Demographic, Biometric, and Geographic Comparison of Clients of Prostitutes and Men in the US General Population

Devon D. Brewer[1], Stephen Q. Muth[2], and John J. Potterat[3]

[1]Interdisciplinary Scientific Research, Seattle, Washington, USA

[2]Quintus-ential Solutions, Colorado Springs, Colorado, USA

[3]Independent consultant, Colorado Springs, Colorado, USA

Corresponding author: Devon D. Brewer, Ph.D., Interdisciplinary Scientific Research, P.O. Box 15110, Seattle, WA, 98115, USA; tel. 206-985-2398; fax 815-301-8854; email via www.interscientific.net/contact.html.

Abstract

To elucidate factors underlying prostitution, we compared clients arrested for patronizing prostitute women in several US metropolitan areas with temporally and geographically comparable men in the general population, as represented in local Census data and probability sample surveys. We conducted parallel analyses for self-reported clients and other men in the General Social Surveys. Using data from a Colorado Springs study, we also compared clients of street prostitutes and clients who patronized off-street prostitutes only. On average, clients were less educated, had lower body mass index values, and were more likely to be young, Hispanic or Black, and currently unmarried than men in the general population. Clients also resided closer to their arrest locations and drove newer vehicles than expected. Furthermore, clients of street prostitutes had similar demographics and patronizing behavior as clients who patronized off-street prostitutes only. These results suggest demand and supply mechanisms driving prostitution.

Introduction

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 (Brewer et al. 2006, Brewer et al. in press), comparisons involving john school attendees (Kennedy et al. 2004, Monto and McRee 2005) suffer from biased samples of arrested clients. John school participants included clients who were first-time patronizing arrestees, were offered and agreed 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 and McRee 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, Cameron and Collins 2003, Rissel et al. 2003, Ward et al. 2005) circumvent these problems. However, men substantially underreport patronizing in surveys (Turner et al. 1998, Des Jarlais et al. 1999, Brewer et al. 2000, Lau 2000, Lau et al. 2003, Rogers et al. 2005, van Griensven et al. 2006), and it is unknown whether client characteristics moderate reporting of patronizing behavior. Also, comparisons in which clients are defined as men who have ever patronized in their lifetimes (Sullivan and Simon 1998, Monto and

McRee 2005, Træen et al. 2005) risk conflating cohort effects for correlates of patronizing. Such comparisons may also mistakenly identify time-varying characteristics (e.g., education, marital status, etc.) as correlates even though those characteristics may have changed between the time clients last patronized and the time they were interviewed.

In this paper, we compare clients arrested for patronizing prostitute women 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 off-street 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 (Brewer et al. in press). 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 law enforcement 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, Texas (hereafter referred to as Houston/Galveston); Indianapolis, Indiana; Kansas City, Missouri; Portland, Oregon; and Yakima, Washington. Clients were defined on the basis of patronizing-specific prostitution charges or spatiotemporal criteria that were designed to identify men caught in stings (sets of many men arrested on prostitution charges in close spatiotemporal proximity) for data sets lacking patronizing-specific prostitution charges (Brewer et al. in press). 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. According to vice detectives we talked with in several jurisdictions (including some not included in the present analysis), 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. Decoys' general appearance was made to resemble that of prostitute women working in the community at that time. Stings were conducted in areas with high numbers of visible street prostitutes and complaints about prostitution (Baker 2004, Brewer et al. in press). 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, Texas; Harris and Galveston Counties, Texas; Marion County, Indiana; Jackson County, Missouri [Kansas City extends over 4 counties, but all arrests by Kansas City police were within Jackson County]; Multnomah County, Oregon; Yakima County, Washington). 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 spatial 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 (Brewer et al. in press), 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 (age, race/Hispanic ethnicity, education, marital status, and distance between residence and arrest location). For Dallas, Houston/Galveston, and Portland, we compared arrested clients' biometric characteristics (height, weight, and body mass index [BMI]) 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, and the summary data are stratified by sex, age, and race/Hispanic ethnicity. We compared arrested Portland clients' vehicle characteristics (age and type) with those reported by householders residing in the 8-county Portland-Salem Consolidated Metropolitan Statistical Area (CMSA) who participated in the 2001 National Household Travel Survey (NHTS) and the 1990 and 1995 Nationwide Personal Transportation Surveys (NPTS) (http://nhts.ornl.gov). 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 CMSA. 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.) See the Appendix for details on coding procedures for specific variables.

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 and 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 (these behaviors

were combined in a single question), 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; only two reported bisexual behavior in the last 12 months. 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, Colorado (Klovdahl et al. 1994, Potterat et al. 2004). Clients of prostitute women were recruited from the county STD and HIV clinics, jail, and outreach in areas of prostitution, 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 (Brewer et al. 2006). 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 off-street 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 determine whether the difference between observed and expected category distributions was statistically significant. 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 (interval) of the characteristic, and then computed the cumulative Z for a variable across strata, weighting z-scores by the number of clients in a stratum (Mosteller and 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. We coded the number of sex partners in the same way as in prior analyses of the GSS data (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 (Goodman and Kruskal 1954, Agresti and Finlay 1986) to measure the association between sector of clients' prostitution and race (with sector as the dependent variable).

Results

Demographics

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, except for the youngest age group. 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 Black-White difference in representation among clients was stronger in the GSS data than in the arrest data, and was matched by Black GSS respondents' greater share of sexual partnerships, relative to their underlying numbers, in the general population. Asian/Pacific Islanders were underrepresented in the arrest data 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 cannot be explained by the missing data, as 2000 Census data show that Hispanics in Indianapolis (and nationally) tended to have less education than other ethnic and racial groups (http://factfinder.census.gov). The relationship between education and patronizing in the GSS data is weaker than that in the Indianapolis data.

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, and 47 for the GSS.
[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, 353 for Portland, and 47 for the GSS.
[a]Ratio of the proportion of all sex partners reported by metropolitan males to the proportion of metropolitan male respondents in the 1998-2002 GSS
[b]Expected frequency < 5

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	6.12[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), 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]	1.00[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

Married men were slightly to moderately less likely to be clients (1989-91 Indianapolis observed:expected ratio = 0.88, n = 686 clients, p < .001; 1999-2001 Indianapolis ratio = 0.81, n = 532 clients, p < .001; 1988-2002 GSS ratio = 0.44, n = 47 clients, 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 to 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, but this variation 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 CMSA 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 and Renne 2003). Clients who resided in the outer counties of the CMSA 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 off-street prostitutes

In the Colorado Springs study, 78% (87/112) of clients reported patronizing street prostitutes, with the remainder patronizing prostitutes only in off-street settings (escort services, massage parlors, bars, and/or other venues). Clients of street prostitutes and clients of off-street 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 off-street 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. (The extreme underrepresentation of the oldest men may also reflect, in part, insufficient physical mobility to patronize prostitutes on the street or elsewhere.) 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 stereotypes about why some clients seek prostitutes, our results show that clients did not seem to be more unattractive than the general population of men, at least in terms of their height/weight proportionality. 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

Table 3. Ratios of observed to expected frequencies of male clients for age-adjusted education

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]p < .05
[c]p < .001

Table 5. Mean difference in observed and expected residence-client arrest location road 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, $p < .0001$. SUV = sport utility vehicle.
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 off-street prostitutes, Colorado Springs, 1988-92

Variable	Clients of street prostitutes Mean (SD)/% (n)	Clients of off-street prostitutes Mean (SD)/% (n)	Association[a]
Age (years; n = 112)	33.9 (9.4)	36.1 (12.2)	.09
Education (years; n = 111)	13.2 (2.6)	12.3 (2.8)	-.14
No. local prostitute sex partners in last 5 years (n = 112)[b]	9.1 (13.2)	4.8 (5.9)	-.15
Race[c]			.01
Black	19 (16)	13 (3)	
Hispanic	12 (10)	21 (5)	
White	69 (58)	67 (16)	

Note: All associations $p > .05$.
[a]Point biserial (Pearson) correlation for all ratio-scale variables, with off-street coded as 1 and street coded as 0; Goodman and Kruskal's tau for race
[b]Medians = 4 for clients of street prostitutes, 2 for clients of off-street prostitutes
[c]Percentages do not sum to 100 for off-street clients due to rounding error; excludes 4 clients (two Asian/Pacific Islanders, one Black Hispanic, and one of another race)

less than a pound for the main age groups of clients) (Willey and Falsetti 1991, Kuczmarski et al. 2001). 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 and 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 valid estimation of client prevalence is challenging (Roberts and Brewer 2006, Brewer et al. in press), perhaps the highest, well-documented prevalences of prostitutes occurred in settings with most of these factors (Goldman 1978, Butler 1985); presumably the prevalence of clients was similarly high in such contexts.

In contrast to the similarity of clients of street and off-street 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 and 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% 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, Potterat et al. 1990, O'Leary and Howard 2001, Hull 2006).

The arrest data showed consistent results across communities and periods, and corresponded moderately with the GSS data. 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 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 also 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 (60-5% of the language exclusions were for Spanish speakers) (http://www.norc.org/GSS+Website/Publications/Codebook/). Some of the difference in results for the GSS and arrest data could also stem from the broader definition of clients in the GSS (which could have included, at most, two bisexual male prostitutes and/or bisexual clients of male prostitutes as well as clients who patronized prostitute women in off-street settings only).

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 who patronized local street prostitutes, and thus our results do not necessarily extend to all clients residing in the metropolitan areas studied 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.

Appendix

This appendix describes our procedures for coding variables in the comparisons between arrest and Census data. We used the most specific codes in common between the two data sources.

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). (The 2000 Census data tables are not cross-classified by age, race, sex, and Hispanic ethnicity simultaneously.) 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 Census counts of Hispanics upward according the greater proportion of males among Hispanics ≥ age 18.

For comparisons with the 1990 Census, if 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). If 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 are stratified by age (18-24, 25-34, 35-44, 45-64, ≥ 65), and we summarized data for Indianapolis clients accordingly.

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 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. 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, 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. $\geq$ age 45). Vehicle age is negatively related to personal income but is uncorrelated with race at both the individual and county levels (Miller et al. 2002, Zhou and Soot 2004).

For vehicle type, 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.

References

Agresti, A., and B. Finlay. 1986. *Statistical methods for the social sciences*. 2nd ed. San Francisco: Dellen Publishing Company.

Baker, L. M. 2004. The information needs of female police officers involved in undercover prostitution work, *Information Research* 10(1), paper 209, http://informationr.net/ir/10-1/paper209.html.

Barrows, S. 1986. *Mayflower madam: The secret life of Sydney Biddle Barrows*. New York: Arbor House.

Brewer, D. D., J. J. Potterat, S. B. Garrett, S. Q. Muth, J. M. Roberts, Jr., D. Kasprzyk, D. E. Montano, and W. W. Darrow. 2000. Prostitution and the sex discrepancy in reported number of sexual partners, *Proceedings of the National Academy of Sciences of the USA* 97(22): 12385-12388.

Brewer, D. D., J. J. Potterat, S. Q. Muth, and J. M. Roberts, Jr. 2006. A large specific deterrent effect of arrest for patronizing a prostitute, *PLoS One* 1(1): e60, doi:10.1371/journal.pone.0000060.

Brewer, D. D., J. M. Roberts, Jr., S. Q. Muth, and J. J. Potterat. In press. Prevalence of male clients of prostitute women in the United States. *Human Organization*.

Butler, A. M. 1985. *Daughters of joy, sisters of misery: Prostitutes in the American West 1865-1890*. Champaign, IL: University of Illinois Press.

Cameron, S., and A. Collins. 2003. Estimates of a model of male participation in the market for female heterosexual prostitution services, *European Journal of Law and Economics* 16(3): 271-288.

Davis, J. A., and T. W. Smith. 1994. *General Social Surveys 1972-1994: Cumulative Codebook*. Chicago: National Opinion Research Center.

de la Puente, M. 1995. Using ethnography to explain why people are missed or erroneously included by the Census: evidence from small area ethnographic studies. *Proceedings of the Section on Survey Research Methods of the American Statistical Association*. Alexandria, VA: American Statistical Association; http://www.census.gov/srd/papers/pdf/mdp9501.pdf.

Des Jarlais, D. C., D. Paone, J. Milliken, C. F. Turner, H. Miller, J. Gribble, Q. Shi, H. Hagan, and S. R. Friedman. 1999. Audio-computer interviewing to measure risk behavior for HIV among

injecting drug users: A quasi-randomized trial, *Lancet* 353(9165): 1657-1661.

Freund, M., N. Lee, and T. Leonard. 1991. Sexual behavior of clients with street prostitutes in Camden, NJ, *Journal of Sex Research* 28(4): 579-591.

Goldman, M. S. 1978. Sexual commerce on the Comstock Lode, *Nevada Historical Society Quarterly* 21(2): 98-129.

Goodman, L. A., and W. H. Kruskal. 1954. Measures of association for cross classifications, *Journal of American Statistical Association* 49:732-764.

Hull, A. 2006. Rape case is seen as symbol at black college in N.C. *Seattle Times*. Seattle; May 9, p. A3; http://archives.seattletimes.nwsource.com/cgi-bin/texis.cgi/web/vortex/display?slug=duke09&date=20060509.

Kennedy, M. A., C. Klein, B. B. Gorzalka, and J. C. Yuille. 2004. Attitude change following a diversion program for men who solicit sex, *Journal of Offender Rehabilitation* 40(1/2): 41-60.

Klovdahl, A. S., J. J. Potterat, D. E. Woodhouse, J. B. Muth, S. Q. Muth, and W. W. Darrow. 1994. Social networks and infectious disease: The Colorado Springs study, *Social Science and Medicine* 38(1): 78-88.

Kuczmarski, M. F., R. J. Kuczmarski, and M. Najjar. 2001. Effects of age on validity of self-reported height, weight, and body mass index: findings from the Third National Health and Nutrition Examination Survey, 1988-1994, *Journal of the American Dietetic Association* 101(1): 28-34.

Lau, J. T., J. Thomas, and J. L. Liu. 2000. Mobile phone and interactive computer interviewing to measure HIV-related risk behaviours: the impacts of data collection methods on research results, *AIDS* 14(9): 1277-1279.

Lau, J. T., H. Y. Tsui, and Q. S. Wang. 2003. Effects of two telephone survey methods on the level of reported risk behaviours, *Sexually Transmitted Infections* 79(4): 325-331.

Laumann, E. O., J. H. Gagnon, R. T. Michael, and S. Michaels. 1994. *The social organization of sexuality: Sexual practices in the United States*. Chicago: University of Chicago Press.

Lever, J., and D. Dolnick. 2000. Clients and call girls: Seeking sex and intimacy, in R. Weitzer, (Ed.). *Sex for sale: Prostitution, pornography, and the sex industry*. New York: Routledge, pp. 85-100.

Miller, T. L., W. T. Davis, G. D. Reed, P. Doraiswamy, and A. Tang. 2002. Effect of county-level income on vehicle age distribution and emissions, *Transportation Research Record (Energy, Air Quality, and Fuels 2002)* (1815): 47-53.

Monto, M. A., and N. McRee. 2005. A comparison of the male customers of female street prostitutes with national samples of men, *International Journal of Offender Therapy and Comparative Criminology* 49(5): 505-529.

Mosteller, F., and R. R. Bush. 1954. Selected quantitative techniques, in G. Lindzey, (Ed.). *Handbook of Social Psychology*. Cambridge, Mass.: Addison-Wesley Publishing Company, Inc., pp. 289-334.

Ogden, C. L., C. D. Fryar, M. D. Carroll, and K. M. Flegal. 2004. *Mean body weight, height, and body mass index, United States 1960-2002. Advance Data from Vital and Health Statistics, no. 347*. Hyattsville, MD: National Center for Health Statistics; http://www.cdc.gov/nchs/data/ad/ad347.pdf.

O'Leary, C., and O. Howard. 2001. The prostitution of women and girls in metropolitan Chicago: a preliminary prevalence report. Chicago, IL: Center for Impact Research.

Paz-Bailey, G., S. Teran, W. Levine, and L. E. Markowitz. 2004. Syphilis outbreak among Hispanic immigrants in Decatur, Alabama: association with commercial sex, *Sexually Transmitted Diseases* 31(1): 20-25.

Potterat, J. J., D. E. Woodhouse, J. B. Muth, and S. Q. Muth. 1990. Estimating the prevalence and career longevity of prostitute women, *Journal of Sex Research* 27(2): 233-243.

Potterat, J. J., D. E. Woodhouse, S. Q. Muth, R. B. Rothenberg, W. W. Darrow, A. S. Klovdahl, and J. B. Muth. 2004. Network dynamism: history and lessons of the Colorado Springs study, in M. Morris, (Ed.). *Network epidemiology: a handbook for survey design and data collection*. New York: Oxford University Press, pp. 87-114.

Pucher, J., and J. L. Renne. 2003. Socioeconomics of urban travel: Evidence from the 2001 NHTS, *Transportation Quarterly* 57(3): 49-77.

Rissel, C. E., J. Richters, A. E. Grulich, R. O. de Visser, and A. M. Smith. 2003. Sex in Australia: experiences of commercial sex in a representative sample of adults, *Australian and New Zealand Journal of Public Health* 27(2): 191-197.

Roberts, J. M., Jr., and D. D. Brewer. 2006. Estimating the prevalence of male clients of prostitute women in Vancouver with a simple capture-recapture method, *Journal of the Royal Statistical Society Series A (Statistics in Society)* 169(4): 745-756.

Rogers, S. M., G. Willis, A. Al-Tayyib, M. A. Villarroel, C. F. Turner, L. Ganapathi, J. Zenilman, and R. Jadack. 2005. Audio computer assisted interviewing to measure HIV risk behaviours in a clinic population, *Sexually Transmitted Infections* 81(6): 501-507.

Rosenthal, R. 1991. *Meta-analytic procedures for social research*. Newbury Park: Sage.

Sullivan, E., and W. Simon. 1998. The client: a social, psychological, and behavioral look at the unseen patron of prostitution, in J. E. Elias, V. L. Bullough, V. Elias, G. Brewer, (Ed.). *Prostitution: On whores, hustlers and johns*. Amherst, NY: Prometheus Books, pp.

Træen, B., L. M. Eek-Jensen, and H. Stigum. 2005, September 26. Sex customers in Norway 2002, *Electronic Journal of Human Sexuality* 8: http://www.ejhs.org/volume8/Sex_Norway.htm.

Turner, C. F., L. Ku, S. M. Rogers, L. D. Lindberg, J. H. Pleck, and F. L. Sonenstein. 1998. Adolescent sexual behavior, drug use, and violence: increased reporting with computer survey technology, *Science* 280(5365): 867-873.

van Griensven, F., S. Naorat, P. H. Kilmarx, S. Jeeyapant, C. Manopaiboon, S. Chaikummao, R. A. Jenkins, W. Uthaivoravit, P. Wasinrapee, P. A. Mock, and J. W. Tappero. 2006. Palmtop-assisted self-interviewing for the collection of sensitive behavioral data: randomized trial with drug use urine testing, *American Journal of Epidemiology* 163(3): 271-278.

Ward, H., C. H. Mercer, K. Wellings, K. Fenton, B. Erens, A. Copas, and A. M. Johnson. 2005. Who pays for sex? An analysis of the increasing prevalence of female commercial sex contacts among men in Britain, *Sexually Transmitted Infections* 81(6): 467-471.

Willey, P., and T. Falsetti. 1991. Inaccuracy of height information on driver's licenses, *Journal of Forensic Sciences* 36(3): 813-819.

Zhou, J., and S. Soot. 2004. Travel characteristics of low-income households: vehicle age, type and annual miles driven. *Paper presented at the Changing Face of Chicago conference, University of Chicago.*