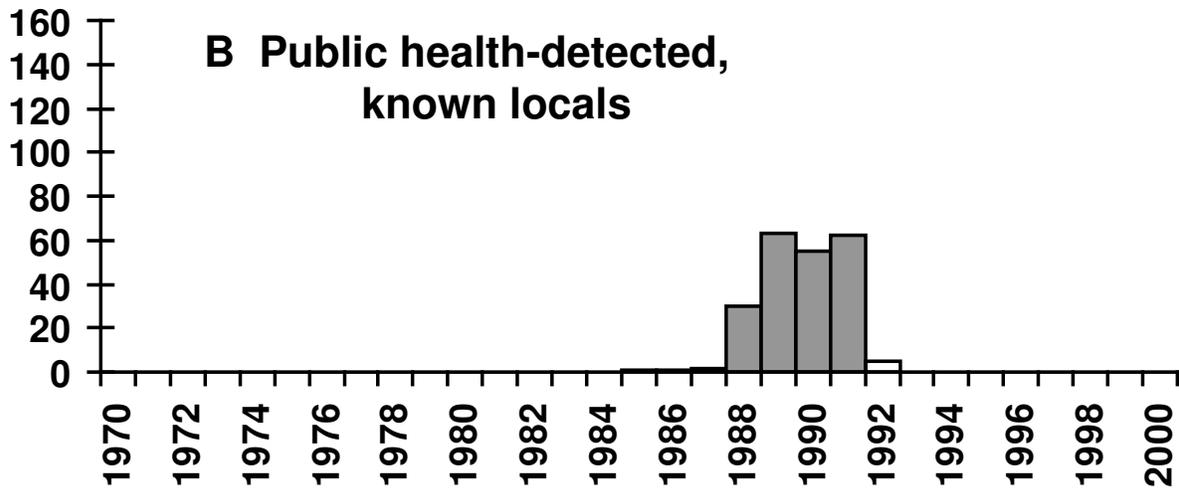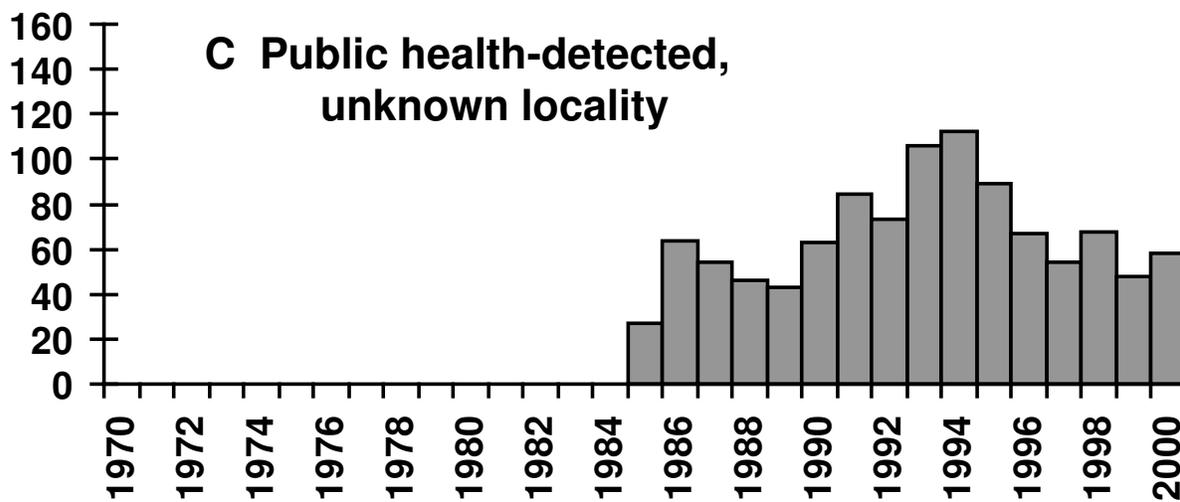
Chapter 2

Prevalence of male clients of prostitute women in the United States*

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*For some of our analyses, the New York State Department of Criminal Justice Services (DCJS) provided anonymous criminal history data in electronic form. DCJS is not responsible for our analyses of these data or the conclusions derived therefrom.

Prostitution is often associated with illegal drug markets, crime, violence, other negative impacts on neighborhoods, and sexually transmitted disease. Despite the problems of public safety, order, and health linked to prostitution, there is little good empirical evidence on the extent of prostitution as indicated by the prevalence of clients of prostitutes. Capture-recapture and census methods have been used for many decades to estimate the prevalence of prostitute women (Brewer et al., 2000; Symanski, 1981; Watts, 1994; Woolston, 1921). In the last 20 years, the prevalence of their male clients has also been studied systematically in scores of countries worldwide, but only with surveys. Unfortunately, survey estimates of client prevalence are plagued by underreporting. Randomized experiments have repeatedly shown that men substantially underreport contact with prostitutes in self-administered paper

questionnaires, face-to-face interviews, and interviewer-administered telephone interviews (as used in most surveys to date) compared to computer-assisted self-interviewing, which is thought to promote accurate reporting (Des Jarlais et al., 1999; Lau, 2000; Lau et al., 2003; Rogers et al., 2005; Turner et al., 1998; van Griensven et al., 2006). Additional evidence for underreporting comes from the observation that men are more likely to acknowledge patronizing prostitutes on repeated questioning in surveys (Brewer et al., 2000).

Given the difficulty of assessing client prevalence with surveys, we sought to use alternate methods, such as capture-recapture techniques, for this estimation problem. Capture-recapture methods are often used to estimate the size of populations that are difficult or impossible to find and count (Sudman, 1988). One basic capture-recapture approach involves observing one sample of individuals over a period of time and noting the number of times each individual in the sample is encountered or "captured". Features of the frequency distribution of captures can indicate the number of individuals in the population not observed, thus providing the means to estimate the overall population size. Patronizing arrest data constitute this sort of one-sample capture-recapture data. That is, they include information with which to construct a frequency distribution of client "captures" (number of times a client was arrested for patronizing).

In this chapter, we report capture-recapture estimates of client prevalence in several US metropolitan areas, and assess variation in prevalence across time and space. We supplement the capture-recapture estimates with a prevalence estimate from Colorado Springs derived algebraically from the unique combination of local data on the prevalence of prostitutes, their number of clients, and clients' number of prostitute sex

partners. We also compare these estimates to those from the General Social Surveys (GSS), a regular national probability sample household survey. Moreover, we estimate the fraction of the estimated number of clients who are arrested.

Methods

Inclusion criteria

To apply capture-recapture methods to arrest data meaningfully, several requirements must be met. To be analyzed, the arrest records must include data on: uniquely identified arrestees; prostitution arrests in jurisdictions that comprise all or nearly all (>90%) of the prostitution arrests in the metropolitan area; arrests that have not been filtered by judicial processing (e.g., conviction or court appearance), as such procedures likely produce subsets of clients who differ in some ways from arrested clients overall; and arrestees' residential locations.

Search for data sets

Between 2000 and 2005, we sought prostitution arrest data from approximately thirty selected local jurisdictions across the US. In addition, we requested statewide prostitution arrest records from the central computerized criminal history (CCH) repository for each of the 50 states (excluding those states with statutes that explicitly forbid disclosure of arrest data for this purpose). For Washington state, we requested arrest records from all cities with populations greater than 25,000 residents and counties with an incorporated city with more than 15,000 residents) because misdemeanor arrests are not reliably reported to the state CCH repository.

Included data sets

   Although we obtained prostitution arrest data from many state and local jurisdictions, ultimately only 6 communities met the previously mentioned criteria and had sufficient numbers of rearrests for analysis (see below). These jurisdictions are: Dallas county, TX, Harris and Galveston counties, TX (hereafter referred to as Houston/Galveston), Indianapolis, IN, Kansas City, MO, Portland, OR, and Yakima, WA.

   Most arrests in these communities were based on stings in which female police officers posed as decoys. There is little a client can do to detect a decoy or avoid arrest once a negotiation for a sex act and price has been completed; similarly, police exercise very little discretion or control over which clients are ultimately arrested. According to vice detectives, arresting agencies used many different female officers as decoys at any one time and these officers served in this role for relatively short periods (generally 1-2 years) before rotating out of the duty. Police indicated to us that sting locations were conducted in areas with high numbers of visible street prostitutes and complaints about prostitution (Baker, 2004). Consequently, arrested clients approximate a representative sample of clients of street prostitute women, weighted by frequency of patronizing activity. To evaluate this conclusion further, we examined random samples of client arrests (as defined below) in 5-year periods in Kansas City and Portland. For each sampled client arrest, we measured the road distance to the nearest arrest of a prostitute woman during that 5-year period. (The sizes of the random samples of client arrests were determined by computational feasibility). Short distances indicate that client and prostitute arrests tended to occur in the same areas.

In all data sets except Indianapolis and Yakima, the police had unduplicated arrestees by fingerprints and assigned each a unique identifying code. For Indianapolis and Yakima, we unduplicated male arrestees with a matching algorithm based on date of birth, sex, race, phonetic properties of names, and other available information. We used a "probable" match criterion, by which the preponderance of evidence suggested two arrest records very likely referred to the same person (at different arrests).

Definition of local residents

We sought to estimate both the absolute (count) and proportional prevalence of clients. For proportional prevalence, we needed to define geographic boundaries for the reference general population that would also permit estimation of outmigration and mortality for use in the capture-recapture analyses (see below). We defined metropolitan areas by the counties that included the arresting jurisdictions (Dallas county, TX; Harris and Galveston counties, TX; Marion county, IN; Jackson county, MO [Kansas City extends over 4 counties, but all arrests by Kansas City police were within Jackson county]; Multnomah county, OR; Yakima county, WA). We classified arrestees as residents of these counties based on geocoding of their residential addresses with ArcMap 8.3 (Environmental Research Systems Institute, Inc.) and spatially merging with 2000 Census county boundary shape files. Across data sets, 97-100% of arrests had geocodable arrestee residential addresses. Because our data refer to local residents who patronized in their local area, our prevalence estimates do not include clients who patronized only outside of their local areas.

Definition of clients

For Indianapolis, we defined males arrested on a patronizing-specific charge as clients. The other data sets lacked patronizing-specific charge information. In our analysis of arrest data from Indianapolis and other communities with patronizing-specific charge information (Minneapolis, Seattle, and 6 counties in New York state, all of which lacked residential information on arrestees), the proportion of male prostitution arrestees who were male or transvestite prostitutes ranged from 11% in Minneapolis to 60% in Manhattan (median = 20%). Therefore, we developed incident-based criteria to identify male prostitution arrestees who were very likely to be clients arrested in stings rather than male prostitutes.

For Kansas City and Portland, we defined clients to be men who were arrested on "engaging in prostitution" or "soliciting for immoral purposes" charges within 2 hours and 600 meters (road distance, as measured by ArcView 3.0a with Network Analyst 1.0b (Environmental Research Systems Institute, Inc.) of at least 3 other such men. Based on our analysis of those data sets with patronizing-specific charges and our observations of client stings, 600 meters is the approximate range of arrest locations in a sting (as sometimes clients try to elude police or the agreement between the decoy and client involves the client driving a short distance away to a supposed meeting point). Similarly, most stings involved two or more arrests per hour.

We sought to validate this definition in two ways. First, we applied these rules to the Indianapolis and Minneapolis data sets which had information on the precise time and location of arrests, and found that 87% and 99% of such spatiotemporally defined clients were in fact arrested for patronizing, respectively. The relatively poor

performance of these rules in Indianapolis led us to investigate validity from another direction. In Indianapolis, Minneapolis, and Seattle, male/transvestite prostitutes were 3.0-4.2 times more likely to be rearrested than clients during the period included in the data sets (Indianapolis: 19.7% for male prostitutes vs. 4.8% for clients; Minneapolis: 18.7% vs. 6.3%; Seattle: 24.6% vs. 5.9%). These results, along with the proportion of male prostitution arrestees who are male prostitutes, suggest that roughly half of the males rearrested on nonspecific prostitution charges should be male prostitutes.   If the spatiotemporal criteria are effective, then we expect that many fewer than half of the males identified as clients by the criteria will be male prostitutes. We requested the arrest narratives on the males rearrested for prostitution charges from the police in Kansas City and Portland to determine whether the arrestees were clients or prostitutes. In fact, all 38 rearrested local resident males defined by spatiotemporal criteria to be clients in Portland from 1995-2004 and all 19 rearrested local resident males defined by spatiotemporal criteria to be clients in Kansas City (data unavailable for 4 others rearrested) were actually clients (caught patronizing). Thus, the spatiotemporal definition appears to include very few, if any, male prostitutes in these data sets, and the lower discriminative power of this definition in Indianapolis appears to be an anomaly.

For Dallas, Houston/Galveston, and Yakima, we lacked data on time of arrest (of these, only Yakima had data on precise arrest location). We defined clients in Dallas and Houston/Galveston to be men who were arrested on dates when 5 or more men were arrested on prostitution charges. We defined clients in Yakima to be men who arrested on dates when 3 or more men were arrested on prostitution charges. All such

arrests in Yakima were made within a several block area, given the small city's restricted area of street prostitution, which also made it improbable that a male prostitute would be among the male arrestees on such a date.

We validated these definitions of clients using two approaches. First, we applied the rule to data sets with information on patronizing-specific arrest charges and date of arrest. The median percentage of males arrested on dates when 5 or males were arrested on prostitution charges who were actually clients was 95% in 12 large US communities (Albuquerque, Indianapolis, Minneapolis, Seattle, and the Bronx, Brooklyn, Manhattan, Monroe County [Rochester], Onondaga county [Syracuse], Queens, Erie County [Buffalo], and Westchester County (Yonkers) in New York state). The median percentage of males arrested on dates when 3 or males were arrested on prostitution charges who were actually clients was 99% in 7 smaller US communities (Dutchess County [Poughkeepsie], Oneida County [Utica], Niagara County [Niagara Falls], Schenectady County [Schenectady], and Rockland County [northwestern edge of New York City/Newark metropolitan area] in New York state, and Bremerton and Lakewood in Washington state). Moreover, we obtained arrest narratives for men rearrested on dates when 5 or more men were arrested on prostitution charges in Dallas, Houston/Galveston, and Yakima (rearrested on dates when 3 or men arrested). We removed from analysis 5 of 9 Dallas local resident males rearrested and 8 of 10 Houston/Galveston local resident males rearrested because they were male prostitutes. These proportions are somewhat higher than expected, especially for Houston/Galveston. None of the 6 rearrested local resident men in Yakima were male prostitutes.

Definition of observation periods

Capture-recapture estimation methods require recaptures (rearrests in our case). We sought to delimit the shortest observation periods (measured in whole calendar years) appropriate for analysis within each data set. We required that the shortest observation periods in a data set be contiguous and the same length throughout the time when then were significant numbers of arrests made in the community. We also required that at least two local resident clients be rearrested during the observation period (a conservative step to reduce the chance of overestimating prevalence). The only exception to this is that we accepted periods with only one rearrest if they were between periods of the same length that included multiple rearrests. In defining the observation periods, we began with the most recent year with sufficient arrests and worked backwards in time. We also constructed longer observation periods that spanned multiple shorter observation periods.

Penalties for patronizing

Patronizing was treated as a misdemeanor in all jurisdictions we examined. Based on our conversations with police and prosecuting attorneys in these jurisdictions, as well as accounts published in the media and academic literature, the typical penalties for convictions included probation, community service, fines, publication of name and other identifying information in local media, attendance at an education program that highlights the risks and harms of prostitution ("john school"), jail, vehicle impound (at arrest), confrontation with a panel of community residents, and/or court orders to stay out of areas of prostitution.

Capture-recapture analysis

   We previously developed a one-sample capture-recapture method of estimating

population size when available data indicate only the numbers of initial captures

(arrests) and recaptures (rearrests) (Roberts & Brewer, in press). This method is based

on conceiving the population as a set of slots filled by equally active individuals. The

method produces an estimate of the daily (constant) probability of rearrest by applying a

known daily probability of an individual exiting the population through death or

outmigration and incorporating the assumption that initial arrests were spaced evenly

through the observation period. After adjusting this rearrest probability by a known level

of deterrence (or escalation), the resulting daily initial arrest probability is used to

estimate population size by computing the number of slots for which the expected

number of initial arrests is the observed number.

   We adapted this method to take advantage of data indicating the precise date on

which each arrest and rearrest occurred (rather than simply the numbers of these

events in a given period). The modification concerns estimation of the daily rearrest

probability. With a constant daily rearrest probability r and a daily exit probability x, the

probability that an individual is rearrested on the kth day after his initial arrest is

$(1 - x)^k (1 - r)^{k-1} r$. For individuals who were never rearrested, the possibility of exit must

be considered. The probability of exiting, without being rearrested, on day j after the

initial arrest is $x (1 - x)^{j-1}(1 - r)^{j-1}$. Then for an individual arrested m days before the

end of the study period, the probability of exiting, without being rearrested, before the

end of the study period is the sum of these terms from j = 1 to m - 1. Also, $(1 - x)^m (1 - r)^m$ represents the probability that such an individual never exited *and* was not

rearrested by the end of the study period, so adding this to the previous sum gives the probability that an individual arrested m days before the end of the study period was not rearrested.

With observed data on the time between arrests for rearrested individuals, and the observed time from arrest to the end of the observation period for never rearrested individuals, these expressions can be used to find a maximum likelihood estimate of the daily rearrest probability. With this estimate in hand, we estimated the number of slots as in Roberts & Brewer (in press). As the slots in the model represent equally active individuals, the likely presence of heterogeneity in the actual frequency of patronizing behavior means that the number of individuals who ever patronized in the study period probably exceeds the estimate of the number of slots.

Our analyses of the Dallas, Houston/Galveston, and Yakima data involved an extended series of calculations to account for the small uncertainty in the actual client/prostitute status of those defined to be clients by the rules we adopted. Because the median percentage of men arrested on dates in which 5 or more men were arrested on prostitution charges in large cities who were actually clients was 95% (see above), we performed 25 estimation trials for Dallas and Houston/Galveston in which we randomly culled 5% of men arrested once in the observation period. For Yakima, we randomly culled 1% of such men in 25 trials to correspond to the median of 99% of men arrested on dates in which 3 or more men were arrested on prostitution charges in small cities who were actually clients (see above). We used the mean estimated number of slots from the 25 analysis trials as our estimate for a particular community and observation period.

Estimating exit probabilities and the specific deterrent effect of arrest

We estimated outmigration and mortality for each county (or combination of counties for Houston/Galveston) and summed the result to obtain an estimated exit probability for use in the capture-recapture analyses. We computed estimated outmigration rates for persons age 5 years and older from county-to-county migration flow tables for the 1990 (U.S. Bureau of the Census, 1995) and 2000 Census (http://www.census.gov/population/www/cen2000/ctytoctyflow.html). These tables yield slight underestimates of outmigration as they do not include persons who moved out of the country. However, inmigration from abroad accounts for less than 10% of out-of-county adult male movers (http://www.census.gov/population/www/socdemo/migrate/cps2004.html), and presumably outmigration abroad by US residents is much less. Because arrested clients tend to differ somewhat from the general population of men (somewhat younger, more likely to be Hispanic, and lower educational attainment – see chapter 3), the overall outmigration data may not reflect clients' outmigration rates accurately. Younger aged and Hispanic men have higher outmigration rates than older men/children and non-Hispanics, respectively, but men with lower educational attainment have lower outmigration rates than men with higher educational attainment (http://www.census.gov/population/www/socdemo/migrate/cps2004.html). In calculating outmigration rates and proportional prevalence (number of FTE slots/number of men in local general population), we estimated adult male (age 18 years and older) population totals from decadal Census figures and current population estimates

(http://factfinder.census.gov), and interpolated linearly to obtain an estimate for the midpoint of an observation period.

We estimated mortality rates for males age 15 years and older from tables in CDC Wonder (http://wonder.cdc.gov/mortSQL.html). These rates are likely to be substantial overestimates given the youth of clients relative to the adult male population (chapter 3).

We arrived at estimated exit probabilities by adding the estimated outmigration and mortality rates. The biases in estimating outmigration and mortality rates likely mostly cancel each other out, suggesting these estimates provide a reasonable approximation to clients' true exit probabilities. The observed range of annual exit probabilities for the counties studied was .0390 -.0636 (converted to a daily exit probability in analysis).

We estimated the specific deterrent effect of arrest (70% reduction in the likelihood of a subsequent arrest after a first arrest) from our analysis of arrest and public health data on clients in Colorado Springs (chapter 1).

Colorado Springs data

Between 1988 and 1992, investigators in Colorado Springs conducted a study of prostitutes, drug injectors, and their sexual and personal contacts in Colorado Springs, Colorado (Klovdahl et al., 1994; Potterat et al., 2004). Clients of prostitute women were recruited from the county STD and HIV clinics, outreach in areas of prostitution, and jail, and also were identified by other respondents (Klovdahl et al., 1994; Potterat et al., 2004). Self-reported clients were men who acknowledged, in face-to-face interviews, having had sex with a local prostitute woman in the last 5 years (nearly all of whom reported patronizing within the 6 months before the first time they were interviewed). Clients participating in the study and other clients recruited from many of the same

sources before and after the study were quite similar in behavioral and demographic terms to clients arrested for patronizing (chapter 1). Admitted clients in the study reported the frequency with which they patronized and the setting in which they encountered prostitutes. We used these data to evaluate how prevalence estimates might differ between the observation periods analyzed in the capture-recapture analyses and shorter periods.

In the study, most clients also reported the number of different women they paid for sex in the prior 6 months (some clients completed only an abbreviated version of the interview). Prostitute respondents reported the number of different men who paid them for sex in the prior 6 months. The prostitute respondents included nearly all of the prostitutes working in Colorado Springs at the time. Potterat and colleagues (Potterat et al., 1990) estimated the prevalence of prostitute women in 1988, at the beginning of the study period, using an independent capture-recapture method based on the overlap of women identified by the police and the health department. They expressed their estimate in terms of full-time equivalent prostitute women in Colorado Springs. Because the total number of prostitutes' clients in Colorado Springs must equal the total number of Colorado Springs clients' local prostitute sex partners, the estimated annual number of clients in Colorado Springs can be estimated by: (number of full-time equivalent prostitutes x mean number of client sex partners reported by prostitutes in the study) / mean number of prostitute sex partners reported by clients in the study. In these calculations, we doubled the mean of the reported numbers of commercial sex partners in the prior 6 months to estimate these quantities for a 12-month period. The resulting estimate for prostitutes is conservative compared to other estimation

procedures (Brewer et al., 2000); if the doubling procedure overestimates clients' mean annual number of commercial sex partners, it would yield a conservative estimate of client prevalence. In fact, while the prostitute side of the equation represents the estimated number of heterosexual commercial sex partnerships experienced locally (through the estimate of full-time equivalent prostitutes), clients' reported numbers of prostitute sex partners does not. It is possible that a small fraction of such reported partnerships occurred outside of the Colorado Springs area.

General Social Survey prevalence estimation

We compared the prevalence estimates from the capture-recapture and Colorado Springs analyses with estimates derived from the 1988-2002 GSS (http://sda.berkeley.edu/archive.htm) that were tailored to the metropolitan structure of the particular counties studied. The GSS is a regular national household probability sample of adults in the US (Davis & Smith, 1994). GSS respondents reported on their sexual behavior in self-administered questionnaires that they completed privately and then enclosed in a sealed envelope they returned to the interviewer. The relevant questions focused on the number of sex partners in the last 12 months, whether the respondent had paid or been paid for sex in the last 12 months, and the sex of the respondent's sex partners in the last 12 months. We defined clients to be men who reporting having paid or been paid for sex in the last 12 months and having only female or both male and female sex partners in the last 12 months. This definition might slightly overestimate client prevalence because bisexual men who were male/transvestite prostitutes would be included. This definition also applies to clients

encountering prostitutes in any setting or community, not just street prostitutes in their local metropolitan areas (as in the arrest data).

We weighted respondents' data for nonresponse (GSS variable WT2004NR). We computed prevalence within strata defined by the type and size of incorporated areas (GSS variable XNORCSIZ) within each county, and weighted prevalence by the proportion of a county's population within each class of city (from city > 250,000 population to town < 2,500 population). For these calculations, we ignored the unincorporated (including rural) segment of a county's population and conservatively assumed that it resembled that of the incorporated population (men residing in smaller and rural communities were much less likely to be defined as clients in the GSS – see Appendix). We did not use data from the 2004 GSS because at the time of this writing there was no available information on the size or type of community in which the 2004 respondents resided. Because there was no discernible trend over time in client prevalence in the GSS, we combined data across 1988-2002 to produce a more stable estimate.

Software

To perform data management and analysis, we used Microsoft Access 97 and 2000, Microsoft Excel 97 and 2000, SAS 9.1, SPSS 7.5, UCINET 6.85 (Borgatti et al., 2002), ArcMap 8.3, ArcView 3.0a with Network Analyst 1.0b, and custom programs written in APL and FreeBASIC (www.freebasic.net). All custom programs for implementing the capture-recapture analyses will be made available for free at www.interscientific.net/instr.html.

Results

<u>Proximity of client and prostitute arrest locations</u>

We measured the road distances between a 12% random sample of client arrests in Kansas City between 1996 and 2000 and each prostitute arrest in that period. For 97% of the sampled client arrests, the closest prostitute arrest was less than 200 meters away; for 99%, the closest prostitute arrest was less than 500 meters away. We drew 22% and 23% random samples of client arrests in Portland for the 1981-5 and 1996-2000 periods, respectively. For 99% of the client arrests in the earlier period the closest prostitute arrest was less than 200 meters away; the closest prostitute arrest was less than 500 meters away for every sampled client arrest. For 55% of the client arrests in the latter Portland period, the closest prostitute arrest was within 200 meters; this percentage climbed to 95% when the threshold for the closest prostitute arrest was 500 meters.

<u>Proportion of arrested clients who were local residents</u>

Most arrested clients were local residents of the counties studied, with percentages ranging from 55% in Portland to 85% in Houston/Galveston. The variation in these proportions across communities is probably largely determined by the extent to which a target county encompasses the metropolitan area.

<u>Capture-recapture prevalence estimates</u>

Several hundred to almost 1,700 local resident clients were arrested during the cumulative observation period in each data set, yet few were rearrested (see Appendix). Across communities and observation periods, the estimated number of full-time equivalent client slots ranged from 574 to 18,273 (Appendix).

Table 1 shows the proportional prevalence estimates, which represent the number of slots divided by the number of men in the county general population. The shortest observation period that met our criteria was 2 years, in Indianapolis and Kansas City. Estimated prevalence grows only slightly with increasing length observation periods. In general, the large metropolitan areas showed fairly consistent prevalences, with the estimated number of full-time equivalent local resident clients in the prior 2 to 5 years equivalent to 2-3% of the men in such communities. Houston/Galveston is the main anomaly, with a substantially lower prevalence than the other communities. Houston/Galveston also had an exceptionally small number of client arrests relative to the overall population size in the metropolitan area. Harris and Galveston counties had 64% more residents than the second largest county (Dallas) and 324% more residents than the third largest county (Marion [Indianapolis]). Yakima county, the only small metropolitan area studied (total 2000 population = 222,581), had a noticeably lower prevalence than the larger communities, excluding Houston/Galveston.

Indianapolis and Portland had several reasonably short (≤ 5 years) observation periods, but there were no obvious increasing or decreasing trends in estimated prevalence for these communities. The prevalence estimates for the seven 2-year observation periods between 1988 and 2001 in Indianapolis, in chronological order, were 2.4%, 3.1%, 0.8%, 1.3%, 2.7%, 1.8%, and 1.3%. The estimates for the five 5-year observation periods between 1980 and 2004 in Portland, in chronological order, were 0.7%, 5.3%, 2.0%, 1.5%, and 2.7%.

Colorado Springs prevalence estimate

The estimated mean number of Colorado Springs clients' prostitute sex partners in the prior 12 months was 10.1 (based on doubling the 6-month mean of 5.07; 6-month median = 2, range = 1-100, $\underline{n}$ = 110). The estimated mean number of Colorado Springs prostitutes' client sex partners was 694 ($\underline{n}$ = 98). The estimated number of full-time equivalent prostitutes in Colorado Springs in 1990 was 71.5 (prevalence rate of 23/100,00 from (Potterat et al., 1990) multiplied by El Paso county population of 397,014). From the prostitute side of the equation, multiplication yields an estimated 63,369 heterosexual commercial sexual partnerships formed in Colorado Springs in 1990. Dividing this product by the mean number of clients' prostitute sex partners produces an estimated 6,249 clients served in Colorado Springs in 1990. To obtain an estimate of the number of local resident clients, we reduced the 6,249 by 18% to account for the fact that 18% of clients arrested for patronizing in Colorado Springs did not reside in the health department's service area (El Paso and Teller counties). The resulting estimated number of local resident clients, 5,125, represents 3.5% of the men residing in the local area in 1990.

Frequency and sectors of patronizing

Seventy-three percent (95/131) of the acknowledged clients surveyed in the 1988-92 Colorado Springs study reported patronizing yearly or more often. Seventy-three percent (96/132) reported finding their prostitute sex partners on the street (the setting for essentially all arrests in our data sets). The remaining 27% did not cite the street as such a location and instead mentioned off-street settings (e.g., escort services, massage parlors, bars, etc.). The question about setting of patronizing was not time-

delimited, so clients' reports may reflect relatively recent periods of time (as most questions in the survey had recall periods ranging between 6 months to 5 years and they may have used such time frames as a reference). These two factors—frequency and sectors of patronizing—effectively balance each other and suggest that 2- and perhaps 5-year prevalence estimates from the capture-recapture analyses are comparable with survey estimates of the 1-year prevalence of clients overall (i.e., including clients who patronize only off-street).

Comparison with survey estimates of prevalence

   With the exception of Houston/Galveston, the capture-recapture prevalence estimates for 2- and 5-year periods and the 1-year Colorado Springs estimate are 46-140% higher than the GSS estimates (Table 1). The lowest GSS estimate is for a community with the distribution of municipalities of the size and type found in Yakima county. Excluding Houston/Galveston, Yakima also had the lowest capture-recapture prevalence estimate of all the communities examined. As discussed earlier, the capture-recapture estimates are likely conservative when used to estimate the number of clients who patronized at least once in the study period when there is heterogeneity in clients' frequency of patronizing (a quite probable circumstance). The true differences between capture-recapture and GSS estimates are thus likely greater than those shown in Table 1.

Proportion of estimated number of clients who were arrested

   Only a small proportion of the estimated number of local resident clients were arrested. In Indianapolis, the median percentage arrested was 7 (range = 5-12) for a 2-year period, 14 (range = 13-15) for a 5-year observation period, and 28 for a 10-year

observation period. These are actually overestimates, as the denominator in these

calculations is the estimated number of full-time equivalent local resident slot, not the

number of individual men (there are more men than slots due to exits from the local

population and heterogeneity in clients' patronizing frequency; see Roberts & Brewer, in

press). These analyses were possible only for Indianapolis, as the other data sets did

not have patronizing-specific charge data, and many actual arrested clients likely were

not ascertained because of our definition of clients in those data sets.

Discussion

Client arrests occurred in the same areas as prostitute arrests, confirming other

indications from police arrest and sting procedures that arrested clients constitute a

representative sample of clients of street prostitutes, weighted by frequency of

patronizing. Capture-recapture analyses of arrest data indicated that about 2-3% of

local male residents in several large metropolitan areas in the US patronized local street

prostitutes during observation periods of 2 to 5 years. An independent estimate from

Colorado Springs, based on the prevalence of local prostitutes, their mean number of

their client sex partners, and clients' mean number of prostitute sex partners, showed a

similar client prevalence of 3.5% for a 1-year period. These prevalence estimates were

almost twice as large as those based on self-reports in the GSS, adjusted for the size

and type of municipalities in the corresponding local metropolitan areas. The capture-

recapture estimate for the smallest metropolitan area, Yakima, pointed to a client

prevalence about half that of the larger communities, and the GSS estimate for a small

metropolitan area was also substantially lower than GSS estimates for larger

communities. There was no increasing or decreasing trend in client prevalence over

time in either the capture-recapture and survey estimates. Almost three-quarters of clients identified in a Colorado Springs study patronized on the street, suggesting that the off-street sector accounts for a fairly small portion of commercial sexual partnerships. Furthermore, the very large majority of the clients were not arrested during observation periods as long as 10-years.

Our results bolster prior methodological research that men underreport their patronizing activity in surveys with self-administered questionnaires or face-to-face interviews (Des Jarlais et al., 1999; Lau, 2000; Lau et al., 2003; Rogers et al., 2005; Turner et al., 1998; van Griensven et al., 2006). The magnitude of underestimation in surveys may be more than our analyses suggest. The capture-recapture estimates were likely conservative in relation to the GSS estimates, due to the probable heterogeneity in clients' frequency of patronizing and the exclusion of clients who patronized only outside of their local areas. On the other hand, our analyses of the GSS data may overstate self-reported client prevalence somewhat as our definition of clients would include bisexual men who were male prostitutes, and the way we constructed estimates that corresponded to the size and type of municipalities in the studied communities disregarded the lower self-reported client prevalence in rural and unincorporated areas (this was especially relevant for Yakima). However, given Hispanics overrepresentation among clients and their probable undersampling in household surveys (chapter 3), some of the apparent shortfall in the GSS ascertainment of clients may be a consequence of sampling. (Hispanic mens' greater residential mobility did not influence our capture-recapture estimates – see Appendix). Furthermore, not only do capture-recapture analyses of arrest data appear to produce

more accurate estimates of client prevalence, such procedures are much quicker and far less costly to implement than large-scale probability sample population surveys.

It is unclear why the estimated prevalence for Houston/Galveston was so low. It could reflect genuinely low prevalence, although the other communities showed remarkable similarity and it is not obvious why Houston/Galveston would be different. It seems more likely that the small number of arrests and rearrests make this estimate unreliable. The apparent low level of enforcement in Houston/Galveston may also suggest unrepresentative police coverage of street prostitution, which could also lead to underestimation in capture-recapture analyses.

In our capture-recapture analyses, we observed only slight increases in client prevalence with increasing length of observation period. This contrasted with our capture-recapture analyses of summarized patronizing arrest data from Vancouver, Canada, which showed a substantially larger prevalence for a 7-year period (1.9%) than a 2-year period (0.6%) (Roberts & Brewer, 2006). The Vancouver results might reflect a real increase in prevalence, or there may be problems in the data of which we are unaware, as we did not have access to the raw arrest records. Survey estimates of client prevalence also grow with lengthening recall periods (Leridon, 1998; Rissel et al., 2003; Ward et al., 2005). The capture-recapture estimates refer to full-time equivalent slots of clients who patronized in a particular local area, not all the individuals who have resided in a local area at any point during an observation period and have patronized somewhere (locally or elsewhere) during the period. This means that the capture-recapture estimates become more incommensurate with survey estimates (based on respondent self-reports of patronizing anywhere) with lengthening observation periods.

In addition, over longer periods, men who have only patronized outside of their local areas (especially off-street and including abroad) may account for a larger proportion of clients than in shorter periods. It is also possible that many men who report patronizing at some point in their lifetimes patronized prostitutes only during military service. For instance, in the 1992 National Health and Social Life Survey – a national probability sample household survey in the US – current or past military service was associated with ever patronizing (of those who had served, 36% reported patronizing vs. 13% of those who had not served) (Sullivan & Simon, 1998).

Given that most clients were not arrested, especially intensive enforcement against patronizing (with the corresponding large deterrent effect of arrest on subsequent patronizing [chapter 1]) and/or wider publicity about the risk and consequences of arrest may be necessary to reduce the extent of prostitution substantially. Similar measures might be required for other types of laws that are enforced primarily through proactive policing (e.g., drunk driving).

There are several limitations to our research. The exit probabilities we estimated for the capture-recapture analyses are approximations, although the potential sources of under- and over-estimation of these probabilities appear to cancel out each other, and the exit probability influences the resulting estimates fairly little for short observation periods. We had no suitable arrest data from any communities east of Appalachia. Otherwise, the communities included constitute a fairly diverse cross-section of metropolitan areas in the US. Most state and local jurisdictions we contacted were unable to provide suitable data for our analyses, but local agencies were more likely to have sufficiently complete and detailed arrest records (especially regarding arrestee

residential address). Thus, future investigations will probably most productive if focused

on obtaining data from local jurisdictions.

Appendix

Self-reported prevalence of male clients (as defined in text) by size of place in the 1988-
2002 GSS

Size of place	Prevalence -- % (underlying n)
City > 250,000 residents	1.4 (1,327)
City 50,000-250,000 residents	0.7 (1,220)
Suburb of city > 250,000 residents	1.0 (1,788)
Suburb of city 50,000-250,000 residents	0.3 (1,203)
Unincorporated area near city > 250,000 residents	0.0 (297)
Unincorporated area near city 50,000-250,000 residents	0.5 (384)
City 10,000-49,999 residents	0.2 (484)
City 2,501-9,999 residents	0.0 (499)
Smaller areas	0.6 (631)
Open country	0.3 (294)

Number of local resident clients arrested and rearrested and estimated number of full-time equivalent (FTE) local resident client slots

Community	Period	Number arrested	Number rearrested	FTE slots
Dallas, TX	1994-2003	824	4	18,671
Houston/Galveston, TX	1999-2003	358	2	7,978
Kansas City, MO	1997-8	426	5	4,467
	1999-2000	406	5	4,461
	1996-2000	971	23	5,566
Indianapolis, IN	1988-9	312	2	6,414
	1990-1	529	5	8,391
	1992-3	271	5	2,328
	1994-5	285	3	3,872
	1996-7	424	3	8,179
	1998-9	393	4	5,537
	2000-1	361	6	3,795
	1992-6	733	15	4,963
	1997-01	986	21	7,317
	1992-2001	1691	63[a]	6,111
Portland, OR	1980-4	202	4	1,409
	1985-9	277	1	11,360
	1990-4	408	5	4,566
	1995-9	636	14	3,718
	2000-4	280	2	7,080
	1985-94	678	13	4,321
	1995-2004	909	23	5,671
	1985-2004	1,575	45[b]	5,896
Yakima, WA	1989-93	130	2	1,219
	1994-8	124	3	635
	1989-98	252	7	1,335

Appendix (continued)

Note: The number rearrested are a subset of the number arrested. Within a community, the number arrested within shorter period (e.g., 1989-93 or 1994-8) do not necessarily sum to the number arrested during the longer period they form together (e.g., 1989-98) because rearrested clients sometimes appear in each of the shorter periods.
[a]Includes one client arrested 3 times during period.
[b]Includes 3 clients arrested 3 times during period.

Hispanic mobility and estimation of rearrest probability
    Hispanic men, especially migrants, tended to have greater residential mobility than other men, and migrants may also have returned to their country of origin for extended periods (chapter 3). Such circumstances, in principle, could depress Hispanics' rearrest probability. However, there was no evidence that Hispanics' rearrest probability differed from that for other men. We computed the incidence rate of rearrest for local resident Hispanic and non-Hispanic clients in 5 year periods in Kansas City (1996-2000) and Portland (1990-4, 1995-9). The rate ratios between Hispanic and non-Hispanics were 0.58 for Kansas City, 4.83 for Portland 1990-4, and 0.93 for Portland 1995-9. Hispanics comprised only 4% of local resident clients in Portland 1980-4 (none were rearrested), and only one local resident client (white) was rearrested in the 1985-9 period. In the 2000-4 period, there were only two clients rearrested, and both were Hispanic.

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Table 1. Prevalence of male local resident clients of prostitute women in US communities

Community	Median % (range)	GSS[a]
1 year		
Colorado Springs, CO (1988-92)	3.5	1.3
2 years		
Indianapolis, IN (1988-2001)	1.9 (0.8-3.1)	1.3
Kansas City, MO (1997-2000)	2.0 (2.0-2.0)	1.2
5 years		
Houston/Galveston, TX (1999-2003)	0.6	1.1
Indianapolis (1992-2001)	2.1 (1.7-2.4)	1.3
Kansas City (1996-2000)	2.5	1.2
Portland, OR (1980-2004)	2.0 (0.7-5.3)	1.3
Yakima, WA (1989-1998)	1.3 (0.9-1.9)	0.5
10 years		
Dallas, TX (1994-2003)	2.4	1.2
Indianapolis, IN (1992-2001)	2.1	1.3
Portland, OR (1985-2004)	2.1 (2.0-2.2)	1.3
Yakima, WA (1989-1998)	2.0	0.5
20 years		
Portland, OR (1985-2004)	2.5	1.3

Table 1. (continued)

[a]One-year prevalence based on self-report in the General Social Surveys (GSS), 1988-2002. See text for background on the comparability of these estimates with the other estimates in the table.

Chapter 3

Demographic, biometric, and geographic comparison of clients of prostitutes and men in the US general population

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One of the first steps toward understanding the forces that underlie prostitution is to determine factors that differentiate men who patronize prostitutes from those who do not. Systematic research on this topic has involved three basic approaches: comparing convenience samples of clients with the general population, comparing clients of prostitute women who attend educational programs to discourage patronizing subsequent to their arrest or conviction for prostitution ("john schools") with men in the general population, and comparing clients who admit patronizing in surveys to those who do not. Each approach involves significant methodological problems that threaten the validity of results obtained from it.

Comparisons involving nonprobability samples of clients (Freund, 1991), while useful for preliminary investigation, do not allow conclusions about clients' distinguishing characteristics to be made with confidence. Although clients arrested for patronizing seem to be representative of clients of street prostitutes overall (chapters 1 and 2), comparisons involving john school attendees (Kennedy et al., 2004; Monto, 2005) suffer

from biased samples of arrested clients. John school participants included clients who were first-time patronizing arrestees, were offered and agree to attend, and met other eligibility criteria (e.g., fluent in English). Such criteria inevitably lead to nonrepresentative samples of arrested clients. No more than 71% of arrested clients in Vancouver, Canada, participated in the city's john school during the period of one study (Kennedy et al., 2004). Moreover, comparisons of john school participants from selected US communities with men in the US general population (Monto, 2005) introduce confounding when the general population in the studied communities differs from the nation as a whole.

In principle, comparisons of self-reported clients and non-clients in probability sample surveys (Brewer et al., 2000; Rissel et al., 2003; Ward et al., 2005) circumvent these problems. However, men substantially underreport patronizing in surveys (Des Jarlais et al., 1999; Lau, 2000; Lau et al., 2003; Rogers et al., 2005; Turner et al., 1998; van Griensven et al., 2006), and it is unknown whether client characteristics moderate reporting of patronizing behavior. Also, survey comparisons in which clients are defined as men who have ever patronized in their lifetimes (Sullivan & Simon, 1998) risk conflating cohort effects for correlates of patronizing.

In this paper, we compare clients arrested for patronizing in several US metropolitan communities with men in the general population. These comparisons are based on temporally and geographically comparable men, and include characteristics not assessed in previous research. We also compare self-reported clients in a national probability sample survey with other men, and relate arrested and self-reported clients' distinguishing characteristics to survey data on sexual behavior. Furthermore, using

data from Colorado Springs, we compare the characteristics of clients of street

prostitutes to those clients who patronized prostitutes only in offstreet settings.

Methods

Metropolitan areas studied

Our analyses are based on the same communities and arrest data sets as those we

used for estimating client prevalence (chapter 2). In a national search for prostitution

arrest records from local and state jurisdictions, we identified communities with arrest

data suitable for comparison with general population data. The inclusion criteria were

that the arrest records include data on: uniquely identified arrestees; prostitution arrests

in jurisdictions that comprise all or nearly all (>90%) of the prostitution arrests in the

metropolitan area; arrests that have not been filtered by judicial processing (e.g.,

conviction or court appearance), as such procedures likely produce subsets of clients

who differ in some ways from arrested clients overall; and arrestees' residential

locations. Six communities met these criteria: Dallas county, TX; Harris and Galveston

counties, TX (hereafter referred to as Houston/Galveston); Indianapolis, IN; Kansas

City, MO; Portland, OR; and Yakima, WA. Clients were defined on the basis of

patronizing-specific prostitution charges or spatiotemporal criteria that were designed to

identify men caught in stings for data sets lacking patronizing-specific prostitution

charges (chapter 2). We validated the latter criteria in data sets with both types of

information (patronizing-specific charges and spatiotemporal details of arrests).

Most arrests in these communities occurred in stings with female police officers

working as decoys. There is little a client can do to detect a decoy or avoid arrest once

a negotiation for a sex act and price has been completed; similarly, police exercise very

little discretion or control over which clients are ultimately arrested. Stings were conducted in areas with high numbers of visible street prostitutes and complaints about prostitution (chapter 2). Consequently, arrested clients approximate a representative sample of clients of street prostitute women in a community, weighted by frequency of patronizing activity.

We defined metropolitan areas by the counties that included the arresting jurisdictions (Dallas county, TX; Harris and Galveston counties, TX; Marion county, IN [Indianapolis]; Jackson county, MO [Kansas City extends over 4 counties, but all arrests by Kansas City police were within Jackson county]; Multnomah county, OR [Portland]; Yakima county, WA). We classified arrestees as residents of these counties based on geocoding of their residential addresses with ArcMap 8.3 (Environmental Research Systems Institute, Inc.) and spatially merging with 2000 Census county boundary shape files. Across data sets, 97-100% of arrests had geocodable arrestee residential addresses and most arrested clients were local residents of the counties studied (55-85%).

For most comparisons, we used arrest data from Census years and years adjacent. Specifically, these periods were 1998-2002 for Dallas and Houston/Galveston, 1989-91 and 1999-2001 for Indianapolis, 2000 for Kansas City, 1989-91 and 1999-2001 for Portland, and 1988-92 for Yakima. For most comparisons, we included only those adult (age >= 18) clients who resided in the counties listed previously. In those few cases where a client had been arrested multiple times in the period (chapter 2), we used data from his first arrest only.

General population data

　　We compared clients with the general population in the 1990 and 2000 Censuses

(http://factfinder.census.gov) for each of the corresponding counties in terms of

demographic and geographic characteristics. For Dallas, Houston/Galveston, and

Portland, we compared clients' biometric characteristics with data from the National

Health and Nutrition Examination Surveys (NHANES III, 1988-94, and NHANES 1999-

2002) (Ogden et al., 2004). The NHANES are based on complex, stratified, multistage

cluster samples of the noninstitutionalized U.S. population. We compared Portland

clients' vehicle characteristics with vehicle characteristics reported by householders

residing in the 8-county Portland-Salem Metropolitan Statistical Area (SMSA) who

participated in the 2001 National Household Travel Survey (NHTS;

http://nhts.ornl.gov/2001/index.shtml) and the 1990 and 1995 Nationwide Personal

Transportation Surveys (http://npts.ornl.gov/npts/1995/Doc/index.shtml and

http://npts.ornl.gov/npts/1990/). These cross-sectional, random digit dial telephone

surveys are based on nationally representative samples of households with telephones

and at least one adult member who spoke English or Spanish.

For these comparisons, we included Portland clients who resided in the SMSA. Client

arrest data were drawn from the period extending from 12 months before the beginning

of the transportation survey data collection to 12 months after the survey data collection

had ended. (Survey data collection periods ranged from 12 to 15 months).

Variables

　　Age. We used the following age categories: 18-24, 25-34, 35-44, 45-54, 55-64, and

≥ 65.

Race/ethnicity. Our procedures for these comparisons varied according to the diverse ways Hispanic race/ethnicity is treated by local jurisdictions and the Census. For the 2000 Census, we merged the "Asian" and "Native Hawaiian/Pacific Islander" into an "Asian/Pacific Islander" category, and excluded the "multiple race" and "some other race" categories from analysis, as no arrest jurisdiction used similar categories. For Dallas, Houston/Galveston, Indianapolis, and Yakima, there were incomplete or no additional data on Hispanic ethnicity. All those listed as Hispanics were of white race; therefore, we treated persons in the Census who reported "some other race alone, Hispanic ethnicity" as "white" in our analyses. For these communities, we used Census race data on the total population. In the Kansas City, and Portland arrest data, Hispanic was included as a category of race. Thus, for these communities, we used 2000 Census data on number of Hispanics ≥ age 18 and data on race for non-Hispanics ≥ age 18 in four racial categories (American Indian, Asian/Pacific Islander, black, and white). There were nearly even sex ratios for non-Hispanics in these four categories, but there were substantially more Hispanic men than Hispanic women in these communities. Therefore, we adjusted the expected counts of Hispanics upward according the greater proportion of males among Hispanics ≥ age 18.

For comparisons with the 1990 Census, when the arrest data did not include data on Hispanic race/ethnicity, we coded persons in the Census reporting "other race, Hispanic ethnicity" as "white" and used Census data on race for the total population (with American Indian, Asian/Pacific Islander, black, and white categories. When the arrest data included a Hispanic race code, we used Census data on the number of Hispanics in the total population and data on race for non-Hispanics in the total population. For

these comparisons, we made similar adjustments for the unbalanced sex ratio in Hispanic adults as we did for the 2000 Census.

Education. The 2000 Census data on education for men were stratified by age (18-24, 25-34, 35-44, 45-64, ≥ 65), and we summarized data for Indianapolis clients accordingly. Education was coded in number of years in the arrest data. We mapped these codings to the Census categories as follows: 0-8 years = less than 9th grade, 9-11 years = 9th-12th grade no diploma, 12 years = H.S. diploma/GED, 13-15 years = some college no degree/associate's degree, 16-17 years = bachelor's degree, and ≥ 18 years = graduate/professional degree.

Marital status. We compared Indianapolis clients with men in the 1990 and 2000 general population in terms of marital status (married/not married). We used this simplified coding because the arrest data lacked several marital status codes that the Census data contain.

Biometrics. The NHANES height, weight, and body mass index (BMI) estimates for men were stratified by age (20-39, 40-59, ≥ 60) and race/ethnicity (black, Mexican-American, white), and we summarized the arrest data accordingly. We included white clients in the analyses only if they were listed as non-Hispanic as well, and we assumed that all blacks to be non-Hispanic and all Hispanics to be Mexican-American. The NHANES data are based on direct physical measurements.

Residence-arrest location distance. For Indianapolis, Kansas City, Portland, and Yakima, we compared clients and the general population of males in terms of the road distance between residential block group centroid (population-weighted) and clients' arrest locations (also known as the "journey to crime"). We computed the general

population distances for all block groups in the corresponding counties. Road distances were calculated using the shortest-path routines of Network Analyst 1.0b (Environmental Research Systems Institute, Inc.) on Census 2000 road coverages (available at http://arcdata.esri.com/data/tiger2000/tiger_download.cfm). We kept computational time to a minimum by performing calculations in degrees UTM (NAD83), the native format of the Census 2000 road data, and converting the result to kilometers using a spherical model for the Earth (program available on request).

Vehicle characteristics. In the national travel/transportation surveys, one respondent in each participating household reported on the characteristics of the vehicles available for regular use (including age and type) belonging to household members and the demographics (including age and sex) of each driver in the household. We included just those vehicles for which a male was the primary driver. In our comparisons, we used arrest data on clients' vehicles, unduplicated by client (rearrests not counted) and by event. That is, we counted each vehicle only once per arrest cluster (if multiple clients were riding in the same vehicle, we counted the vehicle only once).

The national surveys' coding procedures for vehicle age are somewhat obscure. The user's guide for the 2001 survey (http://nhts.ornl.gov/2001/usersguide/index.shtml) indicates that vehicle age was constructed by subtracting the year of the vehicle from the year of the interview. In the actual data, vehicle age was computed this way for nearly all interviews conducted in January or February of a year. All interviews conducted in May or later in a year show vehicle ages equal to {interview year – vehicle year + 1}, with interviews conducted in March and April showing vehicle ages computed

by one rule or the other. Vehicles with model years equal or greater than the interview

year were coded in the survey as having an age of 1 year. Therefore, we coded vehicle

age in the arrest data by {interview year – vehicle year} for January, February, and

March arrests, by {interview year – vehicle year + 1} for arrests later in the year, and

assigned ages of 1 year to all vehicles with vehicle years the same as or greater than

the arrest year. In addition, we stratified both the arrest and survey data on vehicle age

by age of the driver (< age 45 vs. ≥ age 45). Vehicle age is negatively related to

personal income but uncorrelated with race at both the individual and county levels

(Miller et al., 2002; Zhou & Soot, 2004).

For vehicle type, we used the categories "car", "van", "sport utility vehicle (SUV)",

"pickup truck" and "motorcycle." We excluded the survey categories "recreational

vehicle" and "other truck" because they were not consistently observed in either the

survey or arrest data. Neither type would be expected to be used by local resident

clients while patronizing ("other trucks"—such as large delivery or utility trucks—might

be used in rare circumstances, but would typically be owned by an individual's

employer). For both vehicle age and type, we weighted the national survey data to

adjust for nonresponse with the "usable household weight" variable.

General Social Survey data

We compared the demographics (age, race, education, and marital status) of self-

acknowledged clients and other male respondents in the 1988-2002 General Social

Survey (GSS) (http://sda.berkeley.edu/archive.htm),

a regular national household probability sample survey of US households (Davis &

Smith, 1994). Respondents reported on their sexual behavior in self-administered

questionnaires that they completed privately and then enclosed in a sealed envelope they returned to the interviewer. For these analyses, the relevant questions focused on the number of sex partners in the last 12 months, whether the respondent had paid or been paid for sex in the last 12 months, and the sex of the respondent's sex partners in the last 12 months. We defined clients of prostitute women to be men who reported having paid or been paid for sex in the last 12 months and having only female or both male and female sex partners in the last 12 months. We restricted these analyses to heterosexual/bisexual males residing in metropolitan areas (i.e., in cities with 50,000 residents or more or suburbs/unincorporated areas surrounding such cities). Forty-seven of these men were defined to be clients. Data on Hispanic ethnicity were available only for the 2000 and 2002 surveys.

Colorado Springs study

Between 1988 and 1992, investigators in Colorado Springs conducted a study of prostitutes, drug injectors, and their sexual and close personal contacts in Colorado Springs, CO (Klovdahl et al., 1994; Potterat et al., 2004). Clients of prostitute women were recruited from the county STD and HIV clinics, outreach in areas of prostitution, and jail, and also were identified by other respondents (Klovdahl et al., 1994; Potterat et al., 2004). Self-reported clients were men who acknowledged, in face-to-face interviews, having had sex with a local prostitute woman in the last 5 years (nearly all of whom reported patronizing within the 6 months before the first time they were interviewed). Clients participating in the study and other clients recruited from many of the same sources before and after the study were quite similar in behavioral and demographic terms to clients arrested for patronizing (chapter 2). Admitted clients (n = 132) in the

study reported their demographic characteristics and certain aspects of their patronizing behavior (such as number of local prostitute sex partners in the last 5 years and settings in which they encountered prostitutes). We used these data to compare clients who patronized street prostitutes with clients who patronized prostitutes in offstreet settings only.

Statistical analysis

For each category of age, race, education, marital status, and vehicle type, we computed the ratio of the number of clients observed to the number expected in the general population. We performed a chi-square goodness-of-fit test for each of these variables to assess the statistical significance of the deviation of the observed from the expected.   Our analyses of the GSS data involved equivalent procedures. For vehicle age, height, weight, and BMI, we calculated the z-score ((client mean – general population mean) / estimated standard error) for each stratum, and then computed the cumulative Z for a variable across strata, weighting z-scores by the number of clients in a stratum (Mosteller & Bush, 1954; Rosenthal, 1991). To describe the magnitude of differences between clients and the general population on these variables, we calculated the weighted (by number of clients in the stratum) mean difference between client (observed) and general population (expected) means. For residence-arrest location distance, we used matched-pair t-tests to compare clients' distances with the expected distances in the general population, represented as the mean distance of all male residents to a particular client arrest location.

To provide a reference point for our age and race comparisons, we described variation in the number of recent sex partners by age and race in male GSS

respondents residing in metropolitan areas. We computed ratios of the proportion of all sex partners in the prior 12 months reported by heterosexual men in a particular age or race category to the proportion of all heterosexual and abstinent male respondents in that category. When the GSS data indicated a respondent's reported number of partners fell in a range (i.e., 5-10, 11-20, 21-100) we coded the response as the midpoint of the range; when respondents reported more than 100 partners, we coded the response as "101" (Brewer et al., 2000).

For the Colorado Springs data, we used point biserial correlation coefficients and t-tests to compare clients of street prostitutes and clients of off-street prostitutes on age, education (number of years), and number of local prostitute sex partners in the prior 5 years. We computed Goodman and Kruskal's tau (Agresti & Finlay, 1986; Goodman & Kruskal, 1954) to measure the association between sector of clients' prostitution and race (with sector as the dependent variable).

We performed data management and analysis with Microsoft Access97/2000, Microsoft Excel97, SAS 9.1, SPSS 7.5, VassarStats (http://faculty.vassar.edu/lowry/VassarStats.html, which we validated against SPSS), and custom programs written in FreeBasic (http://www.freebasic.net).

<center>Results</center>

<u>Demographics</u>

Younger men (< age 35) were substantially more likely to be clients than older men, with the likelihood decreasing monotonically for each increasing older age group in the arrest data sets (Tables 1a and 1b). Men age 65 and older were especially unlikely to be clients (observed frequencies 0-26% of expected). The GSS data on clients showed

roughly the same pattern as the arrest data sets. The relative share of sexual

partnerships reported by heterosexual men in the GSS also declines monotonically with

age, although not as abruptly in the older age groups.

In terms of race, Hispanic men were consistently and strongly overrepresented in

the arrest data (2.8-6.0 times their expected frequency), blacks generally were

moderately overrepresented, and whites generally were moderately underrepresented

among clients (Tables 2a and 2b). Hispanics accounted for 12% of clients arrested in

Portland in 1989-91, 34% in Kansas City in 2000, and 40% in Portland in 1999-2001. In

the four communities that lacked a Hispanic race/ethnicity code in the arrest data, it is

likely that the ratios for whites are overestimated, as Hispanics probably made up a

large portion of those so classified. The 2000-2 GSS data also suggested that

Hispanics were overrepresented among clients: 1.6% (2/124) Hispanic men reported

patronizing in the last year, while only 0.7% (10/1,372) of non-Hispanic men did. The

apparent black-white difference in representation among arrested clients was mirrored

by the GSS data on clients and black respondents' greater share of sex partnerships,

relative to their underlying numbers, in the general population. Asian/Pacific Islanders

were underrepresented in some communities but overrepresented in others. There

were too few American Indians in these communities to estimate their relative

representation with confidence, although the available data suggest they may have

been somewhat underrepresented.

In Indianapolis, men with the least education were the most likely to be clients, and

the probability of being a client declined monotonically as education increased (Table

3). There were more missing data on education than on other variables for Indianapolis

clients, but over 90% of those with missing data on education were Hispanic (as suggested by Spanish surnames and given names) and most of the remainder appeared to be recent immigrants from other parts of the world (as also suggested by names). Consequently, the observed association between education and patronizing in Indianapolis likely cannot be explained by the missing data. The relationship between education and patronizing in the GSS data is weaker than that in the Indianapolis data.

Married men were slightly to moderately less likely to be clients (1989-91 Indianapolis observed:expected ratio = 0.88, n = 686, p < .001; 1999-2001 Indianapolis ratio = 0.81, n = 532, p < .001; 1988-2002 GSS ratio = 0.44, n = 47, p < .05). There seem to be no clear differences in the demographic distribution of clients between 1990 and 2000, beyond those changes occurring in the general population of the communities studied.

Biometrics

Clients were not consistently taller or shorter than expected, but they tended weigh slightly less than expected (3-8 pounds on average) (Table 4). This combination produced slightly lower BMI in clients than in the general population of men.

Geography

Clients resided reliably closer (2-12 kilometers closer on average) to their arrest locations than the typical male resident of their communities (Table 5). The extent of these differences varies by community, which is an artifact of the pattern and density of settlement in a county and how much of a metropolitan area's population was included within county borders.

Vehicle characteristics

Portland clients residing in the 7-county SMSA had newer vehicles—by about 1-2 years on average—than men in the general population (Table 6). In the 2001 NHTS, income was positively associated with average trip length (Pucher & Renne, 2003). Clients who resided in the outer counties of the SMSA would have had to travel greater distances to patronize in Portland, and thus might be expected to have had higher incomes, and by extension, newer vehicles. The magnitude of difference between observed and expected vehicle age decreased somewhat when only those clients who resided in Multnomah county were considered (1990-1 mean difference = -0.9 years, p < .05; 1994-7 mean difference = -1.1 years, p < .01; 2000-3 mean difference = -1.1 years, p < .001).

Cars were overrepresented among Portland clients' vehicles, while sport utility vehicles, vans, and motorcycles were consistently underrepresented (Table 7). Pickup trucks appeared among clients at about the expected frequency.

Comparison of clients of street prostitutes and clients of offstreet prostitutes

In the Colorado Springs study, 73% of clients reported patronizing street prostitutes, with the remainder patronizing prostitutes only in offstreet settings (escort services, massage parlors, bars, and/or other venues). Clients of street prostitutes and clients of offstreet prostitutes were similar in terms of age, education, race, and number of prostitutes patronized in the prior 5 years in Colorado Springs (Table 8).

Discussion

Young men were overrepresented among male clients of prostitute women in US metropolitan communities, and they also accounted for a disproportionate number of

heterosexual sexual partnerships nationally. Clients were much more likely to be

Hispanic, somewhat more likely to be black, had substantially less education, were less

likely to be married, and weighed a few pounds less on average than men in the general

population, but clients did not deviate from the norm in terms of height. Clients also

resided closer to their arrest locations and drove modestly newer vehicles, which were

somewhat more likely to be cars, than expected for males in their communities. These

results suggest that our prior conclusion (Brewer et al., 2000), based on limited

evidence, that clients are broadly similar to the adult male population, is mostly

incorrect. Furthermore, our analyses of data from a Colorado Springs study focused on

prostitutes, drug injectors, and their contacts, showed that clients who patronized street

prostitutes had similar demographics and patronizing behavior as those who patronized

prostitutes only in offstreet settings.

　　Young men's overrepresentation among clients, old men's underrepresentation, and

the correspondence of this pattern to the number of sex partners men have at different

ages may indicate a biological impetus for much of prostitution. National probability

sample surveys in the UK and Australia also showed a peak in self-reported prevalence

of recent patronizing in men in their 20s and early thirties (Rissel et al., 2003; Ward et

al., 2005). Similarly, the first systematic comparison of a nonprobability sample of

clients with the general population also indicated the underrepresentation of old men

among clients (Freund, 1991).

　　The disproportionately large representation of Hispanics among clients may be due

to the unbalanced adult sex ratio in this ethnic group (male:female sex ratios in

Hispanics ranged from 1.18 to 1.44 for the communities and time periods we examined,

based on Census data). Such imbalances, coupled with the strong tendency toward racially and ethnically homophilous short- and long-term sexual partnerships in the US (Laumann et al., 1994), likely reduced the availability of non-commercial sex partners for Hispanic men, and consequently diverted some to patronize prostitutes. For instance, in a sample of Hispanic men in Decatur, Alabama, interviewed in the course of door-to-door screening for syphilis in 2003, lack of a regular sex partner, residence in the US longer than a year, and absence of family members living in the US were each independently associated with patronizing a prostitute in the prior 6 months (Paz-Bailey et al., 2004). Race and ethnicity are associated with patronizing in other countries as well. In the Australian survey, men from households in which English was not spoken were almost twice as likely to admit patronizing in the previous year as men in English-speaking households (Rissel et al., 2003). In the British survey, men of black Caribbean ethnicity had the highest self-reported prevalence of patronizing in the prior 5 years (Ward et al., 2005).

There is somewhat contradictory evidence across communities, measures, and studies about the relationship between socioeconomic status and patronizing. Although arrested Indianapolis clients had substantially less education than men in the general population, Portland clients drove somewhat newer vehicles than men in the general population. In the UK survey, higher education was mildly associated with patronizing, but lower occupational status was weakly associated with it as well (Ward et al., 2005). In the Australian survey, men with blue collar occupations, less education, and lower income were slightly more likely to report patronizing than other men (Rissel et al., 2003). However, all of our data sources and the UK and Australian studies indicated

that married men or men with live-in partners were less likely to be clients than

unattached men.

Despite the stereotype that unattractive men are more prone to seeking prostitutes

than other men, our results show that clients were not more overweight or

consistently shorter than men in the general population. Self-reported height and

weight in surveys and on driver's licenses (the probable sources for arrested clients'

biometric data) tend to be very slight overestimates compared to direct measurements

(approximately half an inch and less than a pound for the main age groups of clients)

(Kuczmarski et al., 2001; Willey & Falsetti, 1991). These small biases would not

change our results noticeably. Interestingly, shorter men (< 66 inches) in the 1990 UK

survey were much less likely to report patronizing in the previous 5 years than taller

men (Cameron & Collins, 2003).

Overall, several of clients' characteristics suggest features of *demand* for prostitution

(the disproportionate representation of young, Hispanic, and unmarried men). That

clients resided closer to their arrest locations than expected for men overall in their

communities also may suggest the influence of a *supply* mechanism. Street prostitutes

probably choose the areas in which they solicit according to where they are most

tolerated and that are in relatively close proximity to large numbers of prospective

clients. In the US, these conditions are often met in the central parts of a metropolitan

area. Proximity likely leads to men having increased exposure to prostitutes and

opportunity (and convenience) to patronize.

Extrapolating our results to the ecological level, we hypothesize that the prevalence

of clients is higher in communities and countries marked by lopsided sex ratios (more

men than women), a high proportion of male migrants, low rates of premarital sex, relatively old average age at first marriage, and easy access to prostitutes. Although estimating the prevalence of clients validly is challenging (chapter 2), perhaps the highest, well-documented prevalences of prostitutes occurred in settings with most of these factors (Butler, 1985; Goldman, 1978); presumably the prevalence of clients was similarly high in such contexts.

In contrast to the similarity of clients of street and offstreet prostitutes in Colorado Springs, clients of street prostitutes and clients of call girls (prostitutes working for escort services) in Los Angeles in 1990-1 appeared to differ dramatically (Lever & Dolnick, 2000). Lever and Dolnick interviewed a probability sample of street prostitutes and a sample of call girls identified from calling their advertised telephone numbers, responses to study advertisements, and referrals from other call girls. Interviewed women reported their perceptions of their most recent client's characteristics. Clients of street prostitutes and clients of call girls had very similar age distributions, but clients of call girls were much less likely to be black or Hispanic (only 6% combined vs. 63% of clients of street prostitutes) and were perceived to have higher incomes (65% in "upper" category vs. 26% of clients of street prostitutes). It is unclear how representative the described clients of call girls were, as many likely were visitors to the Los Angeles area. The racial and economic profile of call girls' clients in this study is very different from that of clients ascertained in the arrest and GSS data, which suggests such clients may account for a small proportion of clients overall. Likewise, the large number of escort agencies listed in telephone directories and online may misrepresent the extent of activity in this sector of prostitution. The same women often work for multiple agencies

(sometimes in different cities across the country and world) and in multiple sectors (including on the street), and frequently the same agency uses several different names, telephone numbers, and web sites (Barrows, 1986; Hull, 2006; O'Leary & Howard, 2001; Potterat et al., 1990).

The unreliable correspondence between the results for the GSS and the arrest data suggests that the GSS data may contain substantial error, as the arrest data showed consistent results across communities and periods. We cumulated the GSS data across 15 years yet still identified few admitted clients in the GSS. These constraints could have obscured patterns that might otherwise have been observed. The somewhat variable demographic correlations with patronizing between the US, UK, and Australian surveys may also suggest that reporting biases (chapter 2) and potential biases in sampling subsets of clients in household surveys could distort the results. For example, in the GSS, a potential sampling bias could be the underrepresentation of men likely to be clients. Specifically, Hispanic men, especially migrants, disproportionately tended to live together in households that were fluid, complex, and nonconsensually-defined, and thus such men may sometimes not be counted as household members by survey interviewers or Census takers (de la Puente, 1995). Clustering of such men in households would lead to their undersampling as only one person in a household was interviewed in the GSS. In addition, the GSS was conducted in English, and Hispanic men were disproportionately excluded from the GSS on language grounds (60-65% of the language exclusions were for Spanish speakers) (http://webapp.icpsr.umich.edu/GSS/).

Other limitations of our analyses of the arrest and Census data include our inability to adjust for/stratify by relevant variables in assessing a few characteristics' associations with patronizing. Also, our analyses of the arrest data were based only on clients residing in the local area, and thus our results do not necessarily extend to all clients who patronize in the metropolitan areas studied but reside elsewhere or clients who patronize only outside of their local areas. Investigation of this latter subset of clients, to the extent they exist, would be useful for further delineating the scope and nature of prostitution.

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Table 1A. Ratio of observed to expected numbers of male clients, by age group, in 3 US communities, 1990

Age group	Indianapolis	Portland	Yakima	GSS 1988-2002	Sex partners GSS 1989-91[a]
18-24	0.92	1.94	1.24	0.42[b]	1.30
25-34	1.40	1.60	1.38	1.85	1.34
35-44	1.24	0.80	1.05	0.78	1.02
45-54	1.03	0.82	0.90	1.15	1.02
55-64	0.56	0.33	1.19	0.82[b]	0.67
65+	0.15	0.00	0.13	0.32	0.39

Note: All arrest data chi-square goodness-of-fit tests $p < .001$; GSS 1988-2002 $p < .05$. Observed sample sizes = 708 for Indianapolis, 252 for Portland, 143 for Yakima.

[a]Ratio of the proportion of all sex partners reported by males to the proportion of male respondents in the 1989-91 GSS
[b]Expected frequency < 5

Table 1B. Ratio of observed to expected numbers of male clients, by age group, in 5 US communities, 2000

Age group	Dallas	Houston/ Galveston	Indianapolis	Kansas City	Portland	GSS 1988- 2002	Sex partners GSS 1998-2002[a]
18-24	1.89	1.40	1.58	1.53	1.80	0.42[b]	1.27
25-34	1.60	1.48	1.47	1.62	1.48	1.85	1.57
35-44	0.88	1.20	1.07	1.32	1.10	0.78	0.90
45-54	0.36	0.61	0.69	0.64	0.61	1.15	0.82
55-64	0.20	0.36	0.37	0.28	0.38	0.82[b]	0.65
65+	0.00	0.03	0.26	0.09	0.07	0.32	0.59

Note: All arrest data chi-square goodness-of-fit tests $p < .001$; GSS 1988-2002 $p < .05$. Observed sample sizes = 493 for Dallas, 368 for Houston/Galveston, 532 for Indianapolis, 225 for Kansas City, and 353 for Portland.

[a]Ratio of the proportion of all sex partners reported by metropolitan males to the proportion of metropolitan cmale respondents in the 1998-2002 GSS

Table 2A. Ratio of observed to expected numbers of male clients, by race, in 3 US communities, 1990

Race	Indianapolis	Portland	Yakima	GSS 1988-2002	Sex partners GSS 1989-91[a]
American Indian	0.67[b]	0.38[b]	0.00	---	---
Asian/Pacific Islander	0.00	2.81	3.42[b]	---	---
Black	0.99	1.84	6.1[b]	2.05	2.57
Hispanic	---	2.84	---	---	---
White	1.02	0.76	0.96	0.85	0.82

Note: Chi-square goodness-of-fit test: Indianapolis (n = 703) p > .05; Portland (n = 251) and Yakima (n = 143), $\underline{p}$ < .001; GSS 1988-2002 (n = 47), p < .05
[a]Ratio of the proportion of all sex partners reported by males to the proportion of male respondents in the 1989-91 GSS for a given racial group
[b]Expected frequency < 5

Table 2B. Ratio of observed to expected numbers of male clients, by race, in 5 US communities, 2000

Race	Dallas	Houston/ Galveston	Indianapolis	Kansas City	Portland	GSS 1988-2002	Sex partners GSS 1998-2002[a]
American Indian	1.38[b]	0.00[b]	0.73[b]	1.0[b]	0.33[b]	---	---
Asian/Pacific Islander	0.29	0.11	0.00	3.64[b]	1.81	---	---
Black	0.95	1.50	0.92	1.33	1.73	2.05	1.51
Hispanic	---	---	---	5.95	4.46	---	---
White	1.05	0.94	1.05	0.46	0.51	0.85	0.90

Note: Chi-square goodness-of-fit test: Indianapolis (n = 529) and GSS 1988-2002 (n = 47), $p < .05$; Dallas (n = 493), $p < .01$; Houston/Galveston (n = 367), Kansas City (n = 225), and Portland (n = 353), $p < .001$

[a]Ratio of the proportion of all sex partners reported by metropolitan males (observed) to the proportion of metropolitan male respondents in the 1998-2002 GSS (expected)
[b]Expected frequency < 5

Table 3. Ratios of observed to expected frequencies for age-adjusted education, Indianapolis, 2000

Data set	< 9 yrs	9-11 yrs	High school diploma/GED	Some college	Bachelor's degree	Graduate/prof. degree
Indianapolis, 2000	3.33	1.77	1.38	0.60	0.25	0.15
GSS, 1988-2002	1.68[a]	1.04[a]	0.57	1.23	1.17	0.80

Note: chi-square goodness-of-fit test: Indianapolis (n = 450) p <.001, GSS (n = 47) p > .05

[a]Expected frequency < 5

Table 4. Mean difference in observed and expected height (inches), weight (pounds), and body mass index (BMI), adjusted for age and race, for male clients in 3 US communities

Community	Mean difference[a]		
	Height	Weight	BMI
Dallas, 1998-2002 (n = 345)	-0.4[b]	-7.6[c]	-0.8[c]
Houston/Galveston, 1998-2002 (n = 143)	0.5	-2.9	-0.8
Portland, 1989-91 (n = 212)	0.3	-7.6[c]	-1.3[c]
Portland, 1999-2001 (n = 294)	-0.2[b]	-5.4[c]	-2.2[c]

Note: Differences in height expressed in inches and differences in weight expressed in pounds.
[a]Observed – expected
[b]$\underline{p}$ < .05
[c]$\underline{p}$ < .001

Table 5. Mean difference in observed and expected residence-client arrest location distance (kilometers) for male clients in 4 US communities

Community	Mean observed	Mean expected	Mean difference[a]
Indianapolis, 1990 (n = 676)	9.7	11.7	-1.9
Indianapolis, 2000 (n = 481)	9.1	12.0	-2.9
Kansas City, 2000 (n = 225)	9.3	17.0	-7.8
Portland, 1990 (n = 252)	10.1	13.3	-3.2
Portland, 2000 (n = 352)	8.5	12.9	-4.3
Yakima, 1990 (n = 135)	13.5	25.9	-12.4

Note: All mean differences p < .0001.
[a]Observed – expected within matched pairs

Table 6. Mean difference in observed and expected vehicle age adjusted for person age, Portland, over time

Year	Mean observed	Mean expected	Mean difference[a]
1989-91	9.5	10.6	-1.2[b]
1994-6	10.4	11.8	-1.3[b]
2000-3	10.8	12.6	-1.8[b]

Note: The sample sizes of clients for 1989-91, 1994-6, and 2000-3 were 359, 441, and 295, respectively. The corresponding sample sizes of Portland-area households in the surveys were 110, 163, and 203, respectively.

[a]Observed – expected
[b]$p < .001$

Table 7. Ratios of observed to expected frequencies of vehicle types, Portland, over time

Vehicle type	1989-92	1994-7	2000-3
Car	1.11	1.23	1.41
Van	0.00	0.10	0.82
SUV	---	0.05	0.53
Pickup truck	1.11	1.31	0.94
Motorcycle	0.17	0.09	0.06

Note: All observed distributions different from the expected, $p < .0001$

Observed n 1989-92 = 330; 1994-7 = 419; 2000-3 = 249
Expected n 1989-92 = 111;1994-7 = 186; 2000-3 = 220

Table 8. Comparison of clients of street prostitutes and clients of offstreet prostitutes, Colorado Springs, 1988-92

Variable	Clients of street prostitutes Mean (SD)/% (n)	Clients of offstreet prostitutes Mean (SD)/% (n)	Association[a]
Age (years; n = 132)	34.0 (9.4)	34.5 (11.3)	.03
Education (years; n = 130)	13.2 (2.5)	12.2 (2.5)	-.17
Number of local prostitute sex partners in last 5 years (n = 131)	8.6 (12.8)	5.3 (8.0)	-.12
Race			.03
Black	21 (19)	17 (6)	
Hispanic	12 (11)	26 (9)	
White	67 (62)	57 (20)	

Note: All associations $\underline{p}$ > .05.
[a]Point biserial (Pearson) correlation for all ratio-scale variables, with offstreet coded as 1 and street coded as 0; Goodman and Kruskal's tau for race.

Chapter 4

Extent, Trends, and Perpetrators of Prostitution-Related Homicide in the United States*

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Violence is prominent in prostitution, and the trade is often linked to other criminal behavior, illicit drug use, and illicit drug markets (1-5). In surveys, many prostitute women report physical and sexual violence from clients and pimps (1, 6-16). Moreover, active and passive surveillance of prostitute women in Canada, Kenya, the United Kingdom, and the United States indicate that homicide is the leading cause of death in this population (10, 17, 18).

In a prospective study, prostitute women who worked in Colorado Springs, Colorado between 1967 and 1999 had a higher homicide victimization rate (229 per 100,000

person-years; standardized mortality ratio = 18) than any set of women ever studied

(17). Nearly all homicides observed in this study occurred while the victims were

working. This observed homicide rate and an empirical estimate of the prevalence of

prostitute women (19) together imply, by extrapolation, that 2.5% of all female homicide

victims in the U.S. in recent decades were prostitute women (17). Clients and pimps

might also be expected to be homicide victims given the violent milieu of prostitution,

but we have been unable to find any systematic studies of their victimization.

Focused and efficient homicide investigations require reliable information on

probable perpetrators. Homicide investigators often assume that drug dealers and

pimps are the primary perpetrators of prostitute homicide (20). However, in recent

years, clients committed 62%-64% of prostitute homicides in Canada and the U.K. (21,

22). To our knowledge, there has been no prior research on the perpetrators of

prostitute homicide in the U.S.

In this paper we report on the extent, trends, and perpetrators of prostitution-related

homicide based on analyses of homicide data from a wide variety of sources. Through

these analyses, we also assess the prior extrapolated estimate of the extent of

prostitute homicide and the consistency of patterns in prostitution-related homicide

across time, space, and data sources. In the discussion, we interpret our results and

highlight implications for law enforcement investigation of prostitution-related homicide.

Methods

We analyzed data from nine different samples of homicides. Four of these include

homicides routinely recorded by criminal justice and/or vital statistics agencies. The

other five include prostitute homicides ascertained through a variety of other

approaches. The diversity of samples allows determination of the reliability of observed

patterns and potential shortcomings in particular samples. We defined a homicide as

prostitution-related if it occurred in the context of prostitution or if the perpetrator's

motive was prostitution-oriented (e.g., targeting an individual because of his/her role in

prostitution or because of a dispute originating from prostitution activity). We focused

exclusively on heterosexual prostitution because in investigations it can be difficult to

differentiate between commercial and non-commercial homosexual encounters and

determine objectively a male client's awareness of and intent in picking up a transvestite

prostitute. Therefore, in our study, all prostitutes were female and all clients and pimps

were male.

General Samples of Homicides

Supplemental Homicide Reports (SHR), 1976-2002

Since 1968, local law enforcement agencies across the U.S. that participate in the

Uniform Crime Reporting program have reported incident-level information on

homicides to the Federal Bureau of Investigation (FBI). One variable in the SHR data

set (23) indicates whether the homicide circumstance involved prostitution. We

considered female victims who were killed in circumstances involving prostitution to be

prostitutes. Our analyses include reports from 1976 to 2002 because the earlier SHR

data do not include a code for prostitution as a possible circumstance of homicide.

Thirty-three Urban Counties, 1988

The Bureau of Justice Statistics (24) gathered data on murder cases filed in

prosecuting attorneys' offices in 33 urban counties. The included cases were

adjudicated in 1988 and involved an arrested perpetrator. All such cases were included

for counties with 200 or fewer cases; a random sample of 200 cases was drawn for each county with more than 200 cases. We considered all female victims who were killed in circumstances of heterosexual prostitution or sex for drugs to be prostitutes in addition to those female victims explicitly identified as prostitutes. All recorded prostitute murders occurred between 1986 and 1988. Heterosexual prostitution-related client and pimp murders cannot be unambiguously and consistently inventoried in these data. Therefore, for this data set we analyzed prostitute murders only. To estimate the proportion of female murder victims who were prostitutes, we multiplied the observed number of prostitute murders and female murders overall in a county by a case sampling weight (the inverse of the proportion of cases sampled in that county) and then summed the weighted number of prostitute murders and female murders, respectively.

Chicago, 1965-1995

Carolyn and Richard Block (25) coded all homicides in Chicago police reports for the period between 1965 and 1995 on many variables, including the relationship each perpetrator had with his/her victim(s) and vice versa. Prostitute, client of prostitute, and pimp are some of the role relationships coded in these variables.

St. Louis, 1978-1995

The St. Louis Homicide Project, directed by Richard Rosenfeld and Scott H. Decker of the University of Missouri-St. Louis, involved collecting quantitative and police narrative data on homicides recorded by the police in St. Louis between 1978 and 1995. We reviewed the narratives and systematically coded prostitution role relationships (prostitute, client, or pimp) perpetrators and victims had with each other and whether the

homicide was prostitution-related. In some cases, the narratives indicate that a victim and/or perpetrator was involved in prostitution, but do not specify that the homicide was prostitution-related.

Washington State, 1981-1986

The publicly available version of the Homicide Investigation Tracking System (HITS) database (26) includes information on murder cases voluntarily reported by local and state agencies to the Washington State Attorney General's Office. Two of the many variables in the database indicate whether a victim had an occupation of "prostitute" or "streetwalker" and whether a perpetrator used deception in the form of patronizing a prostitute to contact the victim.   We considered a female victim to be a prostitute if the case had either of these attributes. This version of the data set does not include any of the "Green River" prostitute homicides (20).

North Carolina, 1991-1993

Decker, Moracco, Runyah, and Butts (27) identified all non-domestic female homicides in North Carolina between 1991 and 1993 through retrospective review of medical examiner records and telephone interviews with homicide investigators. These data indicated whether a homicide was prostitution-related. We obtained the number of all female homicides in North Carolina in this period from WISQARS (http://www.cdc.gov/ncipc/wisqars).

Samples of Prostitute Homicides

Colorado Springs, 1967-1999

We followed prospectively an open cohort of 1,969 prostitute women in Colorado Springs identified from public health and police surveillance (17). We ascertained

women who were killed while still active prostitutes from searches of the Social Security

Death Index (SSDI), National Death Index, local media reports, local police records, and

records of selected other police agencies across the U.S.

National Center for the Analysis of Violent Crime (NCAVC), 1982-2000

The second author collected and coded data on 123 cleared female prostitute

homicides committed by lone male perpetrators in the U.S. between 1982 and the first

half of 2000 (28) from the FBI's NCAVC. These cases were cleared by arrest, warrant

for arrest, or exceptional means (e.g., death of suspected perpetrator). Cases were

submitted to the NCAVC by local, state, and federal agencies requesting investigative

support. The 123 cases represent a haphazard sample of 253 such prostitution

homicide cases recorded by the NCAVC at the time as well as a handful of other cases

that were provided by the investigating agencies. The second author sought

comprehensive reports on these cases from the local, state, and federal agencies that

reported these cases. These extensive data include variables indicating whether the

perpetrator solicited sex from the prostitute victim, whether the perpetrator was known

to frequent street prostitutes, and whether the perpetrator was the victim's pimp.

National Media Sample, 1965-2005

In early 2004, we searched two online national newspaper databases (Newsbank

Retrospective/NewsFile Collections,1970-2004, covering over 500 North American

newspapers; Ethnic NewsWatch, 1960-2004, covering 275 publications of the ethnic,

minority, and native press) and databases for four major metropolitan newspapers (The

Indianapolis Star, 1999-2004; The Oregonian [Portland], 1990-1998; The Seattle Times,

1990-2004; St. Louis Post-Dispatch, 1988-2004) with the keywords "prostitu*" and

"murder*." The * in the keywords represent wildcards that include all words beginning with the listed stem. We conducted a parallel search of the ProQuest ((http://www.proquest.umi.com) newspaper and publication database in May, 2005. We also searched relevant documents posted on the World Wide Web with the Google search engine (http://www.google.com), using the keyword string "prostitute murder arraign OR arrest OR charge OR convict OR accuse OR prosecute". Google automatically searches for variants of words. We inspected the web pages identified by the Google search and also followed relevant links on these pages to additional documents on prostitute homicides. We examined more than 11,500 articles/documents identified in the newspaper and Web searches. In addition, we reviewed a catalog of serial homicide cases (29) and scores of academic and "true crime" publications on homicide cases for information on prostitute homicides. Moreover, we added media reports of prostitute homicides to our database that colleagues informed us about or we discovered incidentally.

We included in our analysis prostitution-related homicides of biologically female prostitutes in the U.S. that had been cleared by law enforcement officials. For our purposes, clearance was indicated by: 1) charges against an accused perpetrator (and no later dropping of charges except when key witnesses were unable to testify); 2) law enforcement officials' belief that they had sufficient evidence to charge a perpetrator for the victim's homicide, but postponed doing so as a prosecutorial strategy (to save the case as a backup); or 3) an offer of a plea bargain to the accused perpetrator. We excluded cases in which a conviction was later overturned and had been based on a forced confession without any other supporting evidence (or had contrary physical

evidence). We retained cases in which the charges were dismissed or the accused perpetrator was acquitted (without contrary physical evidence) but police still considered the case cleared by the arrest.

When information on the relationship between victim and perpetrator was lacking, we searched for more information on the case (by perpetrator and/or victim name) in several media sources: a listing of published books sold by the bookseller Amazon.com (http://www.amazon.com), the World Wide Web via Google, electronically archived national newspapers via ProQuest, and online archives of the newspapers in the local/regional area where the homicide occurred. The archives of particular newspapers include short articles and news briefs typically not included in the national newspaper archives. We also sought to augment information on cases in selected jurisdictions (Connecticut, Texas, Virginia, Washington state, Kansas City, MO, and Minneapolis, MN) by requesting incident reports from the local law enforcement agencies that had investigated these cases.

Furthermore, we searched the Social Security Death Index (SSDI) (via http://www.familytreelegends.com) for victims whose death dates were not known precisely from media sources. A large proportion of such women had no records in the SSDI, as we found in our prior research on prostitute mortality (17). If the victim's identifying information (name, birthdate/birth year, place of death, and/or place of birth) was consistent between the media reports and SSDI, we used the death date listed in the SSDI. When a victim's date of death was not known precisely from either the media reports or SSDI, we estimated the date as the midpoint of the known interval of death (if

available; interval length was 2 years or less for 73 of 80 victims for whom the date was estimated).

Results

Extent of Prostitution-related Homicide

Table 1 shows the number of female prostitute homicide victims and the percentage of female victims they represent in each of the general samples of homicides. The percentage of female homicide victims who were prostitutes ranges from 0.3% to 7.2% across samples. Some of this variation might be explained by different definitions of prostitute victims. The prostitute victims in the SHR, 33 urban counties, Chicago, and North Carolina data sets include just those females killed in prostitution-related circumstances. The St. Louis and Washington state data, however, include female victims who were identified as prostitutes even if their deaths were not necessarily prostitution-related. At least twenty (57%) of the 35 St. Louis prostitute victims (3.6% of all female victims) died in circumstances involving (or suggesting, in the case of four victims) prostitution. The 15 St. Louis prostitute homicides not classified as prostitution-related were committed by drug dealers (3), other types of perpetrators (2), or unknown perpetrators in unknown circumstances (10). Of the six Washington state prostitute murders, at least 4 were prostitution-related (1.3% of all female victims).

Table 1 also shows the estimated percentage of female homicide victims in the U.S. during the 1980s who were prostitutes (17). We calculated this extrapolated estimate by multiplying the homicide victimization rate in the Colorado Springs cohort of prostitute women and a capture-recapture estimate of prostitute prevalence in the Colorado Springs area (El Paso County) (19). (This area is demographically similar to

the U.S. as a whole, including the proportion of the population that is rural.) We then

divided the product by the mean annual number of female homicides in the U.S., based

on figures from CDC Wonder for 1980 (http://wonder.cdc.gov) and WISQARS for 1981-

1990 (http://www.cdc.gov/ncipc/wisqars). The extrapolated estimate from Colorado

Springs and the median estimate from the six contemporary data sets is the same

(2.5%).

The Chicago and St. Louis data also contain information about client and pimp

homicides. In the Chicago data, there are 38 client and seven pimp homicides that

were prostitution-related, with each victim type representing less than 0.2% of all 19,433

male victims. In the St. Louis data, there are 13 client and eight pimp homicides that

were prostitution-related, with each victim type representing less than 0.4% of all 3,543

male victims.

Ascertainment

Prostitute homicides were grossly underascertained in most samples, contributing to

the variation in estimates in Table 1. Table 2 shows the overlap in prostitute homicides

ascertained by pairs of contemporary samples. The numerator in each cell indicates

the number of prostitute homicides that appear in both samples, and the denominator

indicates the number of prostitute homicides identified in the row sample that

corresponds to the jurisdiction and time period of the column sample. The criteria for

determining matching prostitute homicides between data sets were: exact match on

year of homicide; within one month on month of homicide; exact match on state and

local jurisdiction (the latter if available in both sources); exact match on victim sex and

race; within one year on victim age; and exact match on offender race and sex, and

within one year on offender age (if offender demographics available in both sources). In

defining matches, we allowed victim age or race to be missing, but not both.

Furthermore, we allowed slightly more missing or discordant data on these variables if

cases were linked by a common offender and the available evidence in both samples

reflected this. Table 2 indicates that the observed overlap ranged from 0 to 44%, even

though, in principle, the overlap between most pairs of samples would be 100% if

ascertainment were complete in one sample or the other.

The underascertainment in the SHR seems to be due in part to the monthly reporting

schedule for participating agencies. Monthly reporting apparently requires agencies to

report homicides in the month that they are discovered even if that is not the month in

which they actually occurred or if the social context of the homicide is not yet known.

Prostitute homicides often go undetected as such for weeks, months, or years, so the

SHR procedures have a built-in bias toward underascertainment of many prostitute

homicides. Similarly, the SHR likely often misrepresents the date of such homicides

(we encountered a few instances of this in examining overlap). Underascertainment of

prostitute homicides is also implied by the high proportions of female homicides with

missing data on the circumstances and victim-offender relationship in the SHR and

Chicago data sets (SHR = 23%, Chicago = 19%).

Other evidence points to low rates of detected prostitution-related homicides in the

data sets we analyzed. Only 5 total prostitute homicides in North Carolina between

1991 and 1993 were identified in the SHR, NCAVC, and media samples combined. It is

unknown whether any of these 5 were included in the 29 prostitute homicides Decker et

al. (27) found in North Carolina during the same period. At best, the detection rate of

the combined SHR, NCAVC, and media samples is 17% for prostitute homicides in North Carolina during this period. The data sets similarly underascertained client and pimp homicides. Only one of the 36 Chicago client homicides was among the 35 client homicides (including just one in Chicago) in the media sample. None of the 13 St. Louis client homicides appeared in the media sample, and none of the pimp homicides in Chicago ($\underline{n}$ = 7) or St. Louis ($\underline{n}$ = 8) were among the 5 pimp homicides in the media sample. Despite marginal overlap between some pairs of data sets, our analyses of each data set include all homicides identified in that data set.

Capture-recapture analysis, however, permits more complete estimation of the number of prostitute homicides. The features of the NCAVC and media samples allow direct comparison of the specific prostitute homicides detected in each. Other pairs of samples are not suitable for capture-recapture analysis because they exhibit very little or no overlap or have obvious biases that lead to undermatching by our criteria (e.g., the SHR).

We began by estimating the total number of lone male perpetrators in cleared prostitute homicide cases in the US between 1982-2000 (the period for which data are available for both the NCAVC and media samples) with a simple two-sample capture-recapture method ([number of perpetrators in NCAVC sample x number in media sample] / number appearing in both samples) (30). The factors leading to submission of a case to the NCVAC are not necessarily the same as those that might draw media attention about a case, and vice versa. Therefore, it seems reasonable to view these as independent samples for the purpose of analysis. However, inclusion in either sample was probably more likely for serial perpetrators, introducing a common bias. Therefore,

we estimated the number of lone male perpetrators involved in cleared cases of prostitute homicide separately for those with single victims and those with multiple victims. From these calculations, we estimate 1,650 single perpetrators ([49 in NCAVC x 101 in media] / 3 overlapping) and 142 serial perpetrators ([26 in NCAVC x 71 in media] / 13 overlapping) in this period. Serial perpetrators in the media sample in this period had a mean of 6.3 (446/71) victims, which would suggest approximately 892 prostitute homicide victims of serial perpetrators. The sum of the estimated number victims in cleared prostitute homicides involving lone perpetrators is thus 2,542 (1,650 + 892) and represents 2.7% of all female homicides in the U.S. during the 1982-2000 period (Table 1). This estimate is very conservative because a large, but unknown, proportion of prostitute homicide cases are never cleared and because team perpetrators are excluded (given the NCAVC data set's inclusion criteria).

Trends of Prostitution-related Homicide

   Figure 1 displays the frequencies of prostitution-related prostitute homicides over time for the three national samples. The graphs are based on data grouped biennially (e.g., 1965-1966, 1967-1968, etc.); data are shown for a particular time point only if the data set covered both years in a biennial group. The different data sets tend to reveal somewhat similar patterns over time. The media sample indicates few recorded prostitute homicides in the 1960s. In the 1970s, the number of prostitute homicides increased steadily. The 3 samples show a large rise in the early and mid 1980s. The 1983-4 jump in the national media sample is due entirely to dozens committed by one serial perpetrator (Gary Ridgway in Washington state). If these homicides are excluded, the national media sample shows a dip in 1981-2, and in 1983-4 returns

approximately to the 1979-80 level. None of the Ridgway homicides is included in the

SHR or NCAVC data sets. All samples exhibit moderate to large increases in prostitute

homicide in the late 1980s and early 1990s. Thereafter, the NCAVC and national media

samples indicate relatively high and stable frequencies, whereas the SHR suggests a

fairly dramatic decline. In the final years of the NCAVC and media series, there are

noticeable decreases, but these appear to be an artifact of the considerable time lag in

solving prostitute homicides (see below). Although the time series data for the other

contemporary samples are sparse, the biennial periods with the highest frequency of

prostitute homicides in each of these samples occurred after 1986 (Chicago: 1993-4;

Colorado Springs: 1987-8; St. Louis: 1991-2).

The lag between the dates of a prostitute homicide and the perpetrator's arrest tends

to be long. In the media sample, lags were calculable for 508 of the 580 cleared

prostitute homicide cases. Forty-one percent had lags longer than one year, and 17%

had lags longer than five years. Seven percent (1/15) and 50% (2/4) of the cleared

prostitute homicides in the 33 urban counties and Washington state samples,

respectively, had lags more than one year.

The trends in prostitute homicide are roughly parallel to those for female homicide

overall in the US, with a median Pearson correlation of .59 (range = .47 to .66) between

frequencies of prostitute homicide in the national data sets and female homicide overall

in the biennially grouped data. (The frequencies of female homicide overall are national

statistics from the Centers for Disease Control and Prevention (Vital Statistics of the

United States for 1967-1978 [http://www.cdc.gov/nchs/products/pubs/

pubd/vsus/vsus.html]; CDC Wonder for 1979-1980; WISQARS for 1981-2002). The

overall series, with frequencies divided by 100 for convenient display, does not exhibit the shifts as sharply as the prostitute homicide series, but this may be substantially due to variability in prostitute homicides appearing larger as a consequence of smaller frequencies (Figure 1). The correlation between two untransformed time-series is not a good estimate of their underlying association, but it is a convenient way to assess the overall similarity of the two trends.

The general increase over time in frequency of prostitute homicides in the media sample is not a consequence of increased media interest or law enforcement attention to serial murder. The Pearson correlation between frequency of prostitute homicides committed by single perpetrators and the frequency of those committed by serial perpetrators (years grouped biennially) is .80, and the shapes of the two time series are similar (data not shown).

The distribution of prostitution-related client homicides through time generally corresponds to that for prostitute homicides (for biennially grouped data: Chicago, r = .49; St. Louis, r = .21; media = r = .73). The few prostitution-related pimp homicides in Chicago (n = 7) and St. Louis (n = 8) occurred from the late 1970s to the mid/late 1980s, and were not observed before or after this period. Three of the five pimp homicides in the media sample occurred between 1968 and 1991, and the other two (resulting from conflict between competing immigrant pimps/prostitution rings) occurred in 2004.

Perpetrators of Prostitution-related Homicide

Lone perpetrators accounted for most prostitute homicides, including 91% in Chicago, 85% in St. Louis, 82% in the 33 urban counties, and 96% in the media sample.

Client homicides were somewhat less likely to be carried out by lone perpetrators, although they still predominated, accounting for 78% in Chicago, 62% in St. Louis, and 66% in the media sample.

Tables 3-5 show the perpetrator by victim ("killer to killed") matrices of prostitution-related homicides in the Chicago, St. Louis, and media samples, respectively. Homicides in the tables refer to unique victims. When multiple perpetrators were involved with the same homicide and had the same prostitution relationship to the victim, we classified them as one perpetrator with that relationship. All other homicides involving multiple perpetrators had one perpetrator with a prostitution relationship to the victim and one or more other perpetrators with a non-prostitution relationship to the victim; we classified the perpetrators in these homicides as a single perpetrator by the perpetrator with a prostitution relationship to the victim. For the media sample, when a serial perpetrator's relationship to one of his prostitute victims was not explicitly reported, his relationship to his other prostitute victims was imputed to those lacking explicit indications.

In these data sets, clients were perpetrators of 60-78% of prostitute homicides (75-96% of homicides in which the perpetrator's prostitution relationship to the victim is known). Prostitutes, acting alone or with a pimp, were perpetrators of 77-91% of client homicides (86-94% of homicides in which the perpetrator's prostitution relationship to the victim is known). Pimps were perpetrators of 40-57% of pimp homicides (40-67% of homicides in which the perpetrator's prostitution relationship to the victim is known). Overall, as perpetrators of prostitution-related homicide, prostitutes' primary victims

were clients, clients' main victims were prostitutes, and pimps' typical victims were other pimps.

Tables 3-5 indicate that in terms of raw frequencies of prostitution-related homicide, prostitutes were the most victimized, followed by clients and then pimps. However, perpetrators of prostitution-related homicides were most often clients, followed by prostitutes and then pimps. Prostitute-perpetrated (alone or with a pimp) client homicides represent 1.1-3.3% of all homicides committed by females in the Chicago and St. Louis data sets.

Several of the other data sets also illuminate the perpetrators of prostitute homicides. Table 6 shows that, across the 5 samples, clients committed 57% to nearly 100% of the prostitution-related prostitute homicides in which the perpetrator's prostitution relationship with the victim is known. Pimps were perpetrators in 2% (2 of 90 for whom data were available) of the NCAVC prostitute homicides. In addition, 84% of perpetrators (26 of 31 for whom data were available) in this sample were known to have patronized street prostitutes in well-known stroll (street prostitution) areas (28).

Serial perpetrators account for a large share of prostitute homicides. The large majority of prostitute victims in the NCAVC (60%, 74/123) and national media (77%; 447/580) samples were killed by serial perpetrators of prostitute homicide. Twenty-six of the 75 (35%) perpetrators in the NCAVC data had killed multiple prostitutes, as had 97 of the 230 (42%) perpetrators (with team perpetrators counted as one perpetrator only) in the media sample. In the media sample, the percentage of serial perpetrators increases to 55% if single perpetrators are reclassified as serial perpetrators because they were perpetrators of additional cleared prostitute homicides for which we lacked

specific information ($\underline{n}$ = 5), committed non-fatal assaults against prostitute women ($\underline{n}$ = 18), or were suspects in other prostitute homicides ($\underline{n}$ = 5) or assaults ($\underline{n}$ = 2). Furthermore, nearly all serial perpetrators of prostitute homicide were clients (92% [22/24] in the NCAVC and 99% [74/75] in the national media samples).

Despite the large percentage of perpetrators in the NCAVC and media samples who were serial perpetrators, the actual percentage is likely substantially less. The capture-recapture analysis involving cleared prostitute homicides in the NCAVC and media samples suggest that 35% (892/2,542) of prostitute homicide victims in the U.S. between 1982 and 2000 were killed by serial perpetrators of prostitute homicide. The same analysis yields an estimate that 8% (142/1,792) of all perpetrators in cleared prostitute homicide cases had multiple victims. Both of these estimates are conservative, though, in that serial perpetrators were underidentified due to the factors mentioned in the previous paragraph.

Serial perpetrators may be as common in client homicide as in prostitute homicide. Thirty-seven percent (13/35) of client victims in the media sample were killed by serial perpetrators, and 15% (4/26) of perpetrators of client homicide had multiple victims.

Prostitute and client homicides in the media sample differ somewhat in the sector of prostitution in which they occurred. Three percent (16/580) of prostitute victims were known to be working off-street at the time of death. However, 20% (7/35) of client victims were patronizing an escort/call-girl prostitute at the time of death.

Prostitute homicides committed by clients are not easily characterized by motives. Often, any attributed motive is based solely on the self-report of the perpetrator. The varied motives cited in the NCAVC, media, Chicago, and St. Louis data include

arguments over the sex for money/drugs exchange, responses to the victim's

(attempted) robbery of the client, verbal insults from the victim, demands or requests by

the victim, the client's misogyny, the client's hatred of prostitutes, the client's sadism,

the client's psychopathology (e.g., sexual deviance, psychopathy, and psychosis), other

motives, some combination of these reasons, or, commonly, no apparent precipitating

factor.

Client homicides committed by prostitutes were predominantly associated with

robbery/theft (39% in Chicago, 80% in St. Louis, 61% in the media sample) or

altercations over the sex for money/drugs exchange (53% in Chicago, 10% in St. Louis,

16% in the media sample). The characteristics of client victims in the Chicago, St.

Louis, and media samples suggest client victims were vulnerable and attractive targets

for robbery: their median ages ranged between 40 and 51 (22-31% were older than age

60), and 73% were professionals or business owners (media sample only). In St. Louis,

all pimp homicides committed by other pimps were retaliatory killings related to

prostitution "business" disputes between perpetrator and victim (e.g., over prostitution

"turf", "stealing" one another's prostitute, and robbery of another pimp's prostitute); the

Chicago data do not provide sufficient detail for such classification.

Discussion

By our conservative estimate, 2.7% of all female homicide victims in the U.S. during

the 1980s and 1990s were prostitutes, with prostitutes accounting for much higher

proportions in some areas of the U.S. These results approximate the 2.5% national

estimate extrapolated from a prospective study of mortality in prostitutes (17).

Prostitution-related homicides were underascertained considerably in the nine homicide

data sets we examined, and a key limiting factor for several data sets was the long time often required to solve such crimes. Frequencies of recorded prostitution-related prostitute and client homicides generally increased over the last four decades and spiked prominently during the late 1980s and early 1990s. Nearly all of the few observed pimp homicides occurred between the late 1970s and mid 1980s. Lone perpetrators accounted for the overwhelming majority of prostitute and client homicides. In these data sets, clients committed 57-100% of prostitute homicides, prostitutes committed 86-94% of client homicides, and pimps committed 40-67% of pimp homicides. Serial perpetrators of prostitute homicide killed more than one-third of prostitute victims, and nearly all such serial perpetrators were clients. With few exceptions, prostitute homicide victims worked on the street, although 20% of client victims were patronizing off-street prostitutes when killed. Interestingly, the extent and perpetrators of prostitute homicide during the 19th century (31) are similar to those we observed for recent decades.

The frequency of prostitute homicide in urban areas is likely underestimated in the urban data sets. Perpetrators often dump bodies of their prostitute victims outside of the central cities in which they met, making the resulting homicide cases outside many of the jurisdictions covered in the samples we analyzed (as evidenced by numerous cases in the media sample; e.g., (32-36)). Furthermore, while others have noted underascertainment bias in the SHR for other types of homicide (37, 38), our results indicate that underascertainment of prostitution-related homicide is also a problem for the SHR and other homicide data sources we examined. An unknown fraction of prostitute homicides may not have been recorded in the nine data sets we examined—

beyond that already discussed—because identified victims were not recognized as prostitutes, or because the bodies of some prostitute victims were never found or identified due to decomposition of remains. Given the challenges to detecting prostitute homicides, the true extent of prostitute homicide may be much larger than that which we estimated.

The increase in recorded prostitute and client homicides beginning in the late 1980s and early 1990s could reflect a genuine increase in homicidal violence or improved detection and recognition of such homicides. The similarity of the time series based on different data sources suggests the trends are real. Indeed, Lowman (22) observed a similar increase in British Columbia, Canada, beginning in the mid-1980s. If the increase we observed were genuine, one possible cause is the temporally concomitant upsurge in crack cocaine use by prostitutes and others in the U.S. Crack use by prostitutes may increase their vulnerability to violence (e.g., by soliciting while high and the rapid cycle of short-term effect followed by intense withdrawal symptoms, including irritability) and propensity for violence (through increased desperation for money or drugs) (cf. (9, 39)). Cocaine pharmacologically enhances aggression (40), which might also promote violence between clients and prostitutes to the extent either party uses crack. Indeed, most victims and perhaps most perpetrators of prostitute homicide during the crack era were under the influence of cocaine at the time of the homicide (Table 6). Moreover, anecdotal reports (41, 42) suggest cocaine use can inhibit male sexual function, which could lead to a cocaine-using client's misplaced frustration with the prostitute and/or the prostitute ending sexual activities before the client thinks appropriate. The risk of client violence would seem to increase in either situation.

The rise of crack cocaine use in prostitute women may also account for the disappearance of pimp homicides. The prevalence of pimps may have declined and their central role in prostitution may have faded in response to crack-using prostitutes, whose crack addictions undermine pimps' control and earning power (42) and who may tend to engage in prostitution without pimps. (Given the likely small population of pimps, though, their homicide victimization rate is likely quite high despite the few homicides among them.) However, 40% of a sample of incarcerated prostitute women in a large northeastern U.S. city in 1998-9 reported having a pimp, and pimped women's crack use was almost the same as that for women without pimps (43). Further research may better elucidate the prevalence of pimps, violence between them, and the relationship between pimping and prostitutes' crack cocaine use.

We found an unexpectedly large number of client homicides in Chicago and St. Louis. In our media search of prostitution-related homicides, we encountered comparatively fewer reports of client homicides. This suggests that client homicides are much less newsworthy than prostitute homicides or are reported in the media but in terms that do not convey the connection to prostitution. Nonetheless, clients' homicide victimization rate is likely to be much smaller than prostitutes' victimization rate because there are far more clients than prostitutes. Still, violence against clients in prostitution may be generally underrecognized. Fifty-six percent of prostitute women participating in a case management project reported ever assaulting a client not in self-defense (44). In addition, violence perpetration against clients was modestly negatively associated with violence victimization by clients in this sample, suggesting that prostitute victims and perpetrators tend to be somewhat distinct subsets of prostitute women.

Our results have practical implications for the prevention and investigation of prostitute and client homicide. Although prostitute homicides are among the most difficult to solve (10, 27, 28), victims come from a small pool of women who are relatively easily identified when working. As our results indicate, perpetrators also are a definable set of men who can be observed in public when patronizing prostitutes. These facts suggest that ongoing proactive surveillance of diverse prostitution strolls (areas of street prostitution) and collection of DNA (45-48) and other samples (e.g., vehicle carpet fibers, tire tread patterns, dental imprints) from both clients and prostitutes arrested for prostitution or interrogated in the field could help deter and solve prostitute and client homicides.

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TABLE 1. *Percentage of female homicide victims who were prostitutes.*

Sample	% of female victims who were prostitutes
Chicago	0.9 (39/4,384)*
St. Louis, 1978-95	6.3 (35/560)
Washington state, 1981-6	2.0 (6/306)
North Carolina, 1991-3	4.7 (29/611)
Suppl. Homicide Reports, 1976-2002	0.3 (304/118,577)†
33 urban counties, 1988	2.9 (40/1,356)
Capture-recapture estimate for U.S., 1982-2000 (NCAVC vs. media)	2.7 (2,542/94,012)
Estimate for U.S., 1980s, extrapolated from Colorado Springs cohort	2.5

Note: Fractions in parentheses indicate the number of prostitute victims divided by the number of all female victims.

*If based on only those female victims whose relationship to perpetrator is known ($\underline{n}$ = 3,553), this percentage is 1.1%.

†If based on only those female victims whose death circumstances are known ($\underline{n}$ = 91,231), this percentage remains 0.3%.

TABLE 2. *Overlap in prostitute homicides identified by different contemporary data sources.*

	SHR	33 counties*	Chicago	St. Louis	Washington state	Colo. Springs cohort†	NCAVC	media
SHR	---	---†	8/18	0/0	0/0	---	10/235	33/304
33 counties‡	3/17	---	1/1	0/0	---	---	0/17	2/17
Chicago	8/31	1/4	---	---	---	---	4/20	1/39
St. Louis	0/20	0/0	---	---	---	---	0/20	0/20
Washington state	0/6	---	---	---	---	---	0/6	1/6
Colo. Springs cohort	0/14	0/1	---	0/0	0/1	---	1/17	1/16
NCAVC§	10/123	---†	4/14	0/0	0/1	---	---	46/123
Media§	33/537	2/18	1/28	0/0	1/46	---	46/463	---

Note: In each cell, the numerator indicates the number of homicides identified in both samples of a pair and the denominator indicates the number ascertained by the row sample in a comparable time period and jurisdiction to that in the column sample. Dashes indicate that comparisons were not possible by definition.

*Denominators in this column refer to homicides occurring in 1986-8. Lack of overlap could be due to lack of prosecution in same time period.

†No values computed for column or cell because no sensible denominator is calculable or comparable with column sample's jurisdiction.

‡Denominators in this row refer to murders adjudicated in 1988.

§Denominators in this row refer to cleared homicides.

TABLE 3. *Relationships between perpetrators and victims in prostitution-related homicide, Chicago, 1965-95.*

Victim Perpetrator	Prostitute	Client	Pimp	Total
Prostitute	3 (8) (10)	28 (78) (90)	0 (0) (0)	31 (38) (100)
Client	30 (77) (94)	0 (0) (0)	2 (29) (6)	32 (39) (100)
Pimp	4 (10) (31)	5 (14) (38)	4 (57) (31)	13 (16) (100)
Prostitute/ Pimp pair	0 (0) (0)	3 (8) (100)	0 (0) (0)	3 (4) (100)
Unknown	2 (5) (67)	0 (0) (0)	1 (14) (33)	3 (4) (100)
Total	39 (100) (48)	36 (100) (44)	7 (100) (9)	82 (100) (100)

Note: Cells display frequencies with column percentages in the top parentheses and row percentages in the bottom parentheses.

TABLE 4. *Relationships between perpetrators and victims in prostitution-related homicide, St. Louis, 1978-95.*

Victim Perpetrator	Prostitute	Client	Pimp	Total
Prostitute	0 (0) (0)	6 (46) (86)	1 (13) (14)	7 (17) (100)
Client	12 (60) (92)	0 (0) (0)	1 (13) (8)	13 (32) (100)
Pimp	2 (10) (29)	1 (8) (14)	4 (50) (57)	7 (17) (100)
Prostitute/ pimp pair	0 (0) (0)	4 (31) (100)	0 (0) (0)	4 (10) (100)
Other	2 (10) (100)	0 (0) (0)	0 (0) (0)	2 (5) (100)
Unknown	4 (20) (50)	2 (15) (25)	2 (25) (25)	8 (20) (100)
Total	20 (100) (48)	13 (100) (32)	8 (100) (20)	41 (100) (100)

Note: Cells display frequencies with column percentages in the top parentheses and row percentages in the bottom parentheses.

TABLE 5. *Relationships between perpetrators and victims in prostitution-related homicide, national media sample, 1965-2005.*

Perpetrator \ Victim	Prostitute	Client	Pimp	Total
Prostitute	2 (0.3)	21 (60)	1 (20)	24 (4)
	(8)	(88)	(4)	(100)
Client	449 (77)	0 (0)	1 (20)	450 (73)
	(99.8)	(0)	(0.2)	(100)
Pimp*	10 (2)	2 (6)	2 (40)	14 (2)
	(71)	(14)	(14)	(100)
Prostitute/ Pimp team†	0 (0)	11 (31)	0 (0)	11 (2)
	(0)	(100)	(0)	(100)
Other	5 (1)	0 (0)	1 (20)	6 (1)
	(83)	(0)	(17)	(100)
Unknown	114 (20)	1 (3)	0 (0)	115 (19)
	(99)	(1)	(0)	(100)
Total	580 (100)	35 (100)	5 (100)	620 (100)
	(94)	(6)	(1)	(100)

Note: Cells display frequencies with column percentages in the top parentheses and row percentages in the bottom parentheses. Some percentages do not sum to 100 because of rounding error.

*Includes prostitute's boyfriend

†Includes prostitute working with her boyfriend and/or other accomplices

TABLE 6. *Percentage of prostitution-related prostitute homicides committed by clients in other samples.*

Sample	% perpetrated by clients
33 urban counties, 1988	88 (15/17)*
Colorado Springs cohort, 1967-1999	57 (4/7)†
Washington state, 1981-1986	100 (4/4)‡
NCAVC, 1982-2000	84 (86/103)§

Note: Fractions in parentheses indicate the number of prostitute homicides perpetrated by clients divided by the number of all prostitution-related prostitute homicides in which the perpetrator's prostitution relationship to the victim is known.

*Calculations based on unweighted data.

†Perpetrator-victim prostitution relationship unknown for 10 victims.

‡Perpetrator-victim prostitution relationship unknown for 2 victims.

§Perpetrator-victim prostitution relationship unknown for 20 victims.

TABLE 7. *Percentage of perpetrators and victims in prostitution-related prostitute homicide who were under the influence of cocaine at the time of the homicide.*

Sample	Perpetrators	Victims
Washington state, 1981-6*	0 (0/6)	---
33 urban counties, 1988†	67 (12/18)	82 (14/17)
NCAVC, 1982-2000‡	79 (22/28)	74 (51/69)

*Sample covers a period before crack commonly used in the state.

†Sample covers period when crack commonly used; based on unweighted data.

‡Most of sample covers period when crack commonly used.

FIG 1. *Prostitute homicides and female homicides overall in the U.S. over time.*
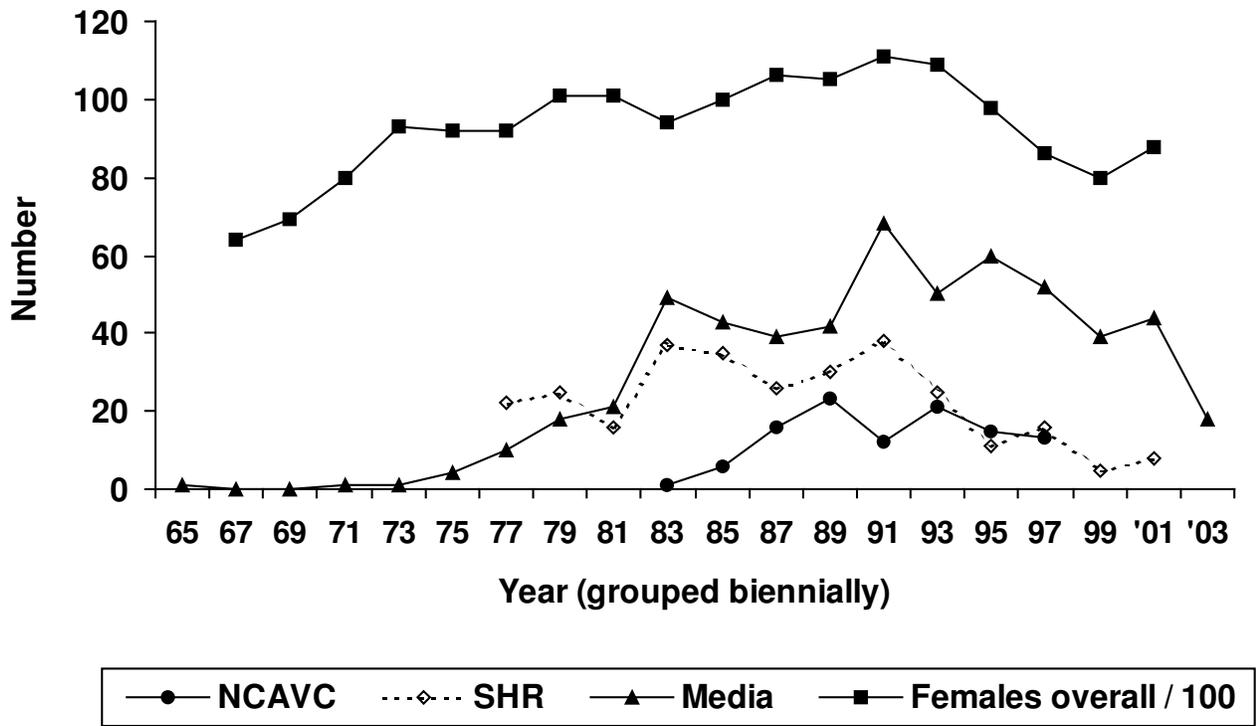
Online appendix to "Extent, trends, and perpetrators of prostitution-related homicide in the United States" by Brewer, Dudek, Potterat, Muth, Roberts, and Woodhouse; to be posted at

http://www.interscientific.net/pubs/HistoricalProHom.html

This appendix describes analyses of three historical homicide data sets with respect to the extent and perpetrators of prostitute homicide.

Methods

Seven California Counties, 1850-1900

McKanna (1, 2) compiled data on all homicides between 1850 and 1900 in seven California counties (Calaveras, Sacramento, San Diego, San Joaquin, San Luis Obispo, Santa Barbara, and Tuolumne) recorded in such historical documents as coroner's inquest reports, criminal case files, and newspaper articles. These data include information on victim characteristics (including occupation, with prostitution as one possibility), perpetrator characteristics, and limited information about the incident and relationship between victim and perpetrator.

Chicago, 1870-1930

Bienen (3, 4) assembled data on all homicides in Chicago between 1870 and 1930 found in police records. These data include information on victim characteristics (including occupation, with "prostitute/street walker" as one possibility), perpetrator characteristics, and limited information about the incident and relationship between victim and perpetrator.

National Media Sample

In our search of media and related sources that we conducted for the main study, we identified 6 prostitute homicides that occurred before 1900.

Results

Extent

The proportion of female homicide victims who were prostitutes was likely at least as high, and perhaps much higher, in the 1800s than in the late 1900s (Table A1). There is substantial uncertainty in these estimates because both the California and Chicago data sets have large amounts of missing data on the victim-offender relationship and circumstances of the homicide. None of the prostitute homicides in the California or Chicago data sets were among the prostitute homicides in this era found in the media sample.

TABLE A1. *Percentage of female homicide victims who were prostitutes.*

Sample	% of female victims who were prostitutes
7 California counties, 1850-1900	7.2 (7/97)*
Chicago, 1870-1930	1.0 (14/1,394)†

*If based on only those female victims whose occupation is known ($\underline{n}$ = 66), this percentage is 10.6%.

†If based on only those female victims whose occupation is known ($\underline{n}$ = 69), this percentage is 20.3%.

Perpetrators

The historical data sets suggest a profile of perpetrators that is roughly similar to that we observed for more contemporary data sets. In the California data, 3 (43%) of the 7 prostitute homicides were perpetrated by husbands or male roommates; the remaining 4 were committed by male "friends" or "strangers" during a quarrel. The Chicago data include 14 prostitute homicides. Perpetrators (all working alone) included one client, one prostitute woman, 2 boyfriends, and 10 men whose relationship to the victim was unknown. The available information on the latter 10 homicides suggests perpetrators were not boyfriends/husbands, and most death circumstances and offender characteristics were consistent with perpetrators who were clients. There were data on the victim-perpetrator relationship for 2 of the 8 19th century prostitute homicides in the media sample: one perpetrator was a client and the other was the victim's pimp/common-law husband.

Discussion

The extent of prostitute homicide in the U.S. in the 1800s appears similar to, and possibly higher than, that observed in recent decades. Perpetrators' role relationships with their victims also appear to approximate those of modern perpetrators. If the extent of prostitute homicide was greater in the 1800s, it could be due to a possibly higher prevalence of prostitute women in that era (5). In any event, anecdotal reports indicate that client violence toward prostitutes was common then in the U.S. and Europe (6-8).

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Chapter 5

A comparative profile of violent clients of prostitute women

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Comparison is a fundamental process in generating scientific knowledge. Most objective, empirical offender profiles, however, are summaries of offenders and their offenses and thus lack a comparative basis. Without comparison to non-offenders, it is difficult to know how offenders differ from the general or other relevant reference population (Fox & Levin, 1998). Comparisons between offenders and non-offenders indicate the characteristics that most distinguish offenders and can narrow the range of potential suspects to investigate more effectively than offender summaries alone.

Prostitute women are assaulted, raped, and killed at exceedingly high rates. For instance, in a prospective study, prostitute women who worked in Colorado Springs, USA, between 1967 and 1999 had a higher homicide victimization rate (229 per 100,000 person-years; standardized mortality ratio = 18) than any set of women ever studied (Potterat et al., 2004). Nearly all homicides observed in this cohort occurred while the victims were working. This and other research indicates that prostitute women account for approximately 3% of female homicides in the USA (chapter 4). Male clients

of prostitute women constitute the large majority of the perpetrators of prostitute homicide in the USA (chapter 4) and most of the perpetrators in Canada (Lowman, 2000) and the UK (Kinnell, 2001b).

Effective methods for profiling perpetrators of violence against prostitutes are urgently needed. Violent crimes against prostitutes are difficult to solve for a variety of reasons (Dudek, 2001; Lowman & Fraser, 1996), resulting in a low clearance rate. For instance, only 58% of prostitute homicides in North Carolina in 1991-3 were solved (Decker et al., 2002), in contrast to approximately 70% of all homicides nationally during those years (Wellford & Cronin, 2000). Furthermore, a number of prostitute serial homicide investigations included tens of thousands to millions of persons as potential suspects, severely hampering the efficiency of these investigations (Keppel & Birnes, 2003; Rossmo, 1997; Smith, 1991).

Researchers have sought to compare perpetrators of prostitute homicide with clients of prostitute women, but their efforts have been hindered by geographically and temporally incommensurate samples of perpetrators and clients as well as indirect, crude, and incomparable measures for the two sets of men (Kinnel, 2004; Lowman & Fraser, 1996; Lowman, 1989; Salfati, in press). Cook and colleagues rigorously compared criminal histories of homicide offenders in Illinois, USA, with those of the general population in the state (Cook et al., 2005). Although other characteristics were not examined and the types of homicide were not differentiated in this study, it exemplifies the comparative method necessary for improving offender profiles.

In this paper, we report a matched case-control study in which we compare clients who assaulted, raped, and/or killed prostitute women with clients arrested for

patronizing prostitutes in the same jurisdictions and time periods. Our analyses focus

on observable characteristics or those that can be readily assessed by police. We

sought to identify characteristics that differentiate violent clients from other clients and

also define subsets of men who are particularly likely to include perpetrators. Moreover,

we estimate the potential for violence in patronizing interactions based on information in

prostitution arrest records.

Methods

Cases

   We identified client perpetrators of cleared (solved) prostitute homicides, assaults,

and rapes in a national search of US media sources. Our search procedures are

detailed in chapter 4 and thus we provide only a summary here. In 2004-5, we

searched several national newspaper databases, archives of selected metropolitan

newspapers, the World Wide Web, and the academic and "true crime" literature for

relevant incidents. We supplemented this search with media reports of attacks of

prostitutes that colleagues informed us about or we discovered incidentally, as well as

incidents that were documented in prostitution arrest records we analyzed for other

purposes (chapters 2 & 3). In addition to the search terms for prostitute homicide

described in chapter 4, we also used "prostitu*" and "rape*" and "prostitut*" and

"assault*" as search term pairs when querying electronic databases and search

engines. When information on key aspects of a perpetrator, victim, and/or incident was

lacking, we performed specific searches using the same media sources and online

databases such as the Social Security Death Index. Altogether, we examined more

than 14,700 articles and documents while conducting the search. Furthermore, we

augmented information on perpetrators and their attacks in selected jurisdictions (Connecticut; Kansas City, Missouri; Minneapolis, Minnesota; Texas; Virginia; and Washington state) by requesting incident reports from the local law enforcement agencies that had investigated these cases and searching online inmate databases provided by state correctional agencies. We included in analysis only those perpetrators who were known clients or whom we inferred to be clients (i.e., the available facts from the investigation were consistent with such a designation and included no contrary indications).

Controls

Controls were men arrested for patronizing in the same time period and jurisdictions in which a case encountered his victim(s). Between 2000 and 2005, we sought prostitution arrest data from approximately thirty selected local jurisdictions in the US and from the central computerized criminal history (CCH) repository for each of the 50 states (chapter 2). We included in analysis only those cases with suitable controls.

Most client arrests in these communities occurred in stings with female police officers working as decoys. There is little a client can do to detect a decoy or avoid arrest once a negotiation for a sex act and price has been completed; similarly, police exercise very little discretion or control over which clients are ultimately arrested. Stings were conducted in areas with high numbers of visible street prostitutes and complaints about prostitution (chapter 2). Consequently, arrested clients approximate a representative sample of clients of street prostitute women in a community, weighted by frequency of patronizing activity.

We defined clients in the prostitution arrest data sets in differing ways depending on the information included in arrest records. Arrest records for Minnesota, New Mexico, New York, Virginia, and most jurisdictions in Washington state indicated patronizing-specific arrest charges (as opposed to a general prostitution offense). Connecticut provided conviction records that included patronizing-specific charge information.

Other jurisdictions did not have or record patronizing-specific charges, and the arrest records included information on unspecified prostitution charges (buying or selling not distinguished; charges related to pimping, procuring, and related activities were separate, however). For two jurisdictions (Kansas City, Missouri, and Portland, Oregon), we defined clients to be men who were arrested for "engaging in prostitution" or "soliciting for immoral purposes" within 2 hours and 600 meters (road distance, as measured by ArcView 3.0a with Network Analyst 1.0b [Environmental Research Systems Institute, Inc.]) of at least 3 other such men. This definition corresponds to spatiotemporal patterns of client arrests in stings and yields extremely few, if any, men falsely identified as clients in these and other data (chapter 2).

For other jurisdictions (Arizona, Florida, Texas, and some jurisdictions in Washington state), the arrest records lacked patronizing-specific charges and time and address of arrest. In these data sets, we defined clients to be men who were arrested on dates when 5 or more men were arrested on prostitution charges (for small jurisdictions, we defined clients as men arrested on dates when 3 or more men were arrested). In arrest data from 12 large metropolitan jurisdictions that included patronizing-specific charges, on average 95% of the men defined as clients by this rule were in fact arrested for patronizing. In arrest data from 7 smaller metropolitan

jurisdictions that included patronizing-specific charges, on average 99% of the men

defined as clients by this rule were in fact arrested for patronizing. Together, these

results indicate that these definitions have a low "false positive" rate (chapter 2).

We eliminated some of the few men falsely identified as clients in these data

(Arizona, Florida, Texas, and some jurisdictions in Washington state) by excluding

arrestees if their criminal history showed evidence of male prostitution (homosexuality-

related charges or > 3 prostitution arrests). Male/transvestite prostitutes had much

higher rates of rearrest than clients (chapter 2). Very few clients had > 3 prostitution

arrests in arrest records that included patronizing-specific charges (0.1% in Minneapolis

[1990-2001] and Seattle (1951-2004), 0.2% in Indianapolis (1985-2002), 0.6% in the 8

New York state counties with the 5 largest cities [combined; 1970-2002]. Most

prostitution charges against those with > 3 arrests were for selling sex. In addition, we

excluded from the set of eligible controls those men arrested on both violence and

prostitution charges on the same day, to eliminate the possibility that such men had

been charged for attacking a prostitute. Furthermore, we defined all men charged in

Florida with "using vehicle for transport for prostitution" as clients.

We matched controls to cases according to a 1 case:5 controls ratio. We selected 5

controls randomly from the pool of controls matched to a case by jurisdiction and time

period. If a case had victims in multiple jurisdictions, we drew controls from the

jurisdiction that included the most of his victims (if controls were not available for that

jurisdiction, we drew from the jurisdiction with the next most victims). To be eligible for

selection, controls had to have been arrested within 10 years of the case's attack(s).

We used the narrowest symmetrical time period surrounding the case's attack for

determining eligible controls (defined in +/- whole years from the attack date). Where possible, we sought to have a pool of at least 10 eligible clients from which to draw 5 for matching. If a case had multiple attacks in a jurisdiction, we used his median attack date as the reference date. If that median attack occurred before any control arrests, we used the first subsequent attack that occurred within the control arrest period as the reference date. For a few cases with limited incident information, we defined attack dates as the date of conviction; see chapter 4 for additional information on how we defined attack dates when they were not known exactly. Fifty-nine percent of controls matched within 1 year of the case's (median) attack date (75% within 3 years and 87% within 5 years).

Variables

Table 1 shows the demographic, biometric, geographic, criminal history, and vehicle characteristic variables available by local and state jurisdictions.

Demographics. We measured age in years. For cases with multiple victims, we computed age at the median attack date (to correspond to the basis for case-control matching and to approximate the age of a typical serial perpetrator who has not yet been apprehended). Blacks and whites together made up the vast bulk of cases (89%) and controls (87%). We created two dichotomous variables for black and white race, respectively.

Biometrics. We assessed height (inches), weight (pounds), and body mass index (BMI; (weight x 703) / height^2). We also created a dichotomous variable for extreme BMI (< 20 [underweight] or > 35 [severely/morbidly obese]).

Geography. We computed the road distance between a case's residence at the time

of the attack and the location where he encountered or picked up his victim ("journey-to-

crime" distance). The sources for our information about the encounter location, in order

of priority, were witness reports (uncommon), perpetrator statements, reports from

others about where the victim was last seen, and reports of where the victim typically

worked. When the encounter location was described as a particular "stroll" (area of

prostitution along a particular street), we used the median location of prostitute arrests

on that street during the period surrounding the attack. When the encounter location

was described as a neighborhood, we used the neighborhood's centroid (with

neighborhood boundaries defined by local sources). For cases with multiple victims, we

computed the mean residence-encounter location distance. There were no data on

victim encounter locations for some attacks.

The journey-to-crime distance for controls was the road distance between a client's

residence and his arrest location. Arrest records for some jurisdictions included only the

city of residence and/or arrest. For controls in these jurisdictions, we estimated the

residence and/or arrest location crudely by the address of the jurisdiction's city hall or

most major municipal building listed on the jurisdiction's web site.

For all jurisdictions except Texas, we calculated road distances with the shortest-

path routines of Network Analyst 1.0b on Census 2000 road coverages (available at

http://arcdata.esri.com/data/tiger2000/tiger_download.cfm). We kept computational

time to a minimum by performing calculations in degrees UTM (NAD83), the native

format of the Census 2000 road data, and converting the result to kilometers using a

spherical model for the Earth (program available on request). For Texas cases and

controls and for individuals known to reside far away from the encounter/arrest location (e.g., several states away), we computed distances with the trip distance function at http://www.mapquest.com. We considered journey-to-crime distances to be "precise" unless only the city of residence or arrest was known. We also created a dichotomous version of the journey-to-crime distance (< 50 km vs. > 50 km) to approximate the road distance "radius" of a typical large US metropolitan area.

We also measured lifetime geographic mobility by noting whether the attack (for cases) or arrest (for controls) was in the same state in which he was born. Moreover, we assessed how representative the victim encounter locations were of locations where police arrested clients for patronizing in a jurisdiction. We calculated the road distances between each victim encounter location and the locations of client arrests during the temporally closest 6 year period (3 years before and after of incident date, if possible), and noted the shortest such distance for each attack.

Criminal history. We measured cases and controls' state criminal history for particular offense categories. These criminal history variables refer to offenses committed before a case's (first) attack or before a control's patronizing arrest in the state where the attack/patronizing arrest occurred. For some jurisdictions, we received controls' state criminal histories when we obtained the prostitution arrest records. For other jurisdictions, we used identifying information in the prostitution arrest records to search for controls in state criminal history databases. We also searched for cases' criminal histories in these state databases. Arizona, Florida, New Mexico, New York, Texas, and Virginia state criminal histories included all recorded arrests, while those for Connecticut, Minnesota, and Washington state included convictions only. We used

arrests as the measure of criminal history for the former set of states, and convictions for the latter set. The state criminal history databases have somewhat varying scopes (e.g., whether misdemeanors included), time depths (e.g., from all arrests/convictions from the past several decades to only the 15 years following completion of a person's last sentence), and structures (e.g., whether all charges or just the top charge from an arrest are included). These aspects of the criminal history data, however, are constant within matched case-control sets.

We created 5 dichotomous, mutually exclusive criminal history variables. By our definition, violent offenses included homicide, assault, domestic violence, robbery, and other offenses involving physical violence or harm against persons. Rape offenses included rape, sexual assault, child molestation, and other crimes involving forced or unwanted direct sexual contact. Sexual offenses included crimes of a sexual nature not involving forced or unwanted sexual contact, such as indecent exposure, lewdness, and pornography-related offenses, among others. Patronizing offenses included patronzing only. Miscellaneous offenses included all other crimes, such as drug offenses, driving while intoxicated, reckless driving, driving without a license, and weapons offenses, among others. We classified all attempted offenses with their completed counterparts. Also, we excluded procedural charges (i.e., those arising from police/judicial intervention) such as resisting arrest, obstructing justice, escape, bail jumping, probation/parole violations, contempt of court, and failure to appear) from all variables, as they are dependent on having had a history of other offenses.

Vehicle characteristics. We matched a separate set of controls to cases with vehicles, given that there were more missing data on arrested clients' vehicles (mostly

due to a small proportion of clients arrested on foot/bicycle or in offstreet settings). All

matched controls were arrested within 1 year of cases' (median) attack date. We

assessed vehicle age (years) and type of vehicle (passenger car vs. other type of

motorized vehicle [pickup truck, other truck, van, sport utility vehicle, or motorcycle]).

Three of 17 cases with data on vehicles drove 2 vehicles during the periods of their

attacks; the other 14 drove only one vehicle. For each of the 3 cases who drove 2

vehicles, we randomly selected one for analysis.

<u>Assessment of arrested clients' potential for violence</u>

Arrest data from two local police departments—Minneapolis, Minnesota (1990-2001)

and Lynnwood, Washington (1996-2003)—allow assessment of the potential for

violence between clients and prostitutes. In their reports of patronizing arrests made in

the context of stings, officers in both jurisdictions occasionally noted the price of the sex

act agreed to by the arrested client and decoy (undercover policewoman posing as a

prostitute) and the amount of money on his person, as well as the presence of weapons

on his person and in his vehicle. Clients who have less money than the agreed-on price

may be more inclined to physically force a prostitute to perform the sex act for little or no

money, and/or may be susceptible to a violent reaction from a prostitute.

<u>Statistical analysis</u>

We summarized univariate distributions numerically and graphically, and performed

bivariate and multivariate conditional logistic regression analyses. The conditional

logistic regressions contrasted cases and controls on each variable and incorporated

the matching design in the estimation of associations. We excluded a case and his

controls from analysis if any had missing data on a variable. We constructed

multivariate models for subsets of variables that preserved the maximum number of cases. All regression analyses were conducted for all cases (and their controls), cases explicitly known to be clients, prostitute killers, and serial prostitute killers separately. We carried out data management and analysis with Microsoft Access97, Microsoft Excel97, Epi-Info 3.3.2 (http://www.cdc.gov/epiinfo/), and custom programs written in FreeBasic (http://www.freebasic.net). We produced graphics with DPlot 2.0.4.7 (http://www.dplot.com) and Venn Diagram Plotter (http://ncrr.pnl.gov/software/).

<div align="center">Results</div>

Summary of cases

We identified 118 cases for whom there were suitable controls. Cases' victim encounter locations were typically very close to patronizing arrest locations (Table 2). Figure 1 shows the temporal distribution of cases' (median) attacks. Although the frequency of prostitute homicide in the US has increased over the last 30 years (chapter 4), the large proportion of cases in the last 10 years in our analyses is mostly an artifact of the greater availability of recent, rather than older, arrest data on controls.

Eight (7%) cases were team perpetrators (committed attacks with another case), 6 (5%) encountered all of their victims in off-street prostitution settings, and 78 (66%) were explicitly known to be clients (for others, the inference was strong). Fifty-six (47%) had multiple victims (fatal and/or nonfatal attacks), 76 (64%) killed at least one victim, and 23 (19%) had both fatal and nonfatal attacks (Figure 2). At least 77 (65%) cases were known to have been convicted. For many of the remainder, prosecutions were still in progress when we collected the data or the case died while in custody before trial; some were never prosecuted, were acquitted, or the court charges were dismissed.

Nonetheless, all attacks were considered cleared by the police. Six (8%) of the convicted cases were reported in media sources as convicted for their attack(s) even though their state criminal histories did not include such convictions.

The median lag between a case's first attack and his arrest on charges for violence against prostitutes was 133 days (range = 0-7,092, 63% ≥ 30 days, n = 71).   Among prostitute killers, the median lag was 207 days (range = 0-7,092, 72% ≥ 30 days, n = 53).

Comparisons between cases and controls

Tables 3 and 4 show the bivariate conditional logistic regression results. Cases and controls were similar in age, but cases were somewhat more likely to be black. The association for black race was of comparable magnitude among serial killers and their controls (29% [10/34] for cases vs. 18% [31/170] for controls, OR = 1.94, 95% CI 0.82-4.61). Cases were approximately one inch taller and 9 pounds heavier than controls on average, but did not differ meaningfully in terms of BMI. However, cases were one-quarter to one-third as likely as controls to be underweight or severely obese (the two cases classified as having extreme BMI had values of 19.967 and 19.996, respectively, just below the threshold of 20). Nearly all cases and controls resided within 50 km of their victim encounter/arrest locations and they had similar journey-to-crime distances on average (median about 10 km among those with "precise" measurements). Almost equal proportions of cases and controls were born in the state of their crimes.

Cases were substantially more likely than controls to have a criminal history of violent, rape, other sexual, and property offenses. Serial prostitute killers were more than three times as likely to have a violent criminal history as their controls (46%

[11/24]) vs. 14% [17/120]), OR = 6.49, 95% CI 2.16-19.52). Very few cases (2%) or controls (4%) had a prior history of patronizing according to the state criminal history databases we searched, and cases were modestly less likely to have a history of other, miscellaneous offenses. However, an additional 6% of cases had a prior history of a patronizing arrest/conviction according to media reports (these could represent arrests/convictions in other states or incidents not recorded in the state databases).

Cases were mildly less likely to drive cars than controls, but their vehicle ages were similar. All bivariate results were very similar in pattern and magnitude for those cases explicitly known to be clients and their controls and serial killers and their controls (data not shown).

Table 5 shows the results for a multivariate conditional logistic regression model for those cases and controls with data on the included variables. No controls in the models had a rape history (precluding the addition of this variable to the model), but 9% (6/65) of cases had a rape history. Most estimates changed little after adjusting for other variables in the model. The only exception is that the *lack* of a criminal history of miscellaneous other offenses shows a much stronger association with client violence in the multivariate than the bivariate context. We also estimated other models involving additional variables. These models involved fewer cases and controls given the pattern of data availability (Table 1) and none showed results that differed notably from the bivariate results in Tables 2 and 3.

Defining suspect search pools

The data suggest there may be means to identify relatively restricted pools of men might include, with a moderate likelihood, perpetrators of violence against prostitutes.

Among all cases with criminal history data, 31% (28/90) had violent and/or rape criminal histories; 40% (24/60) of killers and 47% (14/30) of serial killers had such histories. Only 1 of 28 cases with a violent or rape criminal history was caught with crucial assistance from prostitutes or was known by prostitutes to be violent. However, several violent clients without a violent or rape criminal history were known by prostitutes to be violent, were caught with their assistance, and/or were caught as a result of prostitution stings or routine police patrols of prostitution strolls. If these other means of identifying suspects are included, the percentages of cases included in the suspect search pool increase to 49% for all violent clients, 48% for killers, and 60% for serial killers. Overall, at least 9% of violent clients were known by prostitutes to be violent, and an additional 5% were caught with critical assistance from prostitutes.

Arrested clients' potential for violence

   In Minneapolis, 58 of 2,651 client arrest records noted the price for sex negotiated by the client and decoy and the amount of money on the client's person. Nine of these 58 (16%) clients had less money than the agreed-on price.   In Lynnwood, 28 of 127 arrests had information on the price and amount of money held by the client. Four of these 28 (14%) clients had insufficient money. Furthermore, at least 14 (0.5%) additional clients in Minneapolis and 5 (4%) in Lynnwood had weapons (knives, clubs, nunchucks, and/or handguns [typically loaded]) on their person or easily accessed from the vehicle driver's seat.

Discussion

   Violent clients usually picked up their victims in the same areas where police arrested clients for patronizing. Cleared violent crimes against prostitutes involved long

periods of time between the perpetrator's (first) attack and his arrest (e.g., a median of almost 7 months for prostitute killers). In a matched case-control analysis comparing violent clients with clients arrested for patronizing in the same jurisdictions and time periods, violent clients and controls were similar in terms of age and distance between their residences and victim encounter/arrest locations. However, violent clients were less likely than controls to be white, be underweight or severely/morbidly obese, and drive cars (as opposed to other types of motorized vehicles). Violent clients were also much more likely to have a criminal history of violent, rape, and property offenses, and substantially less likely to have a criminal history of miscellaneous other (non-violent, non-property, non-sex, non-patronizing) offenses than controls. Men with a criminal history of violent and/or rape offenses comprise a pool that would include 40% of prostitute killers (47% of serial prostitute killers). In addition, meaningful proportions of clients arrested for patronizing in two jurisdictions had less money in their possession than they price they had agreed to pay for sex or carried weapons at the time of arrest, suggesting the potential for violence in clients' interactions with prostitutes.

Anecdotal reports suggest that prostitute women perceive black and young clients as more prone to violence (Miller, 1993; Sanders, 2005; Williamson & Folaron, 2001). In our study, blacks were more likely to be violent than clients of other races, but age was unrelated to client violence (see also (Lowman & Fraser, 1996). Contrary to popular perceptions (Fox & Levin, 1998), whites were somewhat less likely to be serial killers in this setting than men of other races, and this pattern holds for homicide in the US generally (Walsh, 2005). Interestingly, the near absence of any perpetrators who were underweight or severely overweight (despite comparatively more controls

classified as such) suggests that a certain degree of physical strength or agility is required to attack a prostitute. In a sample of prostitute homicides drawn from the files of the Federal Bureau of Investigation's (FBI) National Center for Analysis of Violent Crime (NCAVC), only 11% of victims died from gunshot wounds; the remainder died from attacks involving significant physical force (e.g., strangulation, stabbing) (Dudek, 2001).

Other samples of prostitute killers also indicate the potential utility of violent and rape offense criminal histories for defining suspect search pools. Just as in our sample, 40% (4/10) of prostitute killers in cases filed in prosecuting attorneys' office in 33 urban US counties (Bureau of Justice Statistics, 1996) had a state criminal history of violent and/or sex offenses. Eighty-one percent (56/69) of prostitute killers in the NCAVC sample (Dudek, 2001) had such a history based on national (FBI) arrest records. Proportionally more serial prostitute killers were included by this criminal history criterion in our sample (60%; corresponding coverage in the NCAVC sample = 77%). Men with violent and/or rape offense histories constitute a large pool, even if defined only by a state criminal history database. It might be possible to prioritize suspects in this pool by developing a statistical model that contrasts violent clients from other violent offenders, and integrating the results with other facts from the investigation. Indeed, prostitute killers in our sample appear to differ substantially in terms of demographics and criminal history from other samples of homicide offenders ((Fox & Zawitz, 2004; Langford et al., 2000; Rojek, 2000). In some circumstances, it may even be possible to winnow the search pool defined by criminal history to a manageable number of suspects for

investigation by prioritizing merely on the basis of suspects' residential proximity (or proxies thereof) to the victim's probable encounter location.

Nevertheless, the criminal history criterion incompletely identifies potential suspects. Our results indicate that prostitutes are an important source of intelligence on violent clients, and that perpetrators caught with prostitutes' assistance or known by prostitutes to be violent tended not to have had a violent or rape offense criminal history. Wider and more systematic implementation of programs to collect reports of violent clients from prostitute women (Kinnel, 2004; Kinnell, 2001a; Lowman & Fraser, 1996; Penfold et al., 2004) on an ongoing basis may ultimately provide crucial investigative information.

Disputes between clients and prostitutes over money/drugs and the terms of money-for-sex exchange are some of the common motives in prostitute homicide (chapter 4). Patronizing arrest data from two jurisdictions indicated that about 15% of clients had insufficient money to pay the negotiated price, which may have eventually led to conflict had the interactions involved a real prostitute. Further illustrating the potential for violence in client-prostitute encounters, between 0.5-4% of arrested clients had weapons available at the scene of the arrest. However, most (51%) prostitute homicides in the NCAVC sample were strangulations or suffocations that did not involve firearms, knives, or other traditionally defined weapons (Dudek, 2001), so the presence of weapons may not necessarily indicate increased risk of violence.

Our use of cleared cases of client violence against prostitutes potentially limits our conclusions, as offenders who are caught may differ from offenders who are never apprehended. However, serial prostitute killers may account for 35% or more prostitute

homicides, and some unsolved prostitute homicides may have been committed by arrested perpetrators even though the crimes are never linked to them (chapter 1). We also may have underascertained cases' and some controls' criminal histories because many of our criminal history searches were based names and other identifying information rather than fingerprints (the basis for linking controls to their histories in most of our data). At most, four cases' histories could have been missed, and the direction of bias would be toward underestimating the association between criminal history and client violence. Furthermore, official criminal histories obtained from local, state, and federal agencies in the US are incomplete (Geerken, 1994), but this bias was constant across cases and controls and would not account for the differences between cases and controls observed. Despite these limitations, comparative analyses such as ours will put offender profiling on a firmer scientific foundation and likely contribute to more effective investigations.

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Figure legends

Figure 1. Number of violent clients (by median attack date) over time

Figure 2. Overlap of violent clients with fatal and nonfatal attacks of prostitute women.
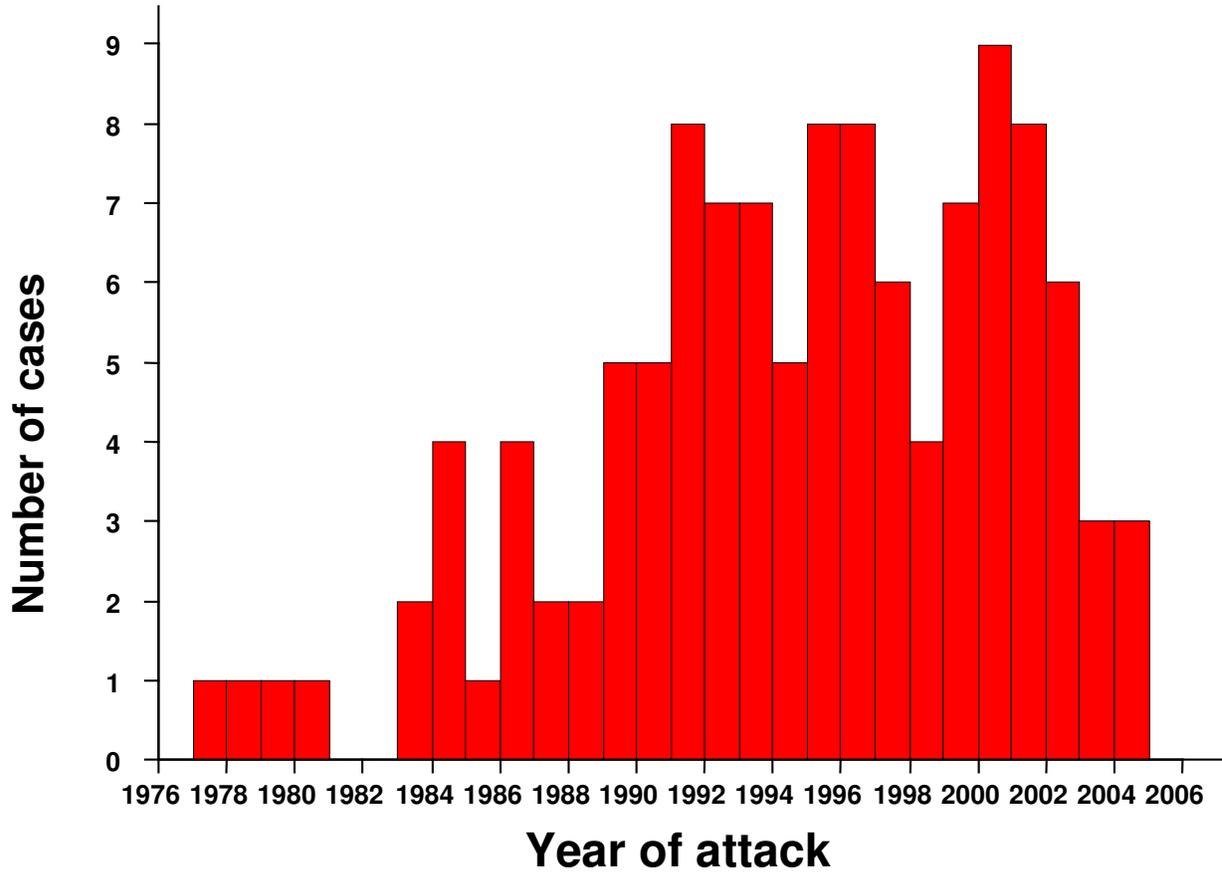
**Perps of fatal
attacks (n = 76)**

**Perps of nonfatal
attacks (n = 65)**

**Overlap
(n = 23)**
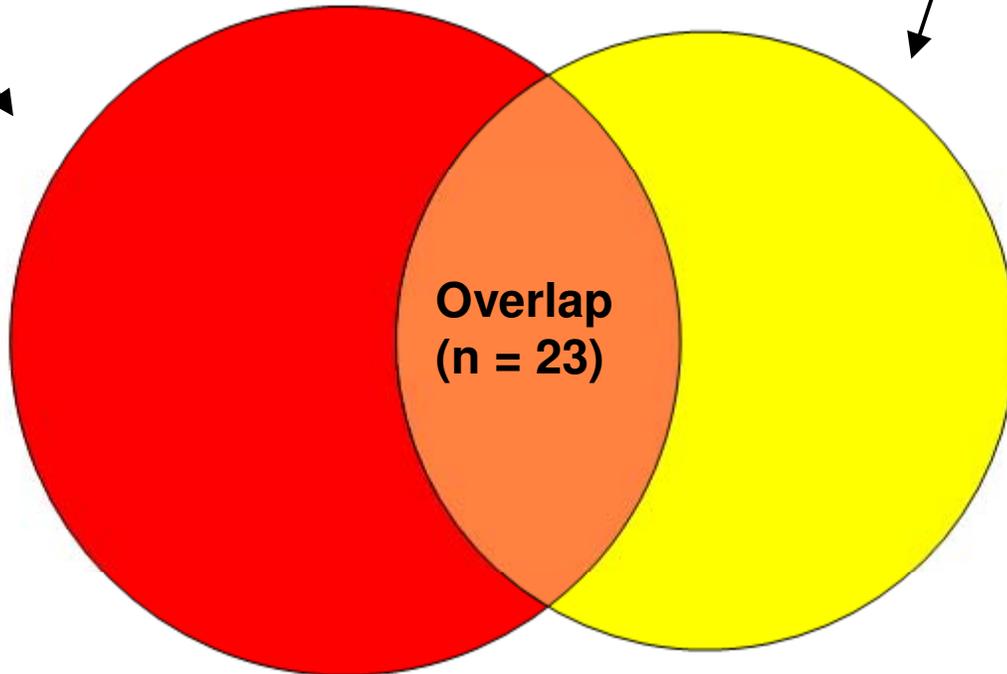
Table 1. Data available for comparing violent clients and clients arrested for patronizing, by jurisdiction

Jurisdiction	N cases	Age	Race	Height/ Weight	Criminal history	Birth state	Journey-to-crime	Vehicle age	Vehicle type
Arizona	3	X	X	X	X				
Connecticut	9	X	X	X	X		X		
Florida	30	X	X	X	X	X			
Kansas City, MO	3	X	X				X		
Minnesota	16	X	X		X		X		X
New Mexico	1	X	X		X				
New York	13	X	X		X				
Portland, OR	15	X	X	X			X	X	X
Texas	11	X	X	X	X[a]	X	X		
Virginia	1	X	X		X[a]		X		
Washington state	16	X	X	X	X	X	X		

[a]Patronizing history only.

Table 2. Proximity of cases' victim encounter locations to client patronizing arrest locations in several jurisdictions

| Jurisdiction | n incidents | % victim encounter locations: | |
		< 0.2 km of closest client arrest location	< 0.5 km of closest client arrest location
Kansas City	3	33	33
Minneapolis	13	92	100
Portland, OR	27	11[a]	26[a]
Seatac, WA	5	80	100
Seattle, WA	13	77	92
Yakima, WA	4	100	100

[a]74% of the victim encounter locations were within 0.7 km of the closest client arrest location

Table 3. Bivariate comparisons between violent clients (cases) and clients arrested for patronizing (controls) on ratio-scale variables

Variable	Cases		Controls		
	N	Mean (SD)	N	Mean (SD)	OR[a] (95% CI)
All					
Age	117	35.9 (10.8)	585	35.0 (11.3)	1.01 (0.99-1.03)
Height	71	69.7 (3.4)	355	68.8 (3.4)	1.08 (1.00-1.17)
Weight	64	183.3 (34.0)	320	174.4 (32.8)	1.01 (1.00-1.02)
BMI[b]	64	26.3 (3.8)	320	25.8 (4.3)	1.03 (0.97-1.10)
Journey distance[c]	48	10.5	240	10.0	1.00 (1.00-1.01)
Vehicle age	10	10.0 (7.2)	50	8.2 (6.4)	1.04 (0.94-1.15)
Killers					
Age	76	33.9 (10.2)	380	35.0 (11.7)	0.99 (0.97-1.01)
Height	53	69.7 (3.5)	265	68.9 (3.4)	1.08 (0.98-1.18)
Weight	49	181.9 (32.0)	245	174.4 (32.1)	1.01 (1.00-1.02)
BMI[b]	49	26.1 (3.6)	245	25.8 (4.2)	1.02 (0.95-1.10)
Journey distance[c]	19	6.6	95	12.4	1.00 (1.00-1.00)
Vehicle age	7	8.3 (5.2)	35	8.4 (6.3)	1.00 (0.87-1.14)

[a]Bivariate odds ratio (indicating change in odds per unit of independent variable) from conditional logistic regression, which incorporates case-control matching design.
[b]Body mass index.
[c]Road distance between residence and victim encounter location (for cases) or patronizing arrest location (controls) when able to be measured precisely for both cases and controls. These distributions are highly skewed; therefore, this row shows medians only.

Table 4. Bivariate comparisons between violent clients (cases) and clients arrested for patronizing (controls) on nominal-scale variables

Variable	Cases		Controls		
	N	% (freq.)	N	% (freq.)	OR[a]
All					
White race	98	63 (62)	490	69 (339)	0.74 (0.46-1.20)
Black race	98	26 (25)	490	17 (85)	1.69 (1.00-2.88)
Extreme BMI[b]	64	3 (2)	320	9 (28)	0.34 (0.08-1.47)
Journey distance < 50 km	57	89 (54)	285	93 (285)	0.51 (0.20-1.33)
Birth state[c]	29	21 (6)	145	23 (33)	0.89 (0.34-2.32)
Violent criminal history	76	30 (23)	380	15 (56)	2.63 (1.46-4.73)
Rape criminal history	76	8 (6)	380	1 (2)	4.15 (0.27-63.0)
Sexual criminal history[d]	76	4 (3)	380	1 (5)	3.00 (0.72-12.6)
Property criminal history	76	29 (22)	380	15 (56)	2.63 (1.43-4.86)
Patronizing criminal history	88	2 (2)	440	4 (16)	0.61 (0.14-2.74)
Other criminal history	76	18 (14)	380	24 (90)	0.70 (0.36-1.36)
Car[e]	17	53 (9)	85	67 (57)	0.49 (0.15-1.57)

Table 4. Bivariate comparisons between violent clients (cases) and clients arrested for patronizing (controls) on nominal-scale variables (continued)

Variable	Cases N	Cases % (freq.)	Controls N	Controls % (freq.)	OR[a]
Killers					
White race	68	62 (42)	340	72 (245)	0.59 (0.33-1.05)
Black race	68	32 (22)	340	17 (59)	2.46 (1.33-4.53)
Extreme BMI[b]	49	2 (1)	245	8 (20)	0.25 (0.03-1.84)
Journey distance < 50 km	32	94 (32)	160	94 (160)	1.00 (0.18-5.46)
Birth state[c]	25	24 (6)	125	24 (30)	1.00 (0.37-2.68)
Violent criminal history	49	39 (19)	245	15 (37)	3.83 (1.88-7.79)
Rape criminal history	49	12(6)	245	0.4 (1)	4.93 (0.08-322)
Sexual criminal history[d]	49	6 (3)	245	2 (5)	3.00 (0.72-12.6)
Property criminal history	49	35 (17)	245	16 (39)	3.04 (1.49-6.19)
Patronizing criminal history	60	2 (1)	300	3 (10)	0.48 (0.06-3.92)
Other criminal history	49	18 (9)	245	26 (63)	0.65 (0.30-1.41)
Car[e]	7	57 (4)	35	71 (25)	0.46 (0.07-3.15)

[a]Bivariate odds ratio from conditional logistic regression, which incorporates matching design.
[b]BMI < 20 or > 35 (underweight or severely/morbidly obese)
[c]Whether birth state the same as state where victims encounter (cases) or arrested for patronizing (controls).
[d]History of sexual offenses other than rape or sexual assault.
[e]Whether used car (vs. other type of motorized vehicle) when encountering victims (cases) or arrested for patronizing (controls).

Table 5. Multivariate conditional logistic regression results for comparison between violent clients and clients arrested for patronizing

Variable	All (n = 390)		Killers (n = 258)	
	OR	AOR	OR	AOR
Age	1.02 (0.99-1.04)	1.03 (1.00-1.05)	1.00 (0.97-1.03)	1.01 (0.98-1.05)
White race	0.81 (0.44-1.49)	0.74 (0.38-1.47)	0.57 (0.27-1.21)	0.49 (0.21-1.17)
Violent criminal history	3.27 (1.71-6.28)	3.39 (1.52-7.55)	4.43 (2.06-9.52)	5.01 (1.87-13.4)
Sex criminal history	3.75 (0.84-16.8)	2.69 (0.40-17.9)	3.75 (0.84-16.8)	1.53 (0.23-10.2)
Property criminal history	2.80 (1.46-5.38)	2.88 (1.38-6.01)	3.28 (1.53-7.02)	4.05 (1.62-10.1)
Patronizing criminal history	0.40 (0.05-3.17)	0.20 (0.02-1.82)	---	---
Other criminal history	0.80 (0.39-1.66)	0.35 (0.14-0.87)	0.78 (0.35-1.76)	0.22 (0.07-0.67)

Note: The table shows the bivariate, unadjusted odds ratios (OR) and multivariate adjusted odds ratios (AOR), with 95% confidence intervals in parentheses; cases coded as 1, controls as 0. Rape criminal history is not included because no controls had such history, although 9% of cases did; no cases in the killers subset had a patronizing history. The models include data from Arizona, Connecticut, Florida, Minnesota, New Mexico, New York, and Washington state.