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An Economic Analysis of Income and Expenditures by Heroin-Using Research Volunteers

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Abstract

At a Detroit research program from 2004 to 2005, out-of-treatment chronic daily heroin users ($N = 100$) were interviewed to evaluate relationships between past 30-day income and factors influencing heroin price, expenditures, and consumption. Weekly heroin purchasing frequency was positively related to income and number of suppliers, and negatively related to time cost (min) from primary supplier. Daily heroin consumption was positively related to income and injection heroin use, and negatively related to unit cost of heroin. Implications and limitations are noted. Simulations are underway to assess within-subject changes in drug demand. Supported by NIH/NIDA R01 DA15462 and Joe Young, Sr. Funds (State of Michigan).

Keywords

behavioral economics; heroin; injection; opiates; Detroit

Introduction

Heroin abuse¹ produces substantial costs at a macroeconomic level (Healey et al., 1998; Mark, Woody, Juday, and Kleber, 2001); however, comparatively little is known about heroin users' income-generating behaviors and purchasing at a microeconomic level. In the few extant studies, criminal behavior is often examined as an income generator (Brown and Silverman, 1974; Silverman and Spruill, 1977). In an ethnographic study of Harlem heroin users not in treatment, Johnson et al. (1985) reported that drug use was supported by a variety of sources *other than* criminal actions. Virtually all heroin users in that study obtained at least some income through noncriminal means (98%), although many (93%) also had some nondrug criminal income and income from involvement in drug business (76%).

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Declaration of Interest

The authors report no conflict of interest. The authors alone are responsible for the content and writing of the article.

¹The journal's style utilizes the category *substance abuse* as a diagnostic category. Substances are used or misused; living organisms are and can be *abused*. Editor's note.

Although the present study focuses on heroin, it should be recognized that economic activity might vary with “drug of abuse.”² For instance, Cross, Johnson, Davis, and Liberty (2001) found that frequent “crack” cocaine users had relatively higher criminal income-generating activity, compared to frequent heroin users and nonfrequent drug users. Because there are few detailed analyses of income-generating and -spending patterns in the literature, the present study examined specific economic behaviors among out-of-treatment heroin users.

Evaluating the income and expense profile of heroin users who are not presently seeking treatment may be useful to assess which factors maintain drug use. Two Northern European studies (Bretteville-Jensen and Sutton, 1996; Grapendaal, Leuw, and Nelen, 1992) have described the income-generating activity of out-of-treatment heroin users. These studies found that income from criminal activity and dealing comprised almost 90% of total income. Bretteville-Jensen (1999) also described gender differences in consumption and economic behavior among heroin users in a large urban Norwegian sample; females consumed heroin in larger amounts and more frequently than their male counterparts. However, other salient factors such as primary route of heroin administration, poly-substance use, duration of drug use, and income level may play a role in heroin purchasing and consumption. Empirical analysis of subgroup differences may help tailor treatment and policy approaches.

The present study provides systematic and quantitative evidence on Detroit metropolitan area heroin consumption among out-of-treatment users, focusing on income-generating and -spending behaviors in this population. Semistructured interview methods were used to address three aims. First, we characterized the population according to the economic variables and compared it to two previous European samples (Bretteville-Jensen and Sutton, 1996; Grapendaal et al., 1992). Second, we examined the relationship between economic variables and heroin purchasing and consumption. Third, we explored individual differences in economic behavior based on patterns of drug use.

Methods

Screening Procedures

This investigation was part of a larger study approved by the local Investigational Review Board. Male and female volunteers, 18–55 years old, were recruited from the Detroit area by newspaper advertisements and word-of-mouth. Those identifying themselves as heroin-dependent were instructed to call for a telephone interview, which excluded individuals seeking drug abuse treatment.

This study sample comprises 100 volunteers who completed the first screening visit from February 2004 to July 2005 at a downtown Detroit outpatient clinical research program. This included written informed consent, providing demographic information, a complete medical and drug use history, and a semistructured interview lasting about 20–30 min that

²The often used nosology “drugs of abuse” is both unscientific and misleading in that (1) it mystifies and empowers selected active chemicals into a category whose underpinnings are neither theoretically anchored nor evidence-informed and which is based upon “principles of faith” held and transmitted by a range of stakeholders representing a myriad of agendas and goals; (2) a range of psychoactive substances—both naturally grown and those which are produced—have been, historically, and continue to be used and misused for a range of functions which are or are not “normed,” acceptable and/or controlled. Editor’s note.

was designed to obtain specific information about factors influencing drug price, purchasing, and use. All volunteers reported current daily heroin use and/or provided a urine sample that had to test positive for opioids (>300 ng/ml). Participants were paid US\$25 for completing the first screening visit.

Semistructured Interview

Participants were asked questions to ascertain past 30-day income, heroin price, all drug and nondrug expenditures, and drug consumption. Before the interview, it was reemphasized that responses to all questions were confidential. A confidentiality certificate was obtained from the US National Institute on Drug Abuse prior to the study. The interview instrument is available upon request.

Data Analysis

Initial data analysis focused on describing characteristics of the participant sample. The means of most variables provided adequate representation of the group; however, medians and quartiles also yield insight. The data were first examined as a whole, then divided into groups based on injection (noninjection) heroin use and gender.

Income was partitioned into percentages of total income for six *a priori* categories (Figure 1). As the semistructured interview took place, notes were taken on the composition of “other income” for *post hoc* analyses (see “Results”).

Multiple regression analyses were performed to determine which variables were significantly associated with purchasing and use of heroin. The independent variables listed in the leftmost column of Table 4 were used to predict dependent variables of bags consumed per day, number of bags purchased per week, percentage of income spent on heroin, and unit purchase amount.

Cluster analysis was also conducted to identify subgroup differences in purchasing and consumption. Group differences (injection/noninjection and gender related) were assessed using analyses of variance (ANOVAs) for continuous variables and Chi-square tests for categorical variables. The rejection region for all statistical tests was set at $p < .05$.

Results

Participant Characteristics

This cohort was predominantly African-American, male and about 45 years old with a high school or equivalent education. Participants reported using heroin for about 20 years. Urinalysis results reflected poly-drug use with 45 participants testing positive for cocaine, 14 participants testing positive for marijuana, and 10 participants testing positive for benzodiazepines.

Table 1 presents overall sample means, medians, and quartiles for selected responses. The sample mean was split based on current primary route of heroin use to assess differences between these subgroups. Of the 100 respondents, 58 individuals reported they primarily injected heroin and 37 reported they did not inject. Primary route of heroin use was

unavailable for five participants. Injection relative to noninjection heroin users reported significantly more time per episode purchasing heroin and consuming more bags of heroin per day. Chi-square analysis indicated that subject classification by route of administration was independent of gender.

Participants reported living fairly close to their primary heroin supplier's transaction location: cumulatively, 46% lived within 1 mile and 60% within 2 miles (see Table 1). Individuals responded that their primary supplier was reliable: 73% endorsed that they "never" (less than once per month) and 17% endorsed that they "rarely" had arranged deals fail. Participants reported relatively easy access to their supplier: 34% primarily walked or rode a bicycle, 26% primarily drove their own vehicle, 19% primarily rode the bus, 11% primarily relied on a friend/family member to drive them, and 10% listed that the dealer delivered heroin to them. Only 4% of participants reported that they had ever bought opiates in Canada (easily accessible from Detroit), and none in the past 30 days.

Of the 92 participants who felt confident to estimate the purity of their usual heroin, the range varied widely across individuals, from 2% to 100%, with a mean estimated purity of 48%. Participants were also questioned about recognition of additives to their usual heroin, and 32% responded that they did not know what substances might be added. One participant believed her heroin had no additives. The other 67% of participants who suspected additives were confident enough to report one or more of the following substances (total number of mentions): lactose (32); mannitol (17); sedative/barbiturate (17); vitamins, especially vitamin B (15); another opiate such as codeine, morphine, oxycodone, or hydromorphone (6); and quinine (6). Purity was significantly and positively correlated ($r = 0.21$) with unit purchase amount; however, it was not significantly correlated with price per unit.

Although the response means represent the data reasonably well, a few notable differences between means and medians occurred in the heroin purchasing data. Specifically, the typical unit price of heroin (for about 1/10th of a gram) was \$10, which was the case for 71 out of 100 respondents. However, others stated their experienced unit price was \$20 ($n = 6$) or \$25 ($n = 6$). Differences in unit purchase amounts were also observed, leading to discrepant values for the mean (\$35) and median (\$25). The most frequent patterns were to buy two \$10 bags each time ($n = 25$), three \$10 bags per episode ($n = 14$), one \$10 bag per episode ($n = 7$), or five \$10 bags each time ($n = 6$). The remainder of the sample reported heterogeneous heroin buying patterns, which ranged from a single monthly purchase of \$500 to several daily purchases of \$5 each.

Income Distribution

Figure 1 identifies sources and amounts of past-month income, and participation rates (percent engaging in the behavior) for the entire group. Injection and noninjection users did not significantly differ in mean income or participation in income-generating activities (Table 1). The only significant gender difference involved employment income. Legal past-month employment income was \$248 for females and \$587 for males. Hourly wage rate in the most recent job was also significantly lower for females than males, \$10.08 versus \$13.10. No females reported income from unemployment compensation, whereas males' mean unemployment compensation was \$63.80. Females reported higher average past-

month total “Other Income” than males (\$1161 versus \$743), but this difference was not statistically significant. Contributing to this mean difference was that prostitution/pimping income was significantly higher for females, although the small number of female participants ($n = 30$) and even fewer reporting income from prostitution ($n = 12$) limit confidence in this finding.

To compare these income distribution data with two previous studies conducted in Oslo, Norway (Bretteville-Jensen and Sutton, 1996), and Amsterdam (Grapendaal et al., 1992), and to further explore the present data, the “Other Income” category—which accounted for about half of total income (Figure 1)—was subdivided into gains from stealing, bartering (trading nonsexual service for drugs), drug gifts (gifts among friends, not in-kind payments), lying/conning, gambling, prostitution/pimping, credit, selling drugs, selling items, and miscellaneous earnings. Table 2 illustrates the income breakdown in the present study and the two other studies. The Oslo study was further compared to data from Scotland: however, the breakdowns included only males and a portion of those were institutionalized. Therefore, a comparison with the Scotland study does not seem prudent. The Detroit area survey ($N = 100$) is presented whole and divided into injection and noninjection users for comparability. In a study for the National Institute of Justice and the Office of National Drug Control Policy, Riley (1997) reports that Chicago heroin users ($N = 122$) earn 52% of their income from employment, 17% from public assistance, 5% from their families, and 18% from drug dealing (7% of income is reported from “other” sources). The differences between the countries are noteworthy but generalizations are not warranted. Participants in the Oslo study may have been interviewed more than once and Norwegian policies regarding drug dealing and use vary dramatically from the United States. The Detroit sample appears to underrepresent the drug-dealing population.

Only 16 participants in the Detroit sample reported selling drugs during the past month; for these individuals, income from past-month drug sales varied widely (\$200–\$5,280). Males and females significantly differed in two of the “Other Income” subcategories. Mean past-month prostitution/pimping income was \$519 for females and \$13 for males. Twelve of the 30 females reported income from prostitution, while only 4 of the 70 males reported income from prostitution/pimping. In contrast, mean past-month income from selling drugs in the overall sample was \$0 for females and \$163 for males. Eight males and no females reported income from selling drugs. Injection relative to noninjection heroin users had significantly higher mean past-month income from lying (\$127 versus \$51) and prostitution income (\$272 versus \$20), effects that were masked in the broadly defined “Other Income” category. Thirty-five injection users reported earnings from lying/conning compared to 20 noninjection users. Thirteen injection users reported income from prostitution/pimping, whereas three noninjection users reported income from this activity.

Expenditure Distribution

Figure 2 reveals the common expense categories, the mean percentage of income devoted to each category, and the participation rate (percent engaging in the behavior). Individuals reported that nearly 3/4 of their income was allocated to heroin purchases, and about 9% to cigarette and other substance purchasing; the remainder of expenditures was for food (7%),

shelter and utilities (5%), and nondrug miscellaneous items (7%). Injection and noninjection heroin users did not significantly differ in their pattern of expenditures. The only significant gender difference was the percentage of income spent on alcohol, which—while accounting for a very small proportion—was 0.8% for males and 0.3% for females. Females reported spending a higher percentage on shelter than males (6.7% versus 4.3%); however, this difference was not significant.

Table 3 reveals a mean of 72% of income devoted to the purchase of heroin, which is a reasonable representation of the sample. The median of income percentage devoted to heroin is 77%, while the first quartile is 59% and the third quartile is 89%. Total income is negatively and significantly correlated ($r = -0.26$) with percentage of income spent on heroin. Percentage of income devoted to heroin is also significantly correlated with income from selling drugs ($r = -0.23$); however, only 16 participants reported any income from this category. All other income categories were not significantly correlated with percentage of income spent on heroin.

Predicting Heroin Purchasing and Consumption

Regression analyses were conducted to predict four measures of heroin purchasing and consumption (rightmost columns of Table 4). The independent variables were identical in each analysis (left column of Table 4).

Higher unit purchase amount (range = \$0 to \$500; median = \$25) was not significantly predicted by any of the selected independent variables. Higher percentage of income spent on heroin (range = 8% to 100%; median = 77%) was significantly predicted by two factors: injection heroin use and less use of nonheroin opiates. These two variables explained 10% of the variance. Percentage of income spent on heroin and purchase of nonheroin opiates may be simultaneously determined, resulting in an endogeneity problem and erroneous estimates of coefficients. However, the regression coefficients change minimally (nonsignificantly) when nonheroin opiates are removed from the equation. Percentages spent on heroin and nonheroin opiates are not highly correlated ($r = 0.002$).

Frequency of heroin purchases varied widely across participants (range = once per month to 8 times per day; median = 14 times per week). Purchasing heroin more often was significantly predicted by three factors: a higher total monthly income, less time spent per purchase (min), and more suppliers. The three significant regressors explained 20% of the variance in weekly purchasing frequency.

Consuming a higher daily number of bags of heroin (range = 1 to 16; median = 4) was significantly predicted by three factors: higher total monthly income, lower bag unit cost (mean = \$10.95), and injection heroin use. These variables explained 51% of the variance in number of daily bags of heroin consumed.

Cluster Analysis

Cluster analysis identified two subgroups (Table 5). Most participants ($n = 89$, Cluster 1) were classified based on their lower past-month total incomes (\$1368), spending 75% of their total income on heroin, purchasing heroin about 2 times daily, consuming 4 bags per

day, more likely not to inject heroin, and less likely to use other nonheroin opiates. The remaining subgroups ($n = 11$, Cluster 2) had substantially higher past-month total income (\$4146), spent 50% of this income on heroin, purchased heroin about 3 times daily, consumed 7 bags per day, were more likely to inject, and more likely to use other nonprescribed opiates.

Discussion

This study resulted in several primary findings. First, this Detroit-based sample of chronic heroin users reported habitual and efficient economic behaviors for obtaining income and expending this income primarily to obtain heroin. Although no single income source predominated among this sample, heroin purchases accounted for the overwhelming majority ($\approx 3/4$) of all expenditures. Second, the economic activity of this sample differed from that of two other non-US comparison samples. Third, this study found that total income was a significant and enabling predictor for purchasing and consuming opiates, but that other factors were differentially associated with purchasing *versus* consuming opiates.

These results and their implications are presented as follows.

Some may find it surprising that mean past-month income for the group exceeds the annual federal poverty threshold for a single individual of \$9,800 (US Health and Human Service guidelines for 2006). To the extent that participants can be described by group means they consumed 4.4 bags of heroin per day at \$10.95 per bag, a consumption level that would require an annual income exceeding the 2006 poverty threshold by \$7,905. In 2000–2002, Manhattan arrestees who reported using *both* heroin and cocaine describe spending more than \$1,000 on drugs over the past 30 days (Golub and Johnson, 2004). Owing to long individual histories of heroin use in this Detroit sample, projection of stated opiate consumption rates may be safe. However, such projections must be done with considerable caution. None of the survey questions asked for annual information. Income and expense reports were provided via semistructured interview responses and great care was taken so that past-month income responses and past-month expense responses were reconciled to within \$100 of each other. The interview was conducted in confidence with the participant, who was encouraged to provide accurate responses. While the researchers are reasonably certain in the accuracy of past-month responses, that certainty would be reduced considerably for extrapolations into the future. When the survey was conducted, the minimum wage in Detroit was \$5.15 per hour while the most recent actual wage rate for the participants in this study was \$12.20. In this regard, the present sample may be described not so much as “income-poor” but, rather, as “consumption-poor,” that is, there is little consumption other than drug purchasing.

While characterizing the income-generating behavior of Detroit area heroin users it became evident that substantial differences existed between this group and other study samples. Oslo opiate users (Bretteville-Jensen and Sutton, 1996) reported earning less than 10% of their total income through legitimate means, more than 30% through criminal activity, and nearly 60% by dealing drugs. Amsterdam opiate users reported income that was segregated into 33% legitimate earnings, 39% criminal activities, and 20% dealing (8% of income came

from “other” transactions). In contrast, Detroit area heroin users reported a markedly different earnings profile that included 55% of total income from legitimate employment activity and transfers, 30% earned through nondealing criminal activity, and only 7% earned through drug dealing (again, 8% of income came from “other” transactions). The difference in income generation activity may be secondary to the participant selection approach. The present Detroit area sample was recruited by word of mouth and through newspaper advertisements and required the participants to present at a research clinic. Furthermore, when systematically asked about motivations to participate in this type of laboratory research (data to be reported elsewhere), the income earned from participation was ranked as the most important reason. It is possible that time away from dealing activity would produce an economic loss; therefore, dealers had minimal motivation to participate. However, the heroin users in this study are of particular interest due to their ability to earn legitimate income combined with their continued participation in criminal activity.

Importantly, the two comparison studies involved only heroin injectors, whereas the present sample had a mixed composition of injecting and noninjecting users. To assess whether income differences between studies might be attributable to this factor, we separated Detroit income data according to primary route of heroin administration. However, there were few significant differences between the two Detroit groups. Only income from prostitution and lying significantly differed between the IV and non-IV users. An *F* test comparing demand regressions between IV and non-IV users led us to reject the null hypothesis and suggests there are differences among the demand determinants of distance to supplier, unit cost, purchase time, total income, and number of suppliers, but the test does not reveal which effects significantly differ across the two populations.

One of the few gender differences in this Detroit sample involved income generation: females earned a significantly lower wage and significantly more income from prostitution than males. Bretteville-Jensen (1999) found that female addicts engage more in prostitution and less in criminal activity than their male counterparts. The fact that the female wage is lower than the male wage is certainly not unique to the opiate-using population; however, the wage differential in this population may have the additional detrimental effect of encouraging female participation in prostitution.

While absolute dollar amounts from income sources provide a fairly thorough accounting of these opiate users' economic behavior, the picture becomes more complete when participation rates are considered. Although only 30% of total income was reportedly obtained through employment, two-thirds of the sample participated in this activity. Contributions from family and friends were a small portion of total income (about 11%); however, the participation rate was 68%. Unstructured comments from these participants suggest that contributions of family and friends may be significantly underestimated in our survey due to food, clothing, and shelter subsidies that are provided but not recorded as income. One limitation of this study is that participants could not accurately estimate the amounts of food, clothing, and shelter subsidies (despite our attempts), so we are unable to provide these data. The existence of this “shadow” income partly explains how some individuals reported spending nearly all of their income on heroin.

Clearly, more income enables heroin users to purchase and consume more opiates. In fact, regression analyses showed that total past-month income significantly predicted both increased heroin purchasing frequency and daily consumption. However, past-month income did not significantly predict the *percentage* of income spent on heroin (significantly and negatively correlated). In contrast, Petry (2000) found in a within-subject hypothetical simulation study that heroin consumption was income elastic, that is, a percentage increase in income brought about a larger percentage increase in heroin purchases. In the present study, income elasticity, measured at the sample mean of total past 30-day income, was 0.75; this is inelastic. The percentage change in quantity demanded of heroin for the past 30 days responded positively, but as a smaller percentage, to income. Price elasticity of demand, measured at the sample mean of past 30-day unit cost, was -0.64 . Again, this is inelastic. A percentage increase/decrease in price, at the sample mean, brought about a smaller percentage decrease/increase in quantity demanded. Cluster analysis of the present data revealed two subgroups that differ on both income and consumption. A minority of the present sample, who reported a higher mean income, purchased and consumed more bags per day of heroin while spending a smaller percentage of total income on heroin. The majority of the sample, who reported a lower mean income, purchased heroin less often and consumed fewer daily bags while spending a higher percentage of total income on heroin. Thus, while higher total income appears to enable significantly greater opiate purchasing, the extent of purchasing does not increase in proportion to income level—an inelastic response at the mean income and quantity level. It is possible that the discrepant results of this study relative to Petry (2000) reflect different methodological approaches and/or that conclusions may need to be qualified for subgroups at the upper and lower extremes of the income spectrum. However, demand curves typically experience changes in elasticity over the full range of quantity.

One lesson derived from this study is that the “price” of heroin must account for the user’s practical considerations other than actual bag unit cost, including the supplier’s reliability, distance and time to purchase, drug purity, and perceived risks of buying in certain locales, because these microeconomic factors may influence purchasing behavior (see Caulkins, 1994, for ambiguities about market-level prices). Most supplemental “price” information can be obtained from interviews and the cost effectiveness of obtaining the income and expenditure information provided in this report should be noted. The analyses included in this paper do not address the full cost of each heroin purchase. The regressions only reveal that purchase time is not a significant variable. When the survey instrument was first developed a “dealer reliability” variable was collected but it was clear that question was not adding additional information (purchasing failure was very low). The outcomes of the regression analyses suggest rational consumption. Increased time costs are related to fewer heroin purchases per week. Heroin users who report a higher number of suppliers also report more purchases per week. Higher unit cost is associated with lower consumption. Finally, higher income predicts more consumption. The signs on the regression coefficients are consistent with planned purchasing behavior and suggest areas for further research. In an independent sample, using a revised survey, we are now attempting to capture full price in a more meaningful fashion by analyzing reactions to hypothetical scenarios involving increased arrest probability and increased purchase time and distance variables.

Theoretically, a new composite price variable could be constructed that combines monetary price, purity, distance, and time variables.

The present data were captured in a 20- to 30-min interview while participants were screened for a separate study. In future research, it would be informative—albeit difficult—to estimate the impact of income subsidies from a drug user's social network, because this would provide a more complete picture of factors that enable drug-acquisitive behaviors. The present data suggest that the complex economic profile of out-of-treatment heroin users parallels the complexity of addiction itself. The interrogative framework and analytic approach applied here offers useful clues about the price- and income-sensitivity of drug-dependent individuals, which could be translated into treatment and policy approaches (Bickel and DeGrandpre, 1996), while the basic factual information on income, expenditures, and prices contribute to overall knowledge of the market.

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Biographies

Juliette Roddy, Ph.D. (Assistant Professor, tenure track), is a health economist teaching for the University of Michigan Dearborn's Masters in Public Policy Program. She is a member of the Sault Ste. Marie Tribe of Chippewa Indians and a Board Member of American Indian Health and Family Services, an Indian Health Services funded clinic serving urban Native Americans. Dr. Roddy is a Robert Wood Johnson Foundation New Connections Initiative Fellow. She has received research funding from NIH/NIDA, the Robert Wood Johnson Foundation, the American Association of University Women, Wyeth-Ayerst, and the Business and Professional Women's Organization. Her Ph.D. was earned from Wayne State University under the direction of Dr. Allen Goodman.

Mark Greenwald, Ph.D. (Associate Professor, tenured), directs the Substance Abuse Research Division and its Human Pharmacology Laboratory (<http://www.med.wayne.edu/psychiatry/SARD/SARD.htm>), and is Neuroscience Ph.D. training program director (<http://tnp.wayne.edu/>), Department of Psychiatry and Behavioral Neurosciences at Wayne State University School of Medicine. His NIH/NIDA funded research focuses on pharmacological, environmental, and individual difference determinants of drug-seeking behavior, and using in vivo functional brain imaging to understand the clinical neurobiology of substance use disorders. Dr. Greenwald is a Fellow of the American Psychological Association, a member of the College on Problems of Drug Dependence, and regularly reviews NIH and VA grants and manuscripts for many substance abuse-related journals.

Glossary

Behavioral economics	A field which applies scientific research on human and social cognitive and emotional biases to understand economic decisions and their outcomes. The research typically combines psychiatry, psychology and economics
Economics	The study of scarcity and how it affects decision making. Economics is a behavioral or social science
Elasticity	A concept used to quantify the response in one variable when another variable changes. Elasticity is measured by dividing the percentage change in one variable by the percentage change in the other
Income elasticity of demand	Measures the responsiveness of demand changes to changes in income. The income elasticity of demand is positive for normal goods. If demand is more responsive to a change in income, the Income Elasticity of demand is greater than one, and the response is considered <i>elastic</i> . If the income elasticity of demand is less than one it is considered <i>inelastic</i>
Price elasticity of demand	Measures the responsiveness of demand changes to changes in price of the good. The price elasticity of demand is always negative. If demand is more responsive to a price change, the absolute value of the price elasticity of demand is greater than one, and the response is considered <i>elastic</i> . If the absolute value of the price elasticity of demand is less than one it is considered <i>inelastic</i>

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Income Category, Mean (\$), and Participation (%), $N = 100$ **Figure 1.**

Past-month income distribution (US dollars) and participation (percent of group) for the aggregate sample ($N = 100$). Mean past-month income was \$1,678.

Figure 2.
Past-month spending distribution (US dollars) and participation (percent of group) for the aggregate sample.

Table 1

Descriptive statistics

	Total sample mean	Median (first, third) (quartile)	Injection users	Noninjection users
Sample size (<i>N</i>)	100	NA	58	37
Race (% Black)	61	NA	24	33
Gender (% male)	70	NA	38	28
Age (year)	44.4	46.5 (40, 50)	44	45
Education (year)	12.4	12 (12, 13)	12	12
Duration heroin use (year)	21.9	23 (13, 32)	21	22
Number of heroin suppliers	3.6	3 (2, 4)	3.5	3.5
Distance to supplier (mile)	4.6	1.5(.5, 6)	4.6	4.5
Walk or ride to primary supplier (%)	34	NA	29	38
Estimated purity	48	50 (30, 70)	45	51
Unit purchase amount (\$)	35.74	25 (20, 40)	33.72	37.92
Unit cost (1 bag = 0.1 gm, \$)	10.98	10 (10, 10)	10.26	11.41
Heroin purchase time (min) per episode	46	30 (15, 60)	53	36
Heroin purchases (#) per week	13.8	14 (7, 17.5)	13.9	13.7
Other opiate (#) purchases per week	0.3	0 (0, 0)	0.4	0.2
Nonopiate purchases (#) per week	1.1	0.28 (0, 1)	1.1	1.2
Heroin consumption pattern (\$10 bags per day)				
0600–1200	1.50	1.5 (1, 2)	1.69	1.26
1200–1800	1.27	1 (0, 2)	1.47	1.01
1800–2400	1.29	1 (0.13, 2)	1.62	0.82
0000–0600	0.37	0 (0, 0.5)	0.47	0.23
Total	4.43	4 (2, 6)	5.25	3.32
Actual current hourly wage (\$)	12.20	10 (9, 15)	12.57	11.65
Past-month income sources (\$)				
Employment	485	270 (0, 681)	432	475
Unemployment insurance	45	0 (0, 0)	54	37
Public assistance	51	0 (0, 140)	52	48
Pension/social security	51	0 (0, 0)	64	38
Family/friends	178	74 (0, 273)	208	148
Other	868	600 (200, 1,138)	964	743
Total	1678	1549 (988, 2,000)	1,774	1,489

Group difference, $p < .05$.

Table 2

Comparative data

Income source	Oslo ^a (N = 770)	Amsterdam ^b (N = 150)	Detroit overall sample (N = 100)	Detroit injection users (n = 58)	Detroit noninjection users (n = 37)
Legitimate	7%	33%	55%	\$917	52% \$915
Productive				\$592	\$537
Transfers				\$325	\$378
Criminal	34%	39%	30%	\$506	35% \$627
Stealing				\$154	\$195
Bartering				\$85	\$65
Drug gift				\$102	\$95
Prostitution				\$165	\$272
Other transactions	3%	8%	8%	\$141	9% \$168
Lying				\$97	\$127
Borrowing				\$44	\$41
Dealing	57%	20%	7%	\$114	4% \$64
Total	101%	100%	100%	\$1,678	100% \$1,774

^a Bretteville-Jensen and Sutton (1996).

^b Grapendaal et al. (1992).

Table 3

Descriptive statistics for expenditures

	Total sample mean (median)	First quartile value	Third quartile value
Heroin	72.2% (77%)	57.8%	89.0%
Shelter	5.0% (0%)	0%	9.8%
Cigarettes	4.7% (4%)	1.0%	7.0%
Cocaine	3.0% (0%)	0%	3.0%
Alcohol	0.6% (0%)	0%	0%
Marijuana	0.2% (0%)	0%	0%
Benzodiazepines	0.1% (0%)	0%	0%
Other illegal drugs	0.3% (0%)	0%	0%
Other	6.9% (1%)	0%	9.0%

Table 4

Regression results (four models)^a

Predicted variable = sample mean =	Unit purchase \$35.36			Heroin/income 72%			Purchases per week 13.97			Consumption 4.5 bags per day		
	(SE) ^b	c	t	(SE) ^b	c	t	(SE) ^b	c	t	(SE) ^b	c	t
Constant	45.799 (20.021)		2.288	69.356 (7.434)		9.330	9.705 (3.200)		3.032	3.605 (.783)		4.603
Primary heroin route (0 = non-IV, 1 = IV)	-7.301 (11.449)	-.069	-.638	8.697 (4.251)	.208	2.046	.351 (1.830)	.018	.192	1.278 (.448)	.214	2.853
Distance to dealer (mile)	-.275 (.837)	-.035	-.329	-.219 (.311)	-.070	-.703	-.004 (.134)	-.003	-.027	-.024 (.033)	-.053	-.731
Unit cost (\$)	-.032 (1.315)	-.003	-.024	.285 (.488)	.059	.585	-.208 (.210)	-.095	-.990	-.261 (.051)	-.379	-5.078
Purchase time (min)	.105 (.109)	.103	.956	.031 (.041)	.075	.752	-.043 (.017)	-.235	-2.484	-.003 (.004)	-.045	-.610
Total income (\$)	.003 (.006)	.069	.587	-.004 (.002)	-.195	-1.785	.002 (.001)	.253	2.450	.002 (.000)	.584	7.237
Number of suppliers	-4.323 (2.644)	-.178	-1.635	.579 (.982)	.060	.590	1.435 (.423)	.327	3.396	.167 (.103)	.121	1.615
Nonheroin opiates (# weekly purchases)	1.761 (7.244)	.027	.243	-6.287 (2.690)	-.246	-2.337	-1.692 (1.158)	-.145	-1.462	-.306 (.283)	-.084	-1.079
Adjusted R ²	0.044	0.096	0.196	0.509								

^a Bold entries indicate statistically significant ($p < .05$) effects.^b Unstandardized (standard error).^c Standardized coefficients from regression analyses.

Table 5

Cluster analysis

Variable	Cluster	
	1 (<i>n</i> = 89)	2 (<i>n</i> = 11)
Purchases per week	13.1	20.0
Nonheroin opiates	0.2	0.7
Total daily bags	4.1	6.9
Total past-month income	\$1,368	\$4,146
Heroin % of income	74.7	52