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Public Investment in the Rehabilitation of Heroin Addicts

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OF HEROIN ADDICTS

by

Edwin T. Fujii

March, 1973

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PUBLIC INVESTMENT IN THE REHABILITATION OF HEROIN ADDICTS

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I. INTRODUCTION

The problem of heroin addiction is currently a matter of great national concern. Drug addicts commit millions of dollars of property crime annually in order to support habits averaging twenty to thirty-five dollars a day. Only 3.7% of addict income in New York City is obtained from legal sources. The rest is financed by burglary, shoplifting, stealing, con games, pushing, and prostitution.¹ The problem is magnified to the extent that sales of stolen property yield at best 20% on the true value of the articles stolen.² This implies that many addicts must steal \$100 to \$175 a day in property in order to support a habit. The costs of attempting to control this crime are equally impressive. It is estimated here that it costs the government between \$1737 and \$2600 annually to contain the criminal behavior of a single addict. The greatest loss to society, however, is the waste of thousands of potentially productive man-years caused by heroin addiction.

* I would like to thank Michael J. Boskin, Richard F. Muth, Robert C. Lind, Richard H. Blum, and Joseph A. Pechman for many helpful comments which aided substantially in the completion of this paper. A research grant from the Law Enforcement Assistance Administration helped finance the project.

¹Mark Moore, Policy Concerning Drug Abuse in New York State, Vol. 3, The Economics of Heroin Distribution (New York: Hudson Institute, 1970) p. 64.

²O. W. Wilson, "Economic Impact of Drug Addiction," Illinois Medical Journal, Oct. 1966, pp. 522-523.

At present, there exists a proliferation of narcotic addict treatment programs in the United States funded by both private and public sources. However, no attempts have yet been made to systematically evaluate the relative effectiveness of the various programs using formal economic criteria.

The purpose of this study is to: 1) determine whether or not there is a case for government intervention in the provision of heroin addict treatment programs; 2) establish criteria for evaluating the relative effectiveness of the programs; and 3) identify the most effective program.

Seven alternatives are investigated: 1) additional supply restriction; 2) detoxification; 3) civil commitment; 4) imprisonment and parole, 5) methadone maintenance; 6) heroin maintenance; and 7) heroin legalization.

II. THE RATIONALE FOR INTERVENTION

Why should the government play a role in the rehabilitation of heroin addicts? For the vast majority of goods and services in the market, the allocation of resources is determined by consumer preferences. In the case of heroin addict rehabilitation, however, there are a number of reasons why consumer preferences are not likely to efficiently allocate resources. The most important are the following:

a) The reduction of addict crime is a public good. Since benefits of crime reduction accrue to all residents of an area, there is no incentive for any one individual to pay for the service. On the contrary, there is an incentive to understate one's preference for crime reduction and treat provision by others as a positive externality.

b) The social return from rehabilitation is likely to exceed the private return to the addict. All other things equal, the greater the number of existing addicts and hence, the greater the availability of heroin, the more

experimentation with the drug will occur. Some proportion of those experimenting will become hooked. To this extent, lowering the population of addicts will reduce the rate of creation of new ones.

III. STRATEGIES FOR INTERVENTION

A. The Social Cost of Additional Supply Restriction

The consumption of heroin was declared illegal by the Harrison Act in 1914. The initial strategy was to reduce the social cost of heroin addiction by reducing the incidence of addiction. The method used was to increase the cost of using heroin by applying strong criminal sanctions on the consumption of the drug.

The effects of supply reduction were dramatic. The incidence of addiction fell from about 0.57% in 1914 to 0.025 in 1967. Correspondingly, the price of heroin, corrected for changes in the cost of living, rose three thousand fold in the last half century.³ Drug addicts, whose habits were not a police problem at the turn of the century, now found it necessary to commit crimes to 1) secure now illegal drugs and 2) finance increasingly expensive habits.⁴ Addict crime has risen to the point that in major urban centers, police attribute half or more of all property crime to addicts.

The increase in property crime is due largely to the nature of the demand for heroin. From what we know of the nature of heroin addiction, we can

³ Arthur D. Little, Inc., Drug Abuse and Law Enforcement (Cambridge: President's Commission on Law Enforcement and the Administration of Justice, 1967) pp. D9-D12.

⁴ Rufus King, "Narcotic Drug Laws and Enforcement Policies," Law and Contemporary Problems, Winter 1957, pp. 113-131.

infer several things about the demand for heroin. First, demand is likely to be price inelastic over a wide range. Second, cross effects are likely to be small. Demand should be insensitive to all but changes in the price and availability of the closest substitutes. Indeed, heroin has only one socially acceptable substitute, methadone. Existing evidence suggest that while cross effects exist, they are not likely to be large.⁵ Addicts maintained on methadone relapse with alarming speed.⁶

An attempt to measure the elasticity of demand has produced results which agree with the above predictions. Estimates of 0.0067 and 0.09 were produced in a study done by Arthur D. Little, Inc.⁷

The implications are clear. If the demand for heroin is highly inelastic, at least over the relevant range, then an increase in enforcement activity will increase expenditures on heroin. If, as the introduction suggests, a large proportion of these expenditures are financed through illegal activity, then an increase in enforcement activity will induce an increase in criminal activity. Estimates by Arthur D. Little, Inc. suggest that crime by addicts would triple if the supply of heroin were restricted sufficiently to cut the addict population in half.⁸

⁵Jacob Hoogerbeets, "Methadone in Miami," in Methadone Maintenance (New York: Marcel Dekker, Inc., 1971) p. 157.

⁶Frances R. Gearing, "Evaluation of Methadone Maintenance Treatment Program," in Methadone Maintenance (New York: Marcel Dekker, Inc., 1971) pp. 171-197.

⁷Little, op. cit., pp. D9-D16.

⁸Ibid., p. D18.

If decreasing the supply of heroin under current market structure is likely to be socially costly, then the appropriate alternatives to be investigated are: 1) reduce the demand for heroin via addict rehabilitation programs; and 2) remove the crime tariff on the consumption of heroin either (a) for existing addicts only under a heroin maintenance program, or (b) for all individuals via heroin legalization.

B. Investment Criteria for Heroin Addict Control Programs

The objective of heroin addict control programs is taken to be maximization of the resulting increase in the amount of national income available for consumption. This increase can be decomposed into the more familiar difference between the present value of benefits, (B), and costs, (C), resulting from the investment.⁹

In the case of heroin addict rehabilitation, C is the sum of 1) the costs of rehabilitation and 2) employment opportunity costs for the duration of inpatient treatment. B is the sum of 1) the increase in employment income following rehabilitation and 2) the reduction in the loss of real income due to crime. Crime, we argue, causes a substantial diversion of resources into activities which produce no positive product. Reduction of the level of addict crime, therefore, will increase the amount of national income available for consumption.

The critical issues are: 1) whether or not resource commitments are justified by increased employment and reduced costs of crime; and 2) the identification of the preferred treatment method.

⁹ Otto Eckstein, Water Resource Development (Cambridge: Harvard University Press, 1961) pp. 70-80. Other criteria such as those incorporating second and higher order effects can also be considered. See Arnold C. Harberger, "Three Postulates for Applied Welfare Economics: An Interpretive Essay," Journal of Economic Literature, Sept. 1971, pp. 785-797.

Following Becker and Tullock, the total real income loss to society is defined as the sum of 1) labor and capital input into criminal activity and 2) the costs of crime control.¹⁰ No direct measures of labor and capital input into criminal activity are available. In evaluating their impact on the evaluation, this term was initially disregarded in ranking programs. Then sensitivity analysis was used to see if the rankings changed. Two proxies were chosen. The value of goods stolen was selected as an upper bound. If the market for stolen goods is competitive, then the value time and capital invested in crime would be approximated the market value of the loss to victims. To the extent that markets for stolen property are not particularly well developed, however, deadweight loss is present, and the value of goods to victims exceeds the value of goods to purchasers. The lower bound chosen was earnings of former addicts following rehabilitation. However, to the extent that 1) once the pressure to feed a habit is gone, less labor is supplied, and 2) former addicts are discriminated against in the labor market, earnings following rehabilitation are likely to understate inputs into crime. Sensitivity analysis later revealed that the rankings of the various programs were not affected by dropping this term.

The benefits of addict rehabilitation can be separated further into the following parts: 1) the expected increase in output; 2) the reduction in the costs of enforcing the heroin laws; 3) the reduction in the costs of policing addict property crime and its associated fencing activity; 4) the reduction in the costs of controlling prostitution by female addicts; and 5) labor and capital input into criminal activity.

¹⁰Gary S. Becker, "Crime and Punishment: An Economic Approach," Journal of Political Economy, March/April 1968, pp. 169-217; Gordon Tullock, "The Welfare Cost of Tariffs, Monopolies, and Theft," Western Economic Journal, June 1967, pp. 224-233.

The expected increase in output is defined as:

$$f_1(\theta) \sum_{t=\theta} (1-r_t)Y_{1t} (1/(1+d))^{t-\theta} - \sum_{t=\theta} (1-r_t)Y_{2t} (1/(1+d))^{t-\theta} f_2(\theta)$$

where $f_i(\theta)$ = expected age at death of an addict of age θ $i = 1,2$

r_t = relapse rate

Y_{it} = expected income $i = 1,2$

d = discount rate

The subscript $i=1$ refers to rehabilitated addicts, $i=2$ to relapsed addicts.

The subscript t varies over the lifespan of an addict. Relapse rates over time are obtained from various follow-up studies. A decay function is fitted to extend rates over the lifetime of an addict. Life expectancy for rehabilitated and relapsed addicts is computed from mortality data. Relapsed addicts have about 65% of the life expectancy of comparable average adults the same age.¹¹ They face substantial risk of mortality from overdoses and infections. Rehabilitated addicts also have shorter life expectancies than average to the extent that associated barbiturate, alcohol, and other substance abuse frequently continues long after addiction is terminated. Heroin addiction itself, however, apparently has no lasting debilitating effects. Except for say malnutrition and bad teeth, rehabilitated addicts are generally free from major medical complications.¹² Finally, discounted net benefits and benefit-cost ratios are computed for various age levels θ to investigate the extent to which

¹¹ John A. O'Donnell, Narcotic Addicts in Kentucky (Chevy Chase: HEW, 1969) pp. 23-30.

¹² John C. Ball and John C. Urbaitis, "Absence of Major Medical Complications Among Chronic Opiate Addicts," British Journal of Addiction, 1970, pp. 109-112.

early treatment increases benefits. This applies especially to detoxification programs where costs are incurred once and benefits extend over the lifetime of an addict.

Some explanation of the above expression is in order. In year t , an addict who enters a treatment program at age θ will earn income Y_{1t} with probability $(1-r_t)$ and income Y_{2t} with probability r_t . His expected income therefore is the sum $(1-r_t)Y_{1t} + r_tY_{2t}$. An addict who remains untreated earns income Y_{2t} . The difference is the expected increase in income in year t if rehabilitation is undertaken. Now an addict of age θ can expect to live to age $f_1(\theta)$ if he remains clean and $f_2(\theta)$ if he relapses or goes untreated. If the differences are then discounted back to time θ and summed over expected lifespans, the above expression is derived. This assumes that earnings are a reasonable proxy for the marginal product of an addict employee so that the increase in output can be identified with the increase in earnings.

Benefits accruing from reduction in the costs of controlling the heroin traffic are:

$$f_2(\theta) \sum_{t=\theta} (1-r_t)E_t (1/(1+d))^{t-\theta}$$

where E_t = the average annual amount of resources spent by the criminal justice system to reduce the heroin consumption of an addict

That is, in year t , an untreated addict imposes enforcement costs of E_t . A treated addict, on the other hand, imposes costs only if he relapses, so that expected costs are r_tE_t . The difference, discounted back to time θ and summed over the expected lifespan of an addict, is the above expression.

Theft is regarded as an involuntary transfer. A substantial amount of

public and private resources producing no positive product are diverted to effecting and preventing these transfers and the associated resale activity in stolen goods. This is the social cost of theft. Presumably, if theft activity decreases, these resources can then be redirected into normal channels of consumption and investment activity. The benefits from reduction in theft activity are:

$$f_2(\theta) - f_1(\theta) = \sum_{t=\theta} (1-r_t)C_t(1/(1+d))^{t-\theta} - \sum_{t=\theta} (1-r_t)\delta C_t(1/(1+d))^{t-\theta}$$

where C_t = the average annual amount of public and private resources diverted to controlling theft activity by an active addict
 $(1-\delta)$ = the proportionate reduction in property crime following rehabilitation

The derivation is essentially the same as the above expressions. In year t , an addict who remains untreated imposes costs of C_t on the criminal justice system. An addict who undergoes rehabilitation, on the other hand, imposes costs of δC_t with probability $(1-r_t)$ if he remains abstinent and C_t with probability r_t if he has relapsed. Expected costs, therefore, are the sum $(1-r_t)\delta C_t + r_t C_t$. The difference is the expected reduction in costs to the criminal justice system in year t if an addict undergoes treatment. If the differences are then discounted back to time θ and summed over expected lifespans, we derive the above expression.

Associated with addict property crime is a substantial traffic in stolen goods. Reducing the population of addicts will presumably reduce the costs of enforcing the laws against receiving stolen goods. Let F_t represent the costs of policing the traffic in stolen property associated with an active addict. Then the reduction in the costs of policing resale of stolen property when an addict is processed through a treatment program is indicated

below. The derivation is identical to the previous equation.

$$\sum_{t=\theta} f_2(\theta) (1-r_t)F_t (1/(1+d))^{t-\theta} - \sum_{t=\theta} f_1(\theta) (1-r_t)\delta F_t (1/(1+d))^{t-\theta}$$

This assumes that fencing activity falls proportionately with addict criminal activity. There is some reason to believe that this estimate is too high. Suppose addicts sell goods to professional fences. If the number of addicts goes down, the return to fences would fall. In the long run, the supply of fences would be smaller than it would be if the addicts had not been rehabilitated. However, this need not be true in the short run. Since the decision to undertake a criminal career is difficult to reverse, fences may simply move on to less lucrative fields and the costs of policing their activity may not fall. Therefore, the benefits would tend to be overstated because: 1) fences may not reduce their criminal activity proportionately with the reduction in the number of addicts; and 2) the reduction in criminal activity occurs later in time. However, addicts are notoriously unreliable partners in crime. Professional criminals tend to avoid them. Indeed, as Preble and Casey show, most sales by addicts of stolen property are to the final consumer or to businessmen whose illegal activity is merely a small part of their total economic activity. It is reasonable to expect that these individuals would cease their illegal activity once opportunities were no longer available.¹³ To this extent, the above estimate is accurate.

A final problem arises in assessing the social costs of prostitution. Since it is the source of 75% of female addict income, determination of the

¹³ Edward J. Preble and John J. Casey, Jr., "Taking Care of Business-- The Heroin User's Life on the Street," International Journal of the Addictions, March 1969, pp. 1-24.

costs of prostitution strongly influences any measure of the desirability of addict rehabilitation.¹⁴ It is argued that since services are freely engaged, mutual gain in exchange occurs, and third party effects are largely absent, such transactions are socially costless and that police resources allocated to curbing prostitution are wasted.¹⁵ When, for example, less than a quarter of major crimes in urban areas are cleared by arrest, it does not make good sense to spend money to harass prostitutes. Resources available to the criminal justice system are scarce and criminalizing prostitution ties up substantial resources which the criminal justice system critically needs to deal with far more serious crimes. San Francisco alone spent approximately \$380,000 to arrest and process prostitutes through its courts and jails in 1967 while 87% of all street crime went unsolved.¹⁶ One can argue that at the very least, the level of enforcement should be reduced. To the extent that prostitution is a revolving door offense, that is, the number of offenses of prostitution committed falls relatively less than other offenses in response to increases in the probability of conviction p and the magnitude of the punishment f , the total social loss from crime, as defined by Becker, can be reduced by lowering p and f for prostitution relative to other crimes.¹⁷

¹⁴ Moore, op. cit., p. 64.

¹⁵ Simon Rottenberg, "The Social Cost of Crime and Crime Prevention," in Crime and Urban Society (New York: Dunellen Co., 1970) pp. 47-49; Thomas C. Schelling, "Economics and Criminal Enterprise," The Public Interest, Spring 1967, pp. 61-78.

¹⁶ Moses Lasky and William H. Orrick, Jr., Sexual Conduct, Gambling and Pornography (San Francisco: San Francisco Committee on Crime, 1971) p. 2; Moses Lasky and William H. Orrick, Jr., Public Drunkenness (San Francisco: San Francisco Committee on Crime, 1971) pp. A1-A7.

¹⁷ Herbert L. Packer, "The Limits of the Criminal Sanction," (Palo Alto: Stanford University Press, 1968) pp. 328-331; Becker, op. cit., p. 189.

Third party harm is an elusive concept. A vast range of human activity generates negative externalities. If we consider third party harm to exist in the case of prostitution, then it must also exist for X-rated movies, common drunkenness, or simply failing to wear sufficient clothing in public. The list is endless. If an argument can be made for criminalizing one, it can be made for another.¹⁸ The issue is, as Packer notes, that when legislators decide whether or not to criminalize a given activity, they should not only put first things first, but also, what is much harder, put last things last.¹⁹ Following this line of reasoning, no benefit should be attributed to reduction in the costs of policing prostitution.

The structure of benefits and costs changes somewhat in the cases of heroin maintenance and heroin legalization to the extent that we are manipulating the supply rather than the demand for heroin.

Since addicts are not taken off heroin, employment income does not increase. Moreover, an additional cost, associated with heroin legalization, is the reduction in output associated with an increase in the number of addicts following legalization. Unlike addict rehabilitation programs and heroin maintenance, which would retain existing legal sanctions against the use of heroin by nonaddicts, heroin legalization would drop all legal sanctions against and hence all crime tariffs on the consumption of heroin. If the market demand for heroin has any elasticity at all, this implies an increase in the number of addicts.

An additional benefit, either from a policy of heroin legalization or heroin maintenance, is the increased consumer's surplus accruing to existing

¹⁸Rottenberg, op. cit., pp. 47-49.

¹⁹Packer, op. cit., pp. 259-260.

users from reinstatement of heroin in their legal consumption set. Addicts presumably derive a great deal of pleasure from the consumption of heroin, and making it illegal for them to get high has a real social cost. Criminalization and supply restriction has the effect of placing an enormously burdensome tax on the consumption of heroin. Conversely, decriminalization and hence lowering the price of heroin increases the amount of consumers' surplus accruing to addicts.

To the extent that the increase in consumers' surplus has little influence on the preferences of policy makers, analysis was done including and dropping this term.

It should be noted that in reducing the demand for heroin, a marked reduction in the price of heroin, and hence an increase in the incidence of addiction, is not likely to occur. The reasons are as follows. First, there are grounds for belief that the supply curve of heroin should be either flat or gently upward sloping in the long run. Large fixed costs are incurred in securing and importing heroin. To the extent that heroin has great value relative to weight and volume and is easily concealed, the costs of smuggling in enough heroin to supply 10,000 addicts should be only slightly more than the costs of smuggling in enough heroin to supply 100 addicts. Variable costs, therefore, should be limited to the costs of final distribution which should increase proportionately with the number of addicts supplied. To this extent, marginal costs should not be increasing rapidly. Second, a demand curve shifting left due to a reduction in the number of addicts should retain the same properties as the original demand curve. To the extent that individual demand curves of addicts are inelastic over a wide range and nonaddicts begin purchasing heroin only at lower price levels, the new market demand curve should also be inelastic over a wide range and turn elastic only at relatively high

and relatively low prices. Now, there is substantial evidence to suggest that the market for heroin is cartelized. If this is true, then if joint profits are maximized, equilibrium will be re-established at a new, equally high price well above the range which would markedly increase the incidence of addiction.

One problem remains before proceeding with the evaluation. Why does it appear that a profit maximizing cartel operates on the inelastic portion of a market demand curve? One possibility is that the cartel is weakly enforced. However, this is not likely to be true because violations of the agreement are easily detected. Since 1) a small increase in the agreed upon amount of heroin to be marketed will cause a large fall in the market price, 2) price cutting cannot be kept secret because there are a large number of independent buyers, and 3) highly efficient nonmarket means of enforcing the cartel agreement are available, the expected gains from cheating are likely to be small or even negative. A second, more plausible argument is that prices are set low to forestall additional government interest in addict rehabilitation. As the price of heroin rises, so does the cost of addict crime and the demand on existing rehabilitation programs. This raises the expected marginal benefits from addict rehabilitation and hence increases the probability of greater government interest in addict treatment.

A practical problem remaining is the reduction of time streams of benefits and costs to comparable dimensions. Although the choice of the discount rate is of considerable significance in the analysis, no appropriate discount rate is dictated by theoretical considerations. Following Weisbrod, two rates are selected, 4% and 10%, the former reflecting the social rate of discount and the latter the average rate of return on investment.²⁰ The justification advanced

²⁰Burton A. Weisbrod, The Economics of Public Health (Philadelphia: University of Pennsylvania Press, 1961).

for this procedure is that we wish to bracket the range of possible discount rates.

IV. IDENTIFICATION OF THE MOST EFFECTIVE PROGRAM

The analysis was done in two parts. The four major programs in the U.S., detoxification, civil commitment, imprisonment and parole, and methadone maintenance, were evaluated first to determine the most effective program given the present structure of laws and enforcement activity.

The data in the appendix were introduced into the model and estimates of benefits and costs constructed. The results are arrayed on the next page. Estimates of discounted net benefits were computed for addicts of ages 20, 30, and 40, discounting at 4% and 10%. Four alternative estimates of the cost of addict property crime were calculated. They are listed as A, B, C, and D.

The conclusions are clear. By whatever set of assumptions about crime, discount rate, or age group, the rankings of the four treatment methods are invariant. Methadone is the preferred treatment modality. Imprisonment and parole, civil commitment, and detoxification follow in order of preferredness.

To test the sensitivity of the model to errors of observation and inaccurate input estimates generated by small samples, estimates of total rehabilitation cost and percentage abstinent ($1-r_t$), were raised and lowered by factors of 1.10, 1.05, 1.00, 0.95, and 0.90. This generated a range of what were considered reasonable estimates of discounted net benefits. The rankings did not change.

Two alternatives remain: 1) heroin maintenance and 2) heroin legalization. The problem now is to compare the effectiveness of these policies with methadone maintenance.

First, consider heroin maintenance. The British approach the problem in

Discounted Net Benefits

	<u>Detoxification</u>	<u>Civil Commitment</u>	<u>Imprisonment and Parole</u>	<u>Methadone Maintenance</u>
Addict Age at Program Entrance is 20				
Discount Rate is 0.040				
A	\$ -2577.43	\$ 1133.42	\$ 4682.21	\$ 8037.38
B	\$ -1984.95	\$ 2265.27	\$ 6964.37	\$ 12320.99
C	\$ -2217.18	\$ 1821.55	\$ 6062.73	\$ 10638.61
D	\$ -1325.38	\$ 3525.11	\$ 9471.85	\$ 17083.36
Discount Rate is 0.100				
A	\$ -3164.29	\$ 100.82	\$ 2334.48	\$ 5890.14
B	\$ -2731.24	\$ 952.61	\$ 3963.25	\$ 9039.83
C	\$ -2903.13	\$ 614.40	\$ 3317.47	\$ 7789.06
D	\$ -2253.12	\$ 1892.98	\$ 5762.93	\$ 12516.41
Addict Age at Program Entrance is 30				
Discount Rate is 0.040				
A	\$ -2592.67	\$ 1105.54	\$ 4607.48	\$ 7956.44
B	\$ -2011.30	\$ 2217.25	\$ 6816.75	\$ 12167.96
C	\$ -2233.36	\$ 1791.91	\$ 5983.01	\$ 10551.82
D	\$ -1353.46	\$ 3473.86	\$ 9335.09	\$ 16919.63
Discount Rate is 0.100				
A	\$ -3167.36	\$ 95.23	\$ 2319.59	\$ 5872.45
B	\$ -2736.87	\$ 942.39	\$ 3936.19	\$ 9005.59
C	\$ -2906.33	\$ 608.65	\$ 3301.96	\$ 7770.64
D	\$ -2258.97	\$ 1882.37	\$ 5734.74	\$ 12480.85
Addict Age at Program Entrance is 40				
Discount Rate is 0.040				
A	\$ -2629.16	\$ 1038.85	\$ 4436.26	\$ 7782.86
B	\$ -2068.37	\$ 2113.80	\$ 6554.14	\$ 11855.65
C	\$ -2273.52	\$ 1718.31	\$ 5793.37	\$ 10354.56
D	\$ -1417.24	\$ 3357.77	\$ 9038.76	\$ 16563.97
Discount Rate is 0.100				
A	\$ -3176.98	\$ 77.76	\$ 2275.01	\$ 5821.59
B	\$ -2753.04	\$ 913.19	\$ 3862.29	\$ 8910.66
C	\$ -2916.64	\$ 589.86	\$ 3253.89	\$ 7715.28
D	\$ -2276.42	\$ 1850.75	\$ 5654.43	\$ 12377.64

an ingenious way. They argue, in effect, that setting a single price for heroin is likely to be nonoptimal. Criminalizing heroin use raises the price of heroin to such an extent that addict crime is a problem. Legalizing it, on the other hand, drives down the price and increases the incidence of addiction. What they attempt to do is practice a kind of price discrimination. Identified addicts are allowed legal access to low-cost heroin. Any consumption of heroin by a nonaddict, on the other hand, is criminal. In this way, they hope to lower both the cost of addict crime and the incidence of addiction.

The separation of the market for heroin of addicts and nonaddicts is accomplished in the following way. First, the population of addicts is identified by requiring two independent medical opinions before legal heroin is dispensed. Second, the price of illegal heroin is set high by supply restriction. To the extent that establishment of a habit requires consumption of heroin for a reasonably long period of time, becoming an addict, and hence acquiring the right to purchase low-cost heroin requires a sizable capital investment. Third, the amount of heroin dispensed to a given addict is strictly limited to the size of his habit. That is, the supply curve facing the addict is a step function. It is infinitely elastic at the legal price up to the extent of his prescription, becomes vertical, and then becomes horizontal again at the illegal market price. If the medical profession gauges the size of the addict's habit correctly, the addict's demand curve for heroin should intersect the supply curve in the discontinuous range. Overprescription leads to a black market; underprescription, to increased crime.

The British government has, in effect, undertaken large-scale entry into a market selling a product, heroin, at a fraction of the cost of its major competitor, organized crime. Organized crime's best customers, established

addicts, are lost. Risks of selling to the remaining market, experimenters who are not as yet hooked, are differentially higher to the extent that distinguishing novices from undercover policemen is difficult at best. A program of heroin maintenance, therefore, shrinks the size of the market available to organized crime and raises its costs adjusted for risk.

The success of this program of price discrimination has been substantial. The number of addicts has stabilized and addict crime is not a police problem. Moreover, while some heroin is still imported from Hong Kong, no large-scale underworld dominated operation exists.²¹

Assessment of the desirability of a policy of heroin maintenance relative to a policy of methadone maintenance requires some speculation. The factors relevant to a decision are the following. First, with heroin maintenance, r_t is set at zero by definition. Second, the costs of treatment per addict per year of the two programs should be about the same. Third, while methadone maintenance can be expected to increase employment income, prescription of heroin will not. Finally, the costs of enforcing the heroin laws will not fall by as much as in the case of heroin maintenance to the extent that police resources will be expended to control the market created by overprescription of heroin.

For ease of exposition, suppose we set $f_2(\theta)$ equal to $f_1(\theta)$. Since the final terms in the summation are very small relative to the other terms, no change in the rankings should occur. Let B represent the value of labor and capital input into criminal activity and K the annual cost per addict of treatment. Then discounted net benefits should be of the following form. Time subscripts are suppressed because expected values rather than life cycle estimates of the various benefits were computed due to insufficient data.

²¹ Edgar May, "Drugs Without Crime," Harper's Magazine, July 1971, pp. 60-65.

$$DNB = \left[(Y_1 - Y_2) + E + (1 - \delta)(G + F + B) - K \right] \sum_{t=\theta}^{f_1(\theta)} (1 - r_t) (1 / (1 + d))^{t - \theta}$$

Some suggested values of the above variables are arrayed below. In the case considered 1) δ is set at 0.4, 2) crime assumption A is employed, 3) addict age at entry to the treatment program is 20, and 4) the discount rate is set at 4%.

	<u>Methadone</u>	<u>Heroin</u>
$(Y_1 - Y_2)$	\$ 1100	\$ 0
E	\$ 700	\$ 500
$(1 - \delta)(G + F)$	\$ 900	\$ 900
$(1 - \delta)B$?	?
K	\$ 1300	\$ 1300
$f_1(\theta)$ $\sum_{t=\theta} (1 - r_t) (1 / (1 + d))^{t - \theta}$	5.7	20.0

The data suggest that discounted net benefits are maximized by a policy of heroin maintenance if B exceeds \$1045. This is reasonable in view of the facts that 1) the annual cost of a habit vastly exceeds this sum, and 2) a large proportion of the costs of a habit are financed by criminal activity. The conclusion is reinforced by the frequent observation that the consumption benefits of heroin to an addict are so great relative to methadone that a sizable proportion of addicts will choose heroin over methadone under a wide variety of circumstances. That is, r_t for methadone is biased downwards, because the population of addicts in methadone programs is not representative of the total population of addicts.

Heroin legalization involves a policy choice in which costs are implicit rather than explicit. These costs take the form of foregone income associated

with the reduction of future earnings of current nonaddicts who will become hooked as a consequence of the fall in price following legalization. To investigate the desirability of a policy of heroin legalization, let us

1) assume that heroin maintenance is the status quo, and 2) investigate whether or not discounted net benefits are positive in a move from a policy of heroin maintenance to a policy of heroin legalization.

The additional benefits associated with heroin legalization are the removal of 1) the costs of policing the heroin traffic and 2) the costs of medically monitoring the habits of existing addicts. From the data above, a guess at the size of these benefits would be \$1800 annually per existing addict. The additional costs associated with the increase in the incidence of addiction following the fall in the price of heroin, however, are likely to be substantial. From what evidence there exists from ghetto areas, the market demand for heroin becomes considerably more elastic as price falls. The price would fall precipitously. For example, in Great Britain, 100 tablets of heroin sell for \$2.16. The same amount of heroin sells for \$1,000 or more in New York City.²² The incidence of addiction should then increase over time. If past history is some guide, the extent of the increase in addiction should parallel the incidence of addiction prior to the enactment of the Harrison Act. This implies that the number of addicts would over time increase 23 fold. Now, we know that labor force participation falls after the onset of addiction and that the expected value of the associated income^{increase} is approximately \$1100 per year. Unless 1) the increase in the incidence of addiction occurs with a very long time lag, and 2) the social discount rate is high, costs of legalization should outweigh benefits.

Inclusion of the change in consumers' surplus should not reverse our rankings. First, suppose we compare addict rehabilitation programs with heroin

²²Ibid., p. 61.

maintenance and heroin legalization. Addition of this term only makes heroin maintenance and heroin legalization more desirable relative to addict rehabilitation programs. Second, consider the relative desirability of heroin maintenance relative to heroin legalization. Addicts would be made equally better off under either scheme. Nonaddicts should be at worst somewhere near the margin between consuming and not consuming heroin. Excluding heroin from a nonaddict's legal consumption set involves relatively little loss. Therefore, the change in consumers' surplus should not play a critical role in the choice between heroin maintenance and heroin legalization.

The conclusion is, therefore, that under the current structure of laws and enforcement activity, methadone maintenance is preferable. Heroin maintenance, however, is the desired policy if the laws can be changed.

V. DATA APPENDIX

The problem with the data is that it is highly aggregative. Statistics on addict income, relapse rates, and criminal activity are not kept by age, race, or sex. However, the follow-ups in the literature are statistically rigorous and complete. The nonresponse problem is likely to be insignificant. Unfortunately, no way of measuring degree of addiction is currently available. Therefore, the results can only suggest the relative desirability of various programs when a randomly chosen addict from an established program is treated. The problem, of course, is that the representativeness of the result depends critically on the research design of the reporting programs. The vast majority of these programs exist to treat addicts; they are not research projects. The generality of their results can thus be questioned. However, what saves this is evidence from two of the most rigorous and complete studies available. O'Donnell reports that relapse rates are likely to be independent of race and

sex.²³ Similarly, Vaillant, contesting the maturation hypothesis, argues that rates may also be independent of age.²⁴ If this is true, then the relative desirability of the programs is not likely to be substantially affected by the composition of the sample. Rather, the particular complex of government services offered the addict appears to be the critical variable.

The following estimates were taken largely from the 1969-1970 period.

A. Income and Employment

Data from 27 programs in New York City report that about 30% of all addicts were employed prior to entry and 65% after treatment in heroin addict rehabilitation programs.²⁵

For each day of employment, wages averaged \$17.50.²⁶ Assuming full employment in the economy and that addicts showed up for work on 75% of all work days, it is estimated that 180 days of work were performed annually.

This implies that expected income prior to treatment was approximately \$945 and \$2047.50 after treatment.

²³O'Donnell, op. cit., p. 3.

²⁴George E. Vaillant, "A Twelve Year Follow-Up of New York Narcotic Addicts: The Relation of Treatment to Outcome," American Journal of Psychiatry, Jan. 1966, pp. 727-737.

²⁵Louis Dickinson, Loretta Bermosk, Louise Casarett, Bernice Polemis, and Charles Stewart, Narcotic Addiction and Rehabilitation in Hawaii (Honolulu: State of Hawaii, 1971) p. 24.

²⁶Phillip H. Person, Lois R. Chatham, and Reginald P. Doran, Program Evaluation in NIMH Funded Treatment and Rehabilitation Programs, presented to the American Public Health Association, Oct. 13, 1971, p. 4.

B. Mortality

O'Donnell reports that addicts generally lose about a third of their life expectancy.²⁷ Accordingly, it is assumed that active addicts can expect to live 35% fewer additional years than normal adults the same age. Rehabilitated addicts are assumed to have 90% of normal life expectancy. Although heroin addiction is terminated, other substance abuse frequently continues. Mortality, therefore, should occur somewhat earlier. With the additional assumption that 40% of addicts are white and 60% nonwhite, the following table was constructed.²⁸

θ	$f_1(\theta)$	$f_2(\theta)$
20	61	50
30	64	54
40	66	59

C. Relapse Rates

Relapse rates were taken from various follow-up studies.²⁹ Exponential decay functions of the form $(1-r_t) = a[\exp(-bt)]$ were then fitted to extend rates of the expected lifespan of an addict. The period used in the fits was always the period following inpatient treatment and outpatient observation. There were two reasons for this. First, relapse occurs most rapidly during the initial year after release. Including this period in the fit would bias the rate of decay of $(1-r_t)$ downward unreasonably. Second, in the case of imprisonment and parole and civil commitment, patients are often returned

²⁷ O'Donnell, op. cit., p. 27.

²⁸ Bureau of the Census, Statistical Abstract of the United States (Washington: Department of Commerce, 1971) p. 54.

²⁹ G. Halsey Hunt and Maurice E. Odoroff, "Followup Study of Narcotic Drug Addicts After Hospitalization," Public Health Reports, Jan. 1962, pp. 41-54; Frances R. Gearing, op. cit., pp. 171-197; Meyer Diskind and George Klonsky, "A Second Look at the New York State Parole Drug Experiment," Federal Probation, Dec. 1964, pp. 34-41; John C. Kramer, Richard A. Bass, and John E. Berecochea, "Civil Commitment for Addicts: The California Program," American Journal of Psychiatry, Dec. 1968, pp. 128-136.

to their respective institutions for reasons unrelated to relapse.

Data for detoxification, methadone maintenance, and imprisonment and parole all indicate about a 12% annual rate of decay once patients are released into the community and are on their own. Data from civil commitment is available only for the 3-year parole period. It is assumed that a 12% decay rate also applies in this case following the conclusion of parole supervision. The rates are arrayed below.

<u>Detoxification</u>		<u>Methadone Maintenance</u>	
t	(1-r _t)	t	(1-r _t)
1	.127	1	.930
2	.108	2	.810
3	.099	3	.720

<u>Imprisonment and Parole</u>		<u>Civil Commitment</u>	
t	(1-r _t)	t	(1-r _t)
1	.450	1	.350
4	.320	3	.160

D. The Costs of Heroin Law Enforcement

A study by Etienne indicates that for 1970 the cost of enforcing the narcotics and dangerous drug laws in California amounted to \$101,867,447.³⁰ An estimate of what proportion of this expenditure can be attributed to heroin law enforcement is constructed as follows. In 83% of all drug cases in Oakland, material evidence was found; 17% of the time, opiates were discovered. If opiate abuse occurred in the same proportion among those cases where no material evidence was found, 20.4% of all cases involve opiate abuse.³¹

³⁰ Robert Etienne, A Study of the Cost of Narcotics and Drug Law Enforcement in California (Palo Alto: Stanford Law School, 1970).

³¹ Richard H. Blum and Associates, The Drug Dealers, vol. 2, 1972, unpublished.

Assuming that Oakland is representative of California as a whole, it is estimated that \$20,782,795 was spent for heroin law enforcement in California.

Kaplan, extending results of Calof, estimated that it cost roughly \$72 million to enforce the marijuana laws during the same period.³² If the above estimate is correct, then about \$8 million was spent to control barbituate, amphetamine, and hallucinogen abuse. Considering that all the above estimates are reasonable and consistent with each other and with the existing priorities of the criminal justice system, the above estimate is accepted.

To derive costs per addict, it is necessary to construct an estimate of the total number of addicts in California. For 1956, Mattick quotes an estimate of 20,000 addicts in California.³³ Between 1956 and 1970, California's population increased from 13,247,000 to 19,700,000.³⁴ If the addict population grew as fast as the rest of California, then there were roughly 29,800 addicts in 1970.

The above estimates imply that the expected costs per addict of enforcing the heroin laws was approximately \$698.

³² John Kaplan, Marijuana: The New Prohibition (New York: Pocket Books, 1970) p. 51; Lawrence Calof, The Cost of Enforcing the Marijuana Laws in California (Palo Alto: Stanford Law School, 1970).

³³ Hans W. Mattick, "The Epidemiology of Drug Addiction and Reflections on the Problem and Policy in the United States," Illinois Medical Journal, Oct. 1966, pp. 436-447.

³⁴ Department of Finance, California Statistical Abstract (Sacramento: State of California, 1970) p. 11.

E. The Cost of Addict Property Crime

Direct estimates of $(C_t + F_t)$ were not feasible. It was hoped that if data on the allocation of resources of the criminal justice system by crime and estimates of property loss were available, detailed estimates of the source of addict income done by the Hudson Institute could be used to construct estimates of the cost of addict property crime.³⁵ Although such data are not available at present, they may be available in the future. A few partial studies have been done. Calof, as mentioned above, estimated the cost of marijuana law enforcement, and Etienne, the costs of enforcing laws against the use of narcotics and dangerous drugs. In addition, the San Francisco Committee on Crime has constructed estimates of the costs of processing alcoholics and prostitutes through the criminal justice system.³⁶

Indirect estimates were constructed in the following way. The President's Commission on Law Enforcement and the Administration of Justice has constructed estimates of the economic loss attributable to different groups of crimes such as a) crimes against persons, b) crimes against property, and c) other crimes. The economic loss attributable to property crime was 26.4% of the total loss from crime.³⁷

A total of \$550,903,000 was spent by New York City's criminal justice system.³⁸ The city's Chamber of Commerce estimates that at least 50% of all

³⁵ Moore, op. cit.

³⁶ Lasky and Orrick, Sexual Conduct, Gambling, and Pornography; Lasky and Orrick, Public Drunkenness.

³⁷ President's Commission on Law Enforcement and the Administration of Justice, Crime and Its Impact--An Assessment (Washington, D.C.: U.S. Government Printing Office, 1967).

³⁸ Bureau of the Census, Expenditure and Employment Data for the Criminal Justice System, 1968-1969 (Washington, D.C.: Department of Commerce, 1970).

property crime is attributable to addicts.³⁹

If resources of the criminal justice system are allocated in proportion to the economic loss, then New York City spent at least \$72,719,000 to control addict property crime.

Private costs related to crime were 45.35% of public costs. If this ratio applies to addict property crime, then total private expenditures amounted to \$32,978,000.⁴⁰

There are approximately 70,000 addicts in New York City.⁴¹ Expected costs per addict, therefore, are \$1510.

Since the above estimate of the cost of addict property crime is the least reliable of the estimates in this study, three additional estimates are constructed to test the sensitivity of the final results to the specification of property crime costs.

The National Institute of Mental Health claims it costs \$2600 to administer justice to an addict per year.⁴² Our estimate is \$1737 (= \$698 + \$1039 where \$1039 is the quotient of \$72,719,000 and 70,000). Suppose we accept NIMH's estimate as correct. Since we know that our estimate of \$698 for the cost of enforcing the heroin laws is reasonable, we add the difference between \$2600 and \$1737

³⁹New York City Chamber of Commerce, Drug Abuse As A Business Problem, 1971.

⁴⁰President's Commission, op. cit.

⁴¹Moore, op. cit., p. 59.

⁴²Person, Chatham, and Doran, op. cit., p. 6.

to our estimate of the cost of addict property crime. The public costs of controlling addict property crime are then \$1902. Since our estimate of public costs rises, our estimate of private costs rises correspondingly to \$862.56. Our second estimate of the cost of controlling addict property crime is then \$2764.56.

Extensive data from Chicago indicate that arrests for property crime fall about 60% following rehabilitation.⁴³ If $\delta = 0.4$, then $\delta(C_t + F_t)$ equals \$604 corresponding to the first estimate and \$1105.82 corresponding to the second estimate.

Dole and Nyswander report far lower values of δ . However, since the New York sample is screened extensively prior to entry, their estimates may be biased downward.⁴⁴ Nevertheless, if $\delta = 0.1$, then we can form a third set of estimates. If $(C_t + F_t) = \$1510$, then $\delta(C_t + F_t) = \$151$. Finally, a fourth set is constructed by combining the NIMH and Dole-Nyswander results. $(C_t + F_t) = \$2764.56$ and $\delta(C_t + F_t) = \$276.46$.

F. Treatment Costs and Employment Opportunity Costs

Costs of detoxification total \$5564.03. Inpatient treatment at Lexington lasts 4 1/2 months at a daily cost of \$38.59.⁴⁵ This totals \$5209.65. Employment opportunity costs, given that the expected annual income of an addict who remains untreated is \$945, are \$354.38.

⁴³H. Joo Shin and Wayne A. Kerstetter, Report on the Evaluation of the Illinois Drug Program: Changes in Patient Arrest Rates (Chicago: The Law School, University of Chicago, 1971).

⁴⁴Vincent P. Dole, Marie E. Nyswander, and Alan Warner, "Successful Treatment of 750 Criminal Addicts," Journal of the American Medical Association, Dec. 16, 1968, pp. 2708-2714.

⁴⁵American Hospital Association, Guide Issue, Hospitals, August 1, 1971.

Methadone maintenance costs roughly \$1300 a year.⁴⁶ Estimates range from \$500 to \$2000. The variability in costs is attributed to differences in amounts of auxiliary services provided addicts.

Imprisonment and parole involves incarceration for about a year followed by intensive parole supervision for 15 months. Imprisonment costs \$2831 a year and parole about \$600 a year.⁴⁷ However, parole officers in this instance had caseloads a half to a third normal size. This permitted close supervision of parolees. Assuming parole costs were 2.5 times higher and that foregone income was \$945, total costs were \$5578.87 discounted at 4% and \$5480 discounted at 10%.

Civil commitment involves a year of inpatient treatment at a cost of \$3300 and parole for three years at \$600 per year. Total cost amounts to \$4965.02 discounted at 4% and \$4792.10 discounted at 10%.⁴⁸

⁴⁶ Alan Craig Leslie, A Benefit-Cost Analysis of New York City's Heroin Addiction Problems and Programs (New York: Health Services Administration, 1971).

⁴⁷ Committee on Ways and Means, Preliminary Report on the Costs and Effects of the California Criminal Justice System (Sacramento: California State Legislature, 1968).

⁴⁸ Ibid.

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