

# Cost Benefits of Substance Abuse Treatment: An Overview of Results From Alcohol and Drug Abuse

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## Abstract

**Background and Methods:** The treatment of substance abuse is an important health service available in all industrialized countries throughout the world. Cost of treatment and its benefit or economic value is an important policy issue. Reduction in health care cost is one alternative way to measure benefits. This paper reviews a series of studies (all from the US) which address the cost–benefit question. Most studies have compared the monthly costs prior to initiation of substance abuse treatment with the costs following initiation.

**Results from Studies of Alcoholism Treatment:** Many studies have found that, over the time prior to alcoholism treatment initiation, total monthly health care costs increased and costs substantially increased during the 6–12 months prior to treatment. Following treatment initiation, monthly total medical care costs declined and the overall trend was downward, i.e., the slope was negative. In contrast to the use of general health care where women typically utilize more medical care than men, overall medical care costs were found to be similar. Alcoholics of different ages, however, showed distinct medical care costs, i.e., younger patients experienced greater declines in medical care costs following alcoholism treatment initiation.

Inpatient treatment is most affected by alcoholism treatment. In some cases, outpatient treatment is actually increased in response to aftercare health care utilization, but at a substantially lower cost than inpatient treatment. If the alcoholism condition can be treated on an outpatient basis, then the total cost of such treatment is obviously lower and the potential for a cost–offset net effect is substantially increased.

**Cost Benefits of Drug Abuse Treatment:** There have been few drug abuse treatment cost-benefit research studies. Early studies found that there was a decline in sickness and medical care utilization associated with initiation of treatment. A recent study found a substantial reduction in total health care costs following initiation of drug abuse treatment. Utilization of inpatient care and its associated costs are most affected by the absence and/or presence of treatment.

**Summary and Conclusion:** This review describes the research findings from a number of cost–offset or cost-benefit studies of alcoholism and drug abuse treatment. In broad terms the findings of this research can be summarized as follows.

- (i) Untreated alcoholics or drug dependent persons use health

care and incur costs at a rate about twice that of their age and gender cohorts.

- (ii) Once treatment begins, total health care utilization and costs begin to drop, reaching a level that is lower than pre-treatment initiation costs after a two- to four-year period. The conclusion is based on similar findings across different patient populations using a variety of research designs.
- (iii) There are no apparent gender differences in the utilization and associated costs before and after treatment initiation.
- (iv) There are age differences that support the value of early intervention. Younger treated substance abuse patients have pre-treatment total cost levels that are lower than pre-treatment levels for older patients.

**Implications for Health Policy:** The results of research provide consistent support for the cost benefits of substance abuse treatment. From a health policy perspective, such results are promising if the objective is to demonstrate that treatment investment can pay for all or part of its associated costs through reductions in other health care costs. One can hold a contrary position, i.e., lower future medical care costs for substance abusers could reflect denial of essential care.

**Implications for Further Research:** The studies that have addressed the potential cost offset of substance abuse treatment have been largely based upon overall or aggregate effects across all forms of substance abuse treatment. There have been no studies of the cost offset of specific treatment modalities, though this is what the next generation of studies should do. © 1998 John Wiley & Sons, Ltd.

Received 24 April 1997; accepted 11 December 1997.

## Introduction

The treatment of substance abuse is an important health service available in all industrialized countries throughout the world. The first consideration for evaluating such treatment is whether it works, i.e., what are its effects? Effectiveness criteria for alcohol and other drug abuse treatment have been defined in a number of ways including length of abstinence or drug-free days, number of relapses, or subsequent admission for treatment following initial treatment.

The treatment of alcoholism and other drug dependency has, in the past fifteen years, been subjected to more and more controlled clinical evaluations. The evaluations usually focus on treatment effects. Effects analysis focuses on the

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Contract grant sponsor: National Institute on Alcohol Abuse and Alcoholism Research Center grant number: AA06282

effect of the treatment in terms of patient outcomes, usually changes in drinking or drug using behavior. There have been a number of treatment effectiveness studies but few that considered the cost of treatment. (See work by Hester and Miller<sup>1</sup> and Miller and Hester<sup>2</sup> for summaries of treatment effectiveness research for alcoholism.) Examples include that of Mason *et al.*,<sup>3</sup> who found that abstinent days were increased after alcoholism treatment for patients who also received desipramine for secondary depression in primary alcohol dependence. In a study, Walsh and Hingson<sup>4</sup> randomly assigned 227 workers who were newly identified as abusing alcohol to one of three treatment alternatives: (i) compulsory inpatient treatment, (ii) compulsory attendance at Alcoholics Anonymous (AA) and (iii) a choice of options. All three groups improved. Alcohol abusing workers who used inpatient treatment did better than those who used AA or who were given free choice on subsequent drinking and drug use. Since AA and choice groups required additional inpatient treatment more often than the initial hospital group, the estimated costs for inpatient treatment for these two groups were found to be only 10 percent less than for the initial inpatient only group.

A second consideration of particular relevance in contemporary times is one of cost of treatment and its relationship to effectiveness. Cost effectiveness considers the overall effectiveness of treatment in terms of its cost to provide such treatment. A more refined analysis enables a comparison among specific types of treatment in which a common effectiveness measure, e.g., days of abstinence, is used and effectiveness per cost of treatment per patient is considered. This enables one to compare the cost per unit of effect achieved for each treatment. For example, Kraft *et al.*<sup>5</sup> found that methadone maintenance plus counseling was more cost effective than methadone without counseling. The study did not support the suggestion that large amounts of support to methadone was cost effective but that moderate amounts were better than minimal amounts of support. Holder *et al.*<sup>6</sup> completed a first approximation of a cost and effect analysis for alcoholism treatment modalities. In their analysis, they combined average unit cost per treatment modality (based upon the least expensive appropriate type of facility in which the treatment modality could be delivered) and a weighted number of positive controlled effectiveness studies. They concluded that increased alcoholism treatment cost was not positively related to treatment effectiveness and that lower-cost treatment could have significant effect on reducing drinking.

McCrary and Langenbucher<sup>7</sup> concluded that a universal coverage of alcoholism treatment using a national system of assessment and triage for treatment could produce one of the largest pools of health care cost savings in a reformed health care system in the US. Thus, this paper will review findings on alcoholism and drug abuse treatment which concern the cost of treatment and the benefits (expressed as the savings in the cost of medical care) of such treatment. Such an approach to cost and economic benefits can be considered within the context of mental health policy. If

substance abuse treatment is associated with lower medical care costs, there is potential for long-term cost reductions.

## Cost Benefits and Treatment

Economic benefits can be measured in a number of ways including the value of increased (or decreased) productivity, government services utilized, personal expenditures or income or health care. Medical or health care cost is one alternative way to measure benefits. A cost-benefit analysis expressed in this fashion concerns a consideration of cost of treatment relative to potential savings in total health care costs following treatment initiations. A further question is whether there is a net positive benefit such that the cost of treatment itself is paid for ('offset', if you will) by the savings in other medical care. Thus, one questions whether treatment can reduce other health care costs to 'offset' the cost of treatment itself.

There have been a number of cost-offset studies relevant to substance abuse over the past twenty years. Jones and Vischi<sup>8</sup> and Saxe *et al.*<sup>9</sup> provided the first review of such studies. They concluded there was initial evidence that alcoholism treatment can reduce the costs of other types of health care. A review by Holder<sup>10</sup> reached a similar conclusion.

## Cost Offset of Alcoholism Treatment

Many studies have found, over the time prior to alcoholism treatment initiation, that total monthly health care costs increased and that costs substantially increased during the 6–12 months prior to treatment. Following treatment initiation, monthly total medical care costs declined and the overall trend was downward, i.e., the slope was negative. This typical pattern of medical care costs before and after treatment initiation is illustrated in **Figure 1**. A similar graph of medical care costs has been found across most cost-offset studies (see published studies cited). Early studies in the 1970s found evidence of potential positive cost offsets (or savings) associated with the treatment for alcoholism. Among the experimental studies, Edwards *et al.*<sup>11</sup> compared 48 inpatients with 46 advice only (minimum-treatment) control patients and found that the costs for the inpatient treatment were greater than for the control group.

Forsythe *et al.*<sup>12</sup> in a study from 1 January 1972 through 30 June 1975 (two years before first referral and two years after initial treatment) compared 191 treated alcoholics with 191 matched nonalcoholic controls in a California Health Maintenance Organization (HMO) and found that costs increased after treatment for both groups.

Holder and Hallan<sup>13</sup> conducted a six-year longitudinal study from 1974 to 1979 to determine whether the treatment of alcoholism as a primary diagnosis results in a reduction of total health care cost and/or utilization for the alcoholic and other nonalcoholic family members. All health care costs and utilization were tracked for a group of 90 families (representing 245 individuals) enrolled with Blue Cross/Blue Shield through the Health Benefits Division of the California

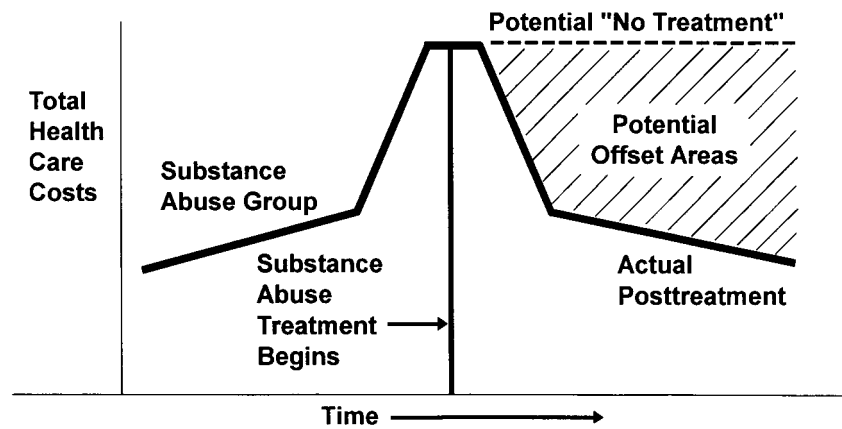


Figure 1. An illustration of "offset" savings resulting from substance abuse treatment

Public Employees Retirement System. At least one member in each family received treatment under a specific diagnosis of alcoholism during the period 1 July 1974–1 December 1975. All health care utilization and costs were obtained for a 12 month period before initial treatment for alcoholism and up to 1 July 1979. A matched group of 83 comparison families (291 persons) with no alcoholic members was selected to reflect comparable family composition, age and sex. Analysis of variance analysis for the treated population of monthly pre-treatment costs for medical care compared to one, two, three, four and five years after treatment initiation was statistically significant ( $F = 12.07, p < 0.001$ ).

The results indicated that overall health care utilization and costs for alcoholic individuals dropped after alcoholism treatment began and ultimately reached a level similar to that of the matched comparison group. These findings held for both inpatient and outpatient care.

Holder and Hallan<sup>13</sup> concluded the following from this six-year (1974–1979) study.

- (i) Contrary to insurance carriers' expectations of greater utilization of alcoholism treatment as a result of insurance coverage, the utilization rate of alcoholism treatment following the advent of specific coverage of primary diagnosis of alcoholism was only half of 1 percent of the entire enrolled population.
- (ii) Over time, inpatient alcoholism treatment decreased while the use of outpatient alcoholism care increased.
- (iii) For each \$1.00 spent on alcoholism treatment, there was at least \$0.42 in projected savings to insurance carriers and prepaid plans from reduced general health care costs for the alcoholic to offset alcoholism treatment costs.

Two experimental studies produced evidence of decreasing costs following alcoholism treatment. Hayami and Freeborn<sup>14</sup> found small decreases in costs for medical office visits, emergency room visits and hospital admissions, but only during the second six-month post-treatment period. Medical costs increased during the first post-treatment period. Although this study supports the hypothesis that in the long run costs of alcohol treatment are offset by reduced health care costs, it has been criticized as lacking internal validity

because it used no untreated control group and the sample size was relatively small. The study of 460 veterans by McLellan *et al.*<sup>15</sup> also produced evidence of post-treatment cost decreases, but it too lacked an untreated control group.

Four naturalistic studies examined health care records and found evidence of post-treatment health care cost decreases.<sup>16–19</sup> As with most naturalistic studies, none included untreated alcoholic control groups or employed a standardized clinical treatment.

Longabaugh *et al.*<sup>20</sup> compared the post-treatment costs of 60 extended inpatients with 114 partial-hospital-treatment patients (patients who remain in the hospital only during the day) and found the partial-hospital group to have lower costs. The post-treatment follow-up period was probably too short for substantial health improvements to emerge and thereby reduce average health care costs. Finally, Lawrence Johnson and Associates<sup>21</sup> examined the health records for alcoholics and a general cohort of Medicaid and Medicare patients across eight quarters (two years). Although they found differences between groups in the expected direction prior to treatment, the post-treatment costs of alcoholics increased substantially while those of the general cohort declined.

Holder and Blose<sup>22</sup> examined the effect of alcoholism treatment services on overall health care utilization and costs for health insurance enrollees under the Federal Employees Health Benefit Program (FEHBP) with Aetna Insurance Company. Four-year average per capita monthly medical care costs for families with an alcoholic member were \$209.60 or almost 100 percent higher than comparable costs (\$106.54) for families with no apparent alcoholic members. Most of this difference resulted from higher monthly inpatient costs.

Overall patterns in monthly total medical care costs were examined by pooling the pre-treatment and post-treatment data from all 1967 treated alcoholics to obtain a distribution of average monthly costs per individual during a six-year period (up to 36 months before and after treatment initiation). For example, analysis of variance was used to test for pre- and post-initiation differences, i.e., pre-monthly mean (13–24 month) = \$247 vs. pre-monthly mean (1–12 month) = \$398

and post-monthly mean (1–12 month) = \$251 ( $F = 4.76$ ,  $p < 0.01$ ).

From 36 to 12 months before alcoholics began alcoholism treatment their medical care costs gradually increased. During the year before treatment began, however, total medical care costs rose much faster. The average monthly medical care cost rose to \$452 in the six-month period before alcoholism treatment and to \$1370 in the final month. After treatment began, total medical care costs dropped fairly rapidly for about 12 months. This drop continued, though more slowly, during the next two years. Total health care costs averaged \$294 per month during the six months following treatment initiation, but only \$190 per month by the third post-treatment initiation year.

Holder and Blose<sup>22</sup> examined patterns of health care cost by gender and age. The pattern of overall medical care costs was almost identical for men and women. Alcoholics of different ages, however, showed distinct medical care cost patterns. Three age groups were used: less than 45 years, 45 to 64 years and 65 years and older. The middle age group was most like the modal age of groups typically represented in previous studies of treated alcoholics. Although alcoholics in each age group followed the general patterns of the total group, there was a clear association between age and the extent of the drop in medical care costs following the start of alcoholism treatment. By 36 months after the start of treatment, the average monthly total costs of those less than 45 years ( $N = 440$ ) had dropped to a level comparable with that experienced 36 months prior to treatment. The health care costs of the middle group ( $N = 823$ ) also dropped significantly following the start of alcoholism treatment, although they did not reach levels as low as those existing several years prior to treatment. The oldest group ( $N = 434$ ), which consisted primarily of retirees, experienced the highest overall medical care costs and showed the least convergence with the levels that existed prior to initiation of alcoholism treatment.

Holder and Blose<sup>23</sup> analyzed data from treated alcoholics (both employees and dependents) who were health insurance enrollees of a large midwestern manufacturing firm. A total of 3729 alcoholics were identified (3068 of whom received treatment and 661 of whom did not) who had filed insurance claims from 1974 to 1987. Untreated alcoholics were those identified by primary or secondary diagnoses of a physical health problem clearly related to chronic drinking, but for whom there was no evidence of participation in an organized alcoholism treatment program with the goal of recovery. Analysis of covariance was used to control for group differences including pre-treatment health status and age. This analysis indicated that the adjusted mean cost post-treatment costs of alcoholics (\$162) was 24% lower than comparable costs for untreated alcoholics (\$201) and statistically significant ( $F = 3.074$ ,  $p = 0.0547$ ).

Using an interrupted time series analysis (ARIMA) for the 14 year time series of the treated group, a statistically significant change was found, i.e.,  $T = -2.86$  (7 months post) with standard error of 0.179). The baseline model [(ARIMA (0,1,1,)) had  $R^2 = 0.99$  with  $Q$  (Ljung-Box) = 19. A similar

ARIMA model applied to the untreated group was not statistically significant.

The time-series analyses found that following treatment initiation the total health care costs of treated alcoholics—including the cost of alcoholism treatment—declined by 23% to 55% from their highest pre-treatment levels. Costs for identified but untreated alcoholics rose following identification.

Blose and Holder<sup>24</sup> found no treatment-related differences in overall health care cost between men and women. Significant differences were found by age: on the average, individuals in the 30 and under and the 31–50 age groups experienced declines in health care costs following initiation of treatment, whereas those over 50 experienced increasing costs.

The cost of medical care other than alcoholism treatment is a major factor in determining the potential for reductions in such costs following treatment initiation. This is especially true for the major source of medical care costs, inpatient treatment. Longitudinal analyses of cost components demonstrate that it is inpatient treatment that is most affected by alcoholism treatment. In some cases, outpatient treatment is actually increased in response to aftercare health care utilization, but at a substantially lower cost than inpatient treatment.

Goodman *et al.*<sup>26</sup> examined several factors that predict long-term alcoholism treatment costs. They found that the probability of long-term treatment depends on whether the diagnosis used in initiating treatment is for alcohol abuse or alcohol dependence. The short-term treatment costs are higher when the treatment is for abuse rather than dependence. Patients with a dependence diagnosis are much more likely to receive subsequent treatment in an inpatient setting than those with abuse diagnoses. In addition, if there is a comorbidity for drug abuse, the probability for subsequent alcoholism treatment is substantially increased. The interaction with mental health and drug co-morbidity was demonstrated by Goodman *et al.*<sup>26</sup> in that inpatient treatment is much more likely to be the location of treatment and thus increase the treatment costs by \$500 to \$1,500 for the first six-month period following initial alcoholism treatment. If the alcoholism condition can be treated on an outpatient basis, then the total cost of such treatment is obviously lower and the potential for a cost-offset net effect is substantially increased.

### *Cost Benefits of Drug Abuse Treatment*

There have been few drug abuse treatment cost-benefit research studies, e.g., those by Hubbard *et al.*,<sup>27</sup> Sells,<sup>28</sup> Tabbush<sup>29</sup> and Appel.<sup>30,31</sup> Hilker<sup>32</sup> conducted a ten-year study in the Illinois Bell Company investigating the effects of employee-based alcohol and drug treatment and aftercare programs on health care utilization. The study found that the same 72 percent decline in sickness disability for the alcoholic group also occurred among drug users. A second study, conducted by Alander and Campbell,<sup>33</sup> found a 33 percent decline in sickness and accident benefits over a

two-year period after the implementation of an employee-based alcohol and drug abuse treatment program, confirming an earlier study which found a reduction of inpatient care episodes among heroin addicts after the implementation of a methadone maintenance program with an accompanying 44 percent reduction in program costs.

Lennox<sup>34</sup> examined the health services used and costs incurred by drug dependent patients enrolled in the health insurance program of a large midwestern manufacturing company for the period 1974 through 1987. He examined health insurance data for enrollees who submitted a claim for drug-dependence treatment between 1980 and 1984 inclusively, and who were continuously covered by the insurance plan from 1977 through 1987. He used a five-year 'treatment window' between January 1, 1980 to December 31, 1984. Only patients who filed claims for treatment with either a primary or secondary diagnosis of drug dependence (ICD-9 304) within the treatment window were included in a study group of 545 drug dependent patients. Half (48%) of those in the sample were employees themselves, with only 17% being the spouse. A full 35% of the treated drug abusers were the children of the enrolled employees. The average age was 30.9 years, which represented a wide age distribution.

Missing data on some of the covariates and control variables used in the analysis reduced the effective sample size to 480 treated drug abusers. The total health care costs across the six 12-month study segments follow the general form of **Figure 1**.

A non-alcohol or non-drug-dependent control group comparable in age, gender and family status to the drug abuse treatment group was developed. This non-dependent group provided a baseline for comparison. The third-year pre-treatment costs started out at approximately \$190 per month, roughly \$150 higher than those reflected in the non-dependent group mean. The second year pre-treatment produced an unexplained decrease to \$160, reducing the difference from the baseline mean by about half. Beyond this point, however, the increase to the first year post-treatment was fairly linear, reaching the highest levels in the first year post-treatment at \$544 per month, and producing a difference from the baseline mean of nearly \$500 per month. The second year post-treatment revealed a dramatic decrease in costs below the baseline in the third year pre-treatment, followed by a further reduction to the lowest level of \$141 per month. At the end of the study period, the treated drug abuse group's total health care costs were only approximately \$50 higher than the non-dependent group mean. The decrease from \$191 at the beginning of the study to \$141 at the end was even more dramatic given the rising health care utilization of the general enrollee population as a whole shown in the rising mean over time. Because the costs used for calculating the imputed costs are all in 1985 dollars, the increase cannot be attributed to inflation, but instead must reflect a real increase in health care utilization across the board. Presumably this increase is caused by a heightened awareness of the availability of health services, and the importance of preventative care.

One can hypothesize that this difference in total health care costs is the difference in inpatient and outpatient utilization by both groups. Separating out the average monthly costs for both the treated drug abuse patients and the matched non-drug abuse patients demonstrates that the outpatient costs of both groups as well as the inpatient costs for the matched comparison group are quite comparable over time. Thus, it is the utilization of inpatient care and its associated costs that are most affected by the absence and/or presence of treatment.

Previous alcoholism research did not find gender-based cost-offset differences.<sup>22,24</sup> Males and females in drug treatment showed fairly similar patterns across the study period, with females producing a slight elevation in health care costs, particularly in the first pre-treatment. Females show a dramatic 'ramp effect'<sup>24</sup> prior to treatment. Holder and Blose<sup>22</sup> have suggested that this ramp effect may be indicative of the onset of the health care crisis state that ultimately brings the individual to seek drug-abuse treatment. Although the costs reflected in the pre-treatment are, by definition, not directly linked to a drug-abuse diagnosis, the average cost for the female groups is almost five times that of the male group in the first year pre-treatment. Though not statistically significant, the difference is possibly due to the rather small number of females in this study population.

Based upon the age-related patterns found in alcoholics in treatment, one might expect a better cost-offset result for younger compared to older drug abusers. Considering the total health care costs for one group of drug abusers under 40, and for those over 40 years of age, one finds the pattern is consistent with that seen in alcoholism cost-offset studies. The younger group shows convincing evidence of cost offsets with the final post-treatment phase showing costs lower than any other phase in the study, and lower than the non-substance-abusing comparison group. The older group shows the elevated levels throughout the study, but the post-treatment costs do return to baseline. Lennox<sup>34</sup> concluded that his study results support the hypothesis that drug abuse treatment is effective in reducing total, inpatient, outpatient, emergency room and other costs to pre-treatment levels. Three-year post-treatment costs compared favorably with costs for non-alcoholic or drug abuse normal controls.

### *Summary of Findings*

This review has described the research findings from a number of cost-offset or cost-benefit studies of alcoholism and other drug abuse treatment. In broad terms the findings of this research can be summarized as follows.

- (i) Untreated alcoholics or drug dependent persons use health care and incur costs at a rate about twice that of their age and gender cohorts.
- (ii) Once treatment begins, total health care utilization and costs begin to drop, reaching a level that is lower than pre-treatment initiation costs after a two- to four-year period. The conclusion is based on similar findings across different patient populations using a variety of research designs.

- (iii) There are no apparent gender differences in the utilization and associated costs before and after alcoholism treatment initiation. The pre- and post-treatment patterns of alcoholic females and males are virtually identical.
- (iv) There are age differences that support the value of early intervention. Younger treated alcoholics have pre-treatment total cost levels that are lower than pre-treatment levels for older alcoholics (say 55 years and older), and older alcoholics have a much poorer prognosis. The older treated alcoholic is much more unlikely to experience lower health care costs, following treatment initiation, than before treatment.
- (v) Part of the increase in health care costs is a function of maturation. The difference between patients and their age/gender cohorts is relatively constant during the period prior to treatment. Once treatment begins there is a clear tendency for cost trends to reverse direction and go down. Convergence with the expected age/gender baseline is quite possible over time.

The results of research provide consistent support for the cost effectiveness of substance abuse treatment. That is, we find support if we define cost effectiveness in terms of treatment's ability to offset its own cost by reducing future health expenses. The studies that have addressed the potential cost–offset of substance abuse have been largely based upon overall or aggregate effects across all forms of substance abuse treatment. There have been no studies of the cost–offset of specific treatment modalities, though this is what the next generation of studies should do.

From a health policy perspective, such results can be promising if the objective is to demonstrate that treatment investment can pay for all or part of its associated costs through reductions in other health care costs. While in principle this perspective is relevant, in practice managed care organizations, government sponsored health services or indemnity insurance plans may not recognize the practical benefits of this potential (or actual) cost saving. It is also possible that one can hold a contrary position, i.e., lower future medical care costs for substance abusers could reflect denial of essential care. In the end, these results from a mental health policy view become more relevant if the objective of the policy is to seek treatment as a means to reduce medical care costs.

## Acknowledgement

Research and preparation of this paper were supported in part by the National Institute on Alcohol Abuse and Alcoholism Research Center grant AA06282 to the Prevention Research Center, Pacific Institute for Research and Evaluation.

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