

Assessing Substance Abuse and Problem Gambling Treatment as an Investment in Population Health

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The purpose of this study is to critically review the recent literature on economic evaluation in the areas of substance abuse and problem gambling. This will assist the Alberta Alcohol and Drug Abuse Commission (AADAC) in describing and positioning its addiction treatment services from a return-on-investment (ROI) perspective in terms of supporting individual recovery, community well-being, and population health.

Economic Evaluation

Economic evaluation is important because resources are scarce. Choices have to be made regarding the resources committed to various substance abuse and problem gambling treatment programs. Economic evaluation is an organized approach to structuring a decision to commit resources to one use rather than another. It makes explicit the relevant alternatives, viewpoints, and provides measurement of inputs and outputs.

Different types of economic evaluation are available to answer different types of questions. The main types of economic evaluation can be classified according to: (1) whether both costs and outcomes are considered, (2) whether different alternatives are compared, (3) and whether consequences are measured in monetary or physical terms.

In the context of economic evaluation of substance abuse treatment, cost-of-illness analysis (COI) is useful for giving policy makers an idea of the magnitude of substance abuse costs, but cannot be used as a basis for comparing programs. Cost-effectiveness analysis is useful for comparing treatment programs which have a similar desired effect (i.e., the relative performance of two substance abuse treatment programs), but cannot say anything about whether either program should be undertaken, or used to compare programs with differing objectives. Cost-benefit analysis is useful for comparing substance abuse treatment programs to social programs with differing desired outcomes, and this is the only type of analysis which lends itself to measuring return-on-investment.

Costs of Substance Abuse and Problem Gambling in Canada

The latest available estimated costs of substance abuse are large in both Canada and Alberta (at 2.67% and 2.19% of Gross Domestic Product, respectively). While previous studies may have produced larger estimates, they are methodologically flawed and reference to the earlier estimates should be avoided.

Although such large figures may capture the attention and imagination of decision-makers, from an economic standpoint, the total cost of a disease is not a suitable basis for either investment in research or the funding of prevention and treatment. The relevant information needed to substantiate such investments is whether the benefits (in terms of

enhancements to the length and quality of life), at the margin of investing in the substance abuse field per unit cost, are greater than the marginal benefit/cost results achieved elsewhere.

There are recent estimates available for the prevalence of problem and pathological gambling for most Canadian provinces. These indicate that the prevalence of problem and pathological gambling is higher in **Alberta** than in any other **province**. However, there appears to be **little** or no research on estimating the economic costs of problem and pathological gambling in Canada. There also appears to be little in the way of objective, scholarly study of the **economics** of problem gambling, and there are no cost-benefit economic evaluations available for Canada in the areas of substance **abuse** and problem gambling treatment. All such studies available are from the United States.

Cost-Effectiveness Between Treatment Modalities **and** Client Types

The existing literature does not, in general, detect outcome differences between in-patient and out-patient modalities. The published literature on in-patient versus out-patient treatment does not directly compare hospital to non-hospital-based settings, and therefore does not directly compare AADAC **versus** non-AADAC treatment. There is no strong evidence of differential treatment effectiveness between in-patient and out-patient treatment, irrespective of how these settings are defined.

Although the idea of matching clients to treatment is intuitively plausible and was mildly supported by some literature in the early **1990s**, it is **very** difficult to find empirical evidence of the **matching** principle. Overall, the literature does not present those involved in treatment with useful guidelines as to how to make treatment more cost-effective using matching. Without effectiveness data, it is not possible to do cost-effectiveness analysis (without assuming equal effectiveness across modalities). Project MATCH (1997) is an important study as it appears to have been well-designed to find matching effects. Although Project MATCH consistently demonstrates a great level of improvement in multiple life domains for individuals who participated in the study, there were no strong indicators (aside from psychiatric severity) that the ten characteristics of the individuals entering care predicted a specific response to any of the three treatment approaches incorporated in the investigation.

According to some recent synthesis and review of the **very** large body of literature on comparisons across treatment modalities, there is no strong relationship between the costs of various treatment modalities and their effectiveness. The inconclusive nature of the research suggests that discriminating between modalities is difficult. There are no randomized studies which compare an intervention to a no-treatment **option**, thus no evidence exists to suggest that treatment is cost-ineffective relative to no-treatment. One exception to these inconclusive results is in the **area** of alcohol detoxification. The **literature** indicates that hospital-based treatment is not required for the safe and cost-effective detoxification of patients, with the exception of those who meet well-specified clinical **criteria**.

Most substance abuse evaluations are hindered by a variety of methodological problems. The chronic and variable nature of substance abuse makes it very difficult to establish a study design which can definitively **attribute** the role that treatment plays in determining outcome.

Cost-Benefit Evaluation • Substance Abuse Treatment Programs

The three broad areas of economic outcome measures are health care offsets, productivity or employment-based measures, and crime related measures. It is important to note that these three functional areas are generally under the jurisdiction of different groups and it is unusual for a study to examine each area comprehensively

A variety of U.S. studies involving **HMO** populations have demonstrated that health care costs and utilization for **both** an individual who has undergone alcohol treatment as well as members of **his/her** family exhibit a "ramping" effect. That is, costs rise and peak prior to treatment, but following treatment health care costs fall dramatically and continue to decline until they are roughly the same as comparison families who do not have a member who has undergone treatment. The costs for both groups tend to rise in years three and four, but the treated families continue to have the same health care costs as the comparison families for four years after treatment, thus indicating **long-term** effects. Considering only health care costs, the investment in treatment pays for roughly half of the cost within one year, and costs are fully recovered within two to three years.

Productivity losses are one of the major costs of substance abuse. Although some studies have found evidence of improved employment functioning, it has not yet been demonstrated that substance abuse treatment aids productivity in **terms** of producing a large cost offset.

Virtually all studies indicate that criminal activity is reduced substantially after **treatment** when **compared** to pre-treatment levels. The cost offsets **attributable** to crime reductions are **higher from a taxpayers'** perspective than from a societal perspective due to victim cost offsets being excluded from the latter perspective. The evidence indicates that **criminal-related** cost offsets alone (during, and two to three years after treatment) may offset the cost of treatment from a taxpayers' viewpoint, but not from a societal viewpoint.

Only one U.S. study aggregates benefits across the three functional domains of health care, productivity, and crime. The return **from** each dollar invested in a **program** (one year after treatment), from a taxpayer perspective, **ranges** from \$4.31 to \$12.58, depending on the modality. Summing across modalities, the overall **return-on-investment** is **\$7.14**. From a societal perspective (one year **after** treatment), the ROI for each dollar invested in **non-methadone** substance abuse treatment ranges from \$2.40 to \$2.87, depending on the modality. However, these **return-on-investment** figures are

likely to be overstated as they do not include adjustments for the 35% of the clients who had re-entered treatment at the time of the follow-up.

Cost-Benefit Evaluation • Substance Abuse Prevention Programs

The only available study of substance abuse prevention programs produces a large cost-benefit ratio (14 to 1) for U.S. programs, but overstates the benefits by attributing all declines in substance abuse prevalence to prevention programs without making a persuasive case for doing so. The economic evaluation of substance abuse prevention programs appears to be under-researched.

Cost-Benefit Evaluation • Pathological Gambling Treatment Programs

Only one study, published in 1985, has estimated cost-benefit ratios for pathological gambling treatment. The very high cost-benefit ratio estimated (\$20 return for every dollar invested in treatment) is probably an over-estimate, especially from a societal perspective. There is much confusion in this study about what the perspective of the study is and therefore what constitutes a cost. The area of economic evaluation of problem gambling remains one which requires much additional study.

1. Background

1.1 Study Purpose

The purpose of this paper is to critically review the economic evaluation literature on substance abuse and problem gambling treatment. It is intended to assist the Alberta Alcohol and Drug Abuse Commission (AADAC) in describing and positioning its addiction treatment services **from a return-on-investment (ROI) perspective** in terms of supporting individual recovery, community well-being, and population health.

1.2 Research Questions

The aim of the literature review was to examine economic evaluations by focusing on the following questions outlined by the funding agency (AADAC).

(1) Prevalence and costs of substance abuse and problem gambling

Why assess these costs?

How are these costs measured?

What is the magnitude of these costs?

(2) Cost-effectiveness of medical versus non-medical approaches

*What does the literature say about measuring the cost-effectiveness of addictions treatment having a **focus on medically** trained providers, hospitals, **and** in-patient care relative **to treatments** that are more non-medical and community-based, involving social service workers, cognitive-behavioural modalities, and making **greater** use of out-patient and day treatment regimes, with community **and** self-help support in long-term **recovery**?*

*From an economic standpoint, **what** approaches appear to provide the best returns for what kinds of clients?*

*Have economic arguments been made for no or minimal intervention in addictions problems in support of natural **recovery** only?*

(3) Cost-benefit of treating substance abuse or problem gambling

*What are the individual and **community** **benefits/impacts** of addictions treatments that lend themselves to economic measurement?*

What is the ratio of costs to benefits for these kinds of services?

- (4) Return-on-investment of addictions treatment
Does treatment pay for itself - in the short or long term?
What is the applicability for Canadian addictions services?

(5) **Implications**

What are the applicability of these research findings for AADAC services?
What qualifiers/caveats should be noted?

What can be said about considering addictions treatment as an "investment" in population health?

What can be said of the state of the economics evaluation literature in this area, noting aspects of theory, measurement, or treatment services in need of improvement?

1.3 Methodology

A literature search was conducted during January, 1997. Two databases were searched using two sets of search terms: (1) cost, economics, cost-effectiveness, and (2) substance abuse, alcohol, tobacco, smoking, drugs, gambling, pathological gambling. The two databases were Medline (1986 to 1995) and Econlit (1990 to 1996). Added to these were articles that were referred to in personal communications with other researchers at AADAC. Of the articles found, only those which referred to economic evaluation were considered further.

2. Nature Of Economic Evaluation

Economic evaluation is important because resources are scarce. Choices have to be made regarding the resources committed to various substance abuse and problem gambling treatment programs. Economic evaluation is an organized approach to structuring a decision to commit resources to one use rather than another. It makes explicit the relevant alternatives, viewpoints, and provides measurement of inputs and outputs.

2.1 Essential Components of a Full Economic Evaluation

There are two essential elements to any full economic analysis. First, the analysis must deal with both the costs and consequences of a particular proposed program. Second, economics is concerned with choices. Scarcity implies that choices will be made. These elements of costs, consequences, and choice are illustrated in Table 1 (page 4).

2.2 Full Economic Evaluations

There are four different kinds of full economic evaluations distinguished by Drummond et al., (1987): cost-minimization analyses (CMA), cost-effectiveness analyses (CEA), cost-benefit analyses (CBA) and cost-utility analyses (CUA). In all these cases, the inputs are measured in monetary terms. The only difference between these analyses are the units in which outcome is measured. A CMA is conducted between alternatives with the same outcomes, so outcome measures are not considered. CEA measures outcomes in physical units, CUA measures outcomes in quality-adjusted life-years (QALYs), and CBA measures outcomes in monetary terms.

2.2.1 Cost-Minimization Analyses (cell 4)

CMA studies are full economic evaluations in which the outcome measures from two or more alternatives are treated as identical. Since the outcomes are identical, the differences between alternatives are reflected only in the costs or inputs used to achieve these outcomes. It is important to distinguish the CMA from the partial economic analysis outlined in cell 1A of Table 1. The CMA is not a partial economic evaluation if evidence is supplied which demonstrates that the outcomes of the alternatives are identical. If equivalence of outcomes is merely assumed in an analysis, then it remains a partial analysis. In the field of addiction treatment, outcome measures are usually contentious, and CMA analysis is therefore generally inappropriate. Accordingly, there are no published cases of CMA analyses in the substance abuse or problem gambling literature.

Table 1

Elements of Economic Evaluations

Are both costs (inputs) and consequences (outputs) of the alternatives examined?

	NO		YES
	Examines only consequences	Examines only costs	
Is there comparison of two or more alternatives?	NO 1A Outcome Description 	1B Cost Description (e.g., Siegel et al., 1984)	2 Cost-outcome description (e.g., Holder & Hallan, 1986)
	YES 3A Efficacy or effectiveness evaluation (e.g., Stockwell, et al., 1991)	3B Cost analysis (eg., French. et al., 1995)	4 FULL ECONOMIC EVALUATION Cost-minimization analysis Cost-effectiveness analysis Cost-benefit analysis Cost-utility analysis

Source: Adapted from Drummond, et al. (1987)

2.2.2 Cost-Effectiveness Studies (cell 4)

In CEA, the consequences of two or more alternatives are typically measured in natural units (e.g., abstinence six months after treatment, incarceration rates). Once again, to facilitate comparison, there must be some general agreement about the relevant outcomes which are common to each alternative. Cost-effectiveness is normally expressed as the ratio of outcomes per unit cost.

Cost-effectiveness studies are helpful in that they provide the decision maker with an accounting of the relative resources consumed to achieve a particular outcome. Thus, CEA allows alternatives to be ranked according to the resources required to achieve a particular objective. CEA methodology is useful for a program manager who has an objective in mind and needs to choose between alternative means to achieve a particular goal.

One of the main drawbacks of cost-effectiveness analysis is that there is an implicit assumption made that whatever objective is agreed to must be undertaken; it is only a matter of deciding which alternative achieves this consequence in the most cost-effective fashion. In the context of substance abuse treatment, it is often difficult to agree on the

appropriate outcome measure (e.g., Is abstinence after six months the appropriate outcome or is controlled drinking acceptable?). As well, it is not possible to compare alternatives which differ in their consequences or outcomes. For example, it will not help a decision maker decide between devoting more resources to vaccinations or to alcohol and drug treatment programs. Since cost-effectiveness is a relative measure, both programs may or may not be desirable from a particular viewpoint. Another potential problem is that it is possible that a program which is more cost-effective is also more costly in absolute terms and may not be feasible within a fixed budget.

2.2.3 Cost-Utility Studies (cell 4)

Cost-utility analysis is similar to cost-effectiveness analysis, but CUA measures outcomes in quality-adjusted life-years (QALYs). Utility values are usually found by sampling subjects using some form of instrument. This approach has not been used in substance abuse economic evaluations, although the methodology is described by French et al., (1996).

2.2.4 Cost-Benefit Studies (cell 4)

Cost-benefit analysis is similar to cost-effectiveness analysis in that both costs and consequences are measured. However, CBA measures the consequences in monetary terms rather than physical units. Since the costs and the consequences are both measured in identical units, they can be compared by subtracting costs from benefits, or (more commonly) taking the ratio of costs and benefits. If the ratio is greater than one (or alternatively, the difference between benefits and costs is positive), then the program is desirable from the point of view of the study. The program 'pays for itself' in the sense that its benefits exceed its costs.

The advantages of cost-benefit analysis compared to cost-effectiveness analysis is that CBA can be used to compare programs regardless of what the outcome is. Thus, it is useful in terms of positioning substance abuse programs with respect to other types of social investments. The major difficulty with cost-benefit analysis is that it is difficult to assign monetary values to many of the consequences of substance abuse: in particular, the intangible consequences such as pain and suffering.

2.3 Partial Economic Evaluations

Cells 1, 2, and 3 in Table 1 illustrate partial economic evaluations which exclude at least one of the elements of costs, consequences, or choice.

2.3.1 Outcome Description (cell 1A)

An outcome description merely describes the outcome of a particular intervention and does not consider costs or alternative choices of treatment. An example of this type of analysis is the statement that, "66% of clients undergoing a particular treatment program are abstinent after six months." Although the outcome description is limited by what is omitted, it nonetheless is a first step towards full economic evaluation.

2.3.2 Cost Description (cell 1B)

Cost description is another limited analysis which considers only the costs of one particular type of treatment. Siegel et al., (1984) give an example of this type of analysis by costing resources used by a mental health facility which treats alcoholics. Once again, although the cost description omits aspects of a full economic evaluation, the results can be used to develop further analyses.

2.3.3 Cost-Outcome Studies (cell 2)

These studies measure the costs and consequences of one intervention without considering an alternative choice. Consequences can be measured either in physical units or in monetary terms. Studies of this type are commonly encountered in the substance abuse literature on alcohol treatment cost offsets (Holder & Hallen, 1986; Holder & Blose, 1986; Goodman et al., 1991; Langenhucher, 1994). The basic idea is that the costs of alcohol treatment are offset by decreased future utilization of health care resources. These studies are normally conducted using administrative databases and therefore look at the health care utilization pattern of those who have been treated for alcoholism; no alternative is considered. This pre-post experimental design has been used in studies conducted by agencies in a number of jurisdictions in North America. Some studies will attempt to construct a control group to see whether the effects are due to treatment or some other confounding variable.

Another commonly encountered analysis related to cost-outcome descriptions are "cost-of-substance abuse" studies which attempt to quantify the social costs of substance abuse in monetary terms. These are based on a well-developed "cost-of-illness" methodological framework. Some examples of this type of analysis are: Rice et al., (1991) for the U.S. and Single et al., (1996) for Canada and provinces. A typical statement from this form of analysis is, "In 1992, the total cost of alcohol, tobacco, and illicit drug use in Alberta was 1.6 billion dollars."

2.3.4 Efficacy or Effectiveness Studies (cell 3A)

The most common evaluation in the substance abuse field compares alternative choices, but only look at the consequences of the alternatives while ignoring the costs. These consequences are normally measured in natural units (e.g., abstinence six months after treatment, incarceration rates). To facilitate comparison, there must be some general agreement about the relevant outcomes which are common to each alternative. For example, there are many studies comparing the outcomes of in-patient programs to outpatient programs. Normally these studies are not explicitly described as economic analyses.

Efficacy or effectiveness studies are primarily useful when the programs examined are trying to accomplish similar goals. In addition, when the costs of the two alternatives are similar, the difference in outcomes alone can be used to help make a decision. These studies also address the skepticism concerning the effectiveness of substance abuse treatment, since quantifiable results are produced. An efficacy or effectiveness study may also provide useful input into more comprehensive types of analysis.

One of the main drawbacks of effectiveness studies is that it is not clear how to make a decision if a more costly treatment is also more effective. As well, decisions can only be made between programs whose outcomes are similar (e.g., one cannot compare a rubella vaccination program to an alcohol treatment program).

2.3.5 Cost Analysis (cell 3B)

Cost analysis involves a comparison of the costs (resources consumed) of alternative treatments and can be useful in deciding between alternatives if the outcomes of the two treatments are nearly the same. This is often assumed in cost analyses. A major problem with this form of analysis is that costs are irrelevant if both of the alternatives are ineffective. An example of this type of analysis is given by French et al., (1995) who compared the costs of two different kinds of Employee Assistance Programs (EAPs).

Summary:

There are several different categories of economic evaluation which are differentiated by (1) whether costs and/or outcomes are considered, (2) whether different alternatives are compared, and (3) whether consequences are measured in monetary or physical terms.

In the context of economic evaluation of substance abuse treatment, cost-of-illness analysis is useful for giving policy makers an idea of the magnitude of substance abuse costs, but it cannot be used as a basis for comparing programs. Cost-effectiveness analysis is useful for comparing treatment programs which have a similar desired effect (i.e., the relative performance of two substance abuse treatment programs), but cannot say anything about whether either program should be undertaken. Cost-benefit analysis is useful for comparing substance abuse treatment programs to social programs with differing desired outcomes.

3. Prevalence And Costs Of Addictions

3.1 Why Assess these Costs?

One of the primary reasons for assessing the costs of substance abuse is that there is increasing pressure throughout the health care field to reduce the costs of treatment. **Governments** are currently facing fiscal constraints and are reassessing resources devoted to substance abuse treatment. They are asking for social programs to justify themselves economically. Although it clearly does not address all issues of concern, estimating the costs of substance abuse gives decision makers an idea of the magnitude of those costs under the present program of treatments.

At the same time, an emphasis on economic evaluation is appropriate for establishing a sound scientific basis for treatment **programs** as well as to increase public acceptance. Sometimes there is a perception that no activity or program is effective in reducing or preventing substance abuse problems. Rather than being viewed as a first step in reduction of treatment services however, it should be recognized that economic evaluations can help make substance abuse treatment more attractive to both decision makers and funding agencies.

3.2 Methodologies for Assessing Costs and Consequences

There are a large number of papers **outlining** various methodological approaches to estimating the costs of substance abuse (Collins & Lapsley, 1994; DiNardo, 1992; Harwood, 1994; Robson & Single, 1995, Single et al., 1996; Zarkin, et al., 1994). Although the basic economic concept is clear enough (**opportunity** cost), these papers emphasize that applying the concept to substance abuse is open to interpretation. Which costs to include in the analysis will depend on the viewpoint (e.g., societal, or from the point of view of the government), how the analyst views the addiction process (i.e., to what extent is addiction "rational"), data availability, and a variety of other factors. There are also a number of studies which have implemented these ideas to produce actual cost estimates for various countries.

In brief, cost-of-illness(COI) studies estimate the **impact** of substance abuse on the material welfare of a society by examining the **social costs** of substance abuse. These social costs consist of: (1) resources expended for **treatment**, prevention, **research** and law enforcement, (2) losses of production due to increased morbidity and mortality, and (3) (ideally, but **virtually** never put into **practice**) some measure for the quality of life years lost, relative to a **counterfactual** scenario in which there is no substance abuse. A taxonomy of these costs are listed in Appendix A.

Naturally, not all of the impacts of substance abuse lend themselves to economic measurement and there are other categories of effects which should, at first glance, be included (e.g., costs of purchasing abused substances, welfare costs), but which are deliberately left out for reasons of economic logic to be explained below. The primary cost categories in COI studies are "direct" costs and "indirect" costs. The direct costs for an illness are represented by the value of tangible goods and services actually delivered to address consequences of that illness. Indirect costs are represented by the value of personal productive services that are not performed due to the consequences of the illness. A further distinction is usually made in COI studies between costs primarily within the health system ("core" costs) and costs outside of the health system ("non-core" costs).

A COI study involves combining an epidemiological database with resource utilization and financial information to generate an amount valued in monetary terms which estimates the costs to society of a particular condition. Typically, the magnitude is large and is used to draw attention to the condition as one which policy makers and researchers ought to pay greater attention. The major concept is that all relevant costs are *opportunity costs*. That is, one activity (such as an illness) prevents resources being used for some other purpose, and so an opportunity is forgone. Thus, COI studies rest on the proposition that if the illness did not exist, then the resources that a society uses for treatment and other related purposes could be deployed in some other way.

One of the reasons for concern about the impact of substance abuse is that it has large social costs as opposed to private costs. For most conventional commodities, an integral assumption of neo-classical economic theory is that consumers value their own consumption, and that they rationally seek to maximize the value of their consumption as best they can—subject to various limitations such as their income and borrowing power. Thus, it is assumed that when a person buys alcohol, cigarettes, or an illicit drug, the cost of the purchase is offset by the benefits the consumer obtains from its use. Hence, the costs of the purchase are not included as a "cost" of substance abuse. But substance abuse can lead to accidents, health care interventions, and other consequences which have social costs that are not borne by the abuser. These external costs are, strictly speaking, what the COI study is trying to capture; although in practice, some private costs such as the property damage caused by an automobile accident would also be included.

Measuring the social costs of substance abuse is not easy. For example, there is strong evidence that the consumption of alcohol is related to a variety of health consequences, and even moderate alcohol use is associated with increased risk of trauma, such as that caused by impaired driving accidents. The proportion of each of these causes of morbidity and mortality which can be attributed to alcohol use must be estimated, ideally for different age and gender groups. Where large-scale population based epidemiological studies have established the relative risk of particular disorders at different levels of alcohol consumption, the attributed fractions of alcohol-related morbidity and mortality can be determined with a fair degree of confidence. In many situations, however, such

studies are lacking, and one is forced to estimate the attributable fractions from less reliable sources.

For other adverse consequences of alcohol use, the issue of causality can be even more daunting. Consider a person who consumed alcohol prior to committing a crime. Even if this person was intoxicated, it is not clear whether the crime can be attributed to alcohol consumption. The alcohol may have caused the person to become aggressive or less inhibited, or precipitated the crime in some other fashion. On the other hand, the person may simply have happened to have a few drinks before engaging in a crime which he or she would have committed anyway. Thus, even when drinking immediately precedes a criminal act, the attribution of alcohol as a causal factor in the crime is not at all clear.

Another issue which must be addressed is the viewpoint of the study. If the viewpoint is that of society as a whole, then such items as welfare are treated as transfers rather than resource consumption (resources are shifted from one pocket of society to another). Similarly, if an abuser steals from another member of society, this is also viewed as a transfer of resources and is not counted as part of the COI. In both of these cases, however, administrative costs, such as policing and court costs, represent resource consumption which should be counted as part of the COI.

Indirect costs or lost productivity due to substance abuse are usually estimated using the human capital approach which attempts to value the production forgone by the abuser. In a perfectly competitive world, the productivity of a worker is reflected by wages paid out. The usual proxy for this is earnings data for an average worker of the same sex and age as the abuser. This approach is controversial due to its implicit distributional weights. People are essentially valued according to their earnings. Although economists are aware of these shortcomings, the human capital approach remains the most common way to estimate productivity losses due to its relative simplicity.

Despite the serious practical problems involved in incorporating intangible costs in substance abuse cost estimates, omission of these costs will lead to significant cost under-estimation. Tangible costs can be defined as those costs (such as health care or productivity) which, when reduced, will yield resources which become available to the community for consumption or investment purposes. Intangible costs, such as pain and suffering, do not yield resources available for other uses and so do not represent a call on the productive resources of the community. Intangible costs (and benefits) can be extremely difficult to estimate with any degree of reliability since there is no market for them, and so the temptation exists to ignore them. Although they do not appear in COI studies, it is important to communicate to decision makers in a qualitative way the significance of these costs

Use and Misuse of Substance Abuse Cost-of-Illness Studies

COI estimates are often used to argue for more resources to be devoted to substance abuse by pointing out the economic consequences of letting a chronic condition take its course. The implied logic is: If a disease has a large economic burden, then devote more resources to it. Some caution is warranted in using the estimates produced by cost-of-illness studies in this fashion. Although the estimates do provide some useful information, they do *not* tell us whether more resources should be devoted to the disease. Decisions on the allocation of scarce health care resources should depend on the availability of treatment options, their cost, and their effectiveness.

There are three major ways in which COI studies may prove useful. First, they offer a method for highlighting the importance of a particular disease, over and above the usual epidemiological estimates of mortality and morbidity. Usually disease rankings are the same whether estimated epidemiologically or economically, but not always. A chronic disease may not lead to many deaths, but may lead to significant reductions in the quality of life and the use of health care resources. Some diseases may lead to relatively modest economic burdens in terms of health care use, either because there are few effective interventions or because they are not regarded by health care professionals as being important. Second, COI estimates can provide a baseline against which new interventions can be assessed. Third, cost-of-illness studies can help determine medical research priorities.

The total cost of a disease is not a suitable basis for either investment in research or the funding of prevention and treatment. The relevant information needed to substantiate such investments is whether the benefits (in terms of enhancements to the length and quality of life), at the margin of investing in the substance abuse field per unit cost, is greater than the marginal benefit/cost results achieved elsewhere.

3.3 Magnitudes of Substance Abuse Costs

3.3.1 Costs of Substance Abuse in Canada

The most recent and methodologically advanced estimates of the costs of substance abuse are available in Single et al., (1996). The figures for Canada are shown in Appendix B, while the figures for Alberta are presented in Appendix C.

As concluded by Single et al., (1996):

- 1) *Substance abuse exacts a considerable toll to Canadian society in terms of illness, injury and death.* It is estimated that there were 40,930 deaths attributable to substance abuse in Canada in 1992. Tobacco accounted for 33,498 of these deaths, alcohol 6,701, and illicit drugs 732. This represents 21% of total mortality for that

year. The number of years of life lost due to substance abuse was 23% of the total years of life lost due to any **cause**—16% due to tobacco, 6% due to alcohol, and 1% due to illicit **drug** use. The number of hospitalizations due to substance abuse constituted 8% of total hospitalizations and 10% of the total days spent in hospitals for any cause.

- 2) *Mortality and morbidity attributable to substance abuse is lower than previous Canadian estimates.* This is primarily due to more accurate estimation of the etiological ratios which attribute substance abuse to mortality and morbidity outcomes. While previous studies (e.g., Adrian et al., 1989) may have produced larger cost figures, reliance on such figures should be avoided.
- 3) *The use of alcohol, tobacco and illicit drugs involve considerable costs to the Canadian economy.* It is estimated that substance abuse cost \$18.45 billion in Canada in 1992. This represents **\$649 per capita**, or about 2.7% of the total Gross Domestic Product.
- 4) *The costs of substance abuse vary considerably between the provinces of Canada.* The use of national averages to estimate overall provincial costs is subject to considerable error. Costs per capita range from \$524 in Newfoundland and \$581 in Saskatchewan, to \$681 in Prince Edward Island and \$699 in Nova Scotia.

3.3.2 Costs of Substance Abuse in Alberta

The costs attributed to alcohol abuse in 1992 were \$749 million which represents 1.02% of GDP, or a per capita figure of **\$285**. The costs **attributed** to illicit **drug** use were \$135 million or 0.18% of GDP (\$51 per capita). Of interest is the fact that costs which arise from alcohol abuse and illicit substance abuse **form** a greater proportion of total **costs** in Alberta than they do elsewhere in Canada.

Summary:

The latest available estimated costs of substance abuse are large in both Canada and Alberta (at 2.67% and 2.19% of GDP, respectively). While previous studies may have produced larger estimates, they are methodologically flawed and reference to the earlier estimates should be avoided.

Although such large figures may capture the attention and imagination of decision makers, from an economic standpoint, the total cost of a disease is not a suitable basis for either investment in research or the funding of prevention and treatment. The relevant information needed to substantiate such investments is whether the benefits (in terms of enhancements to the length and quality of life), at the margin of investing in the substance abuse field per unit cost, is greater than the marginal benefit/cost results achieved elsewhere.

3.3.3 Costs of Pathological Gambling in Canada

Prevalence

Much of the discussion here is based on a recent report by the National Council of Welfare (1996) and a paper by Ladouceur (1996) which together, contain the most recent available information concerning the prevalence of pathological gambling in Canada. In all, eight provinces provided estimates of the prevalence of problem gambling: B.C. (Gemini Research & Angus Reid Group, 1994), Alberta (Wynne Resources, 1994), Saskatchewan (Gemini Research, 1994), Manitoba (Criterion Research, 1995), Ontario (Insight Canada Research, 1993), Quebec (Ladouceur, 1996), New Brunswick (Baseline Market Research, 1992) and Nova Scotia (Omnifacts Market Research, 1993).

In all of the provinces discussed in the National Council of Welfare (1996) report, except Quebec, private companies or individuals were asked by provincial authorities to provide estimates of problem gambling. Each of the studies cited used the South Oaks Gambling Screen (SOGS) which is the most widely accepted tool for measuring problem and pathological gambling. This allows for broad comparisons between jurisdictions.

Seven provinces—British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick and Nova Scotia—reported rates for current problem gamblers. Alberta had the highest combined problem and pathological rate at 5.4%, followed by New Brunswick (4.5%). Manitoba (4.3%), Nova Scotia (3.9%). B.C. (3.5%) and Saskatchewan at 2.7%. Comparable data were not available from the Ontario study, but the reported rate of 0.9% was on the low end of the range for pathological gamblers in other provinces.

Six provinces—British Columbia, Alberta, Saskatchewan, Quebec, New Brunswick and Nova Scotia—also reported on studies measuring lifetime problems. Again, Alberta had the highest lifetime rate of problem and pathological gamblers combined at 8.6%, followed by British Columbia at 7.8%. Rates for the other provinces were 6% in New Brunswick, 5.5% in Nova Scotia, 4% in Saskatchewan, and 3.8% in Quebec.

These studies also provided rates of recovery, which were defined as the difference between lifetime and current problem gambling rates. British Columbia had the highest recovery rate at 4.3%, followed by Alberta (3.2%). Nova Scotia (1.6%), New Brunswick (1.5%), and Saskatchewan at 1.3%.

An interesting finding from the report is that the frequency of gambling shows no consistent relationship to rates of problem and pathological gambling. For example, 65% of British Columbians gambled at least once a week, and the rate of current problem and pathological gambling was 3.5%. Alberta had a lower percentage of weekly gamblers (40%), yet the rate of current problem and pathological gambling was 5.4%—almost two percentage points higher.

Cost Estimates

Despite the liberalization of **gaming** across jurisdictions, there is very little work on the **impact** of gambling in Canada or elsewhere. What literature exists is mainly oriented towards studying the economic impact of casinos. Even here, Henriksson (1996) notes that, "... a dearth of objective, scholarly research is a frustrating reality in this field." The only studies cited by Henriksson which attempt to place a value on the social costs per pathological gambler per year were: Goodman (1994), \$13,200 (U.S.) and Neil Tudiver from the University of Manitoba (\$56,000). There is also a U.S. study which places the social costs of pathological gambling at \$80 billion in 1988 (Politzer, Yesalis & Hudak, 1992). Further, Goodman (1994) provides a summary of 14 studies into the economic impacts of casinos, but none of the studies reviewed were published in a refereed journal, and many were funded by pro-gambling constituencies. Thus, much of the research tends to overstate the benefits of casinos and understate the social costs of gambling.

Summary:

There are recent estimates available for the prevalence of problem and pathological gambling for most of the provinces in Canada. The prevalence of problem and pathological gambling is higher in Alberta than in any other province.

There appears to be little or no research on estimating the economic costs of problem and pathological gambling in Canada. There also appears to be little in the way of objective, scholarly study of the economics of the gaming industry in general.

4. Medical Versus Non-Medical Approaches To Treatment

4.1 Effectiveness *Literature*

4.1.1 In-patient versus Out-patient Treatment

This section discusses the literature which compares non-hospital modalities such as those offered by **AADAC**, to more medically-oriented modalities where the treatment setting would primarily be hospital-based. Unfortunately, this literature is not explicitly framed in economic evaluation terms and only outcomes between alternatives are examined in detail. Referring back to Table 1 (page 4), these efficacy or effectiveness studies are found in cell 3A. In addition, the literature does not consistently define "in-patient" treatment as meaning "hospital-based" treatment. Often residential programs which may not offer medically-based treatment are classified as in-patient treatment. Hence, comparisons **between** in-patient and out-patient modalities typically do not address treatment setting (i.e., hospital-based **versus** non-hospital-based) in a systematic way. An in-patient setting may therefore involve a hospital treatment setting or it may involve a residential setting similar to what is offered by **AADAC**.

Rationales for In-patient and Out-patient Treatment

Although there is no general empirical consensus of the superiority of outcomes of out-patient versus **in-patient** treatment, some theoretical reasons for **preferring** one setting over another have **been** summarized by Finney et al., (1996).

The basic rationale that has been provided for superior outcomes of in-patient treatment is that clients are removed **from** environments that perpetuate their abuse. This consolidates efforts towards abstinence and means that clients are less likely to **drop** out of treatment. In-patient treatment is also claimed to be more intensive, with **effective** links to aftercare, and providing greater **medical/psychiatric** care **and/or** tangible and emotional support. The in-patient setting may further suggest to clients that their problems are more **severe** than would otherwise be the case. A number of arguments have also been advanced for superior outcomes in out-patient programs. These programs allow the patient to test new coping skills and can mobilize help in the patient's natural environment. It is also proposed that the transition from intensive care to aftercare is less troublesome.

Short Review of Alcohol Effectiveness Studies

There is a very large body of **literature** on measuring treatment outcomes among alcohol abusers. Much of this literature presumes that in-patient treatment costs are greater than out-patient costs. Therefore, justification of **in-patient** treatment would require evidence of greater effectiveness, at least for some sub-population of clients. This literature has

been surveyed extensively by Saxe et al., (1983), Annis, (1986), Miller & Hester, (1986), and Finney et al., (1996). The former three reviews are consistent with the prevailing view that out-patient and in-patient treatment modalities show the same outcomes. The latter review explicitly considers treatment setting as a variable, and the authors found some evidence to support the claim that in-patient treatment settings produce significantly better outcomes than out-patient treatment settings (where in-patient refers to therapeutic interventions provided in a residential setting where patients stay 24 hours a day). The authors then take the next step in trying to explain what aspect of the treatment modality, treatment setting, and/or the patient characteristics might account for this. They acknowledge that, "...overall, the main effects of treatment setting in the alcohol field are inconsistent and when present, modest in magnitude."

In general, these reviews do not provide strong evidence for the superiority of in-patient treatment modalities. The methodological quality of substance abuse effectiveness research has been evaluated by Morley et al., (1996). They note that the quality of such studies are improving, yet there are still shortcomings in the sampling and description of patients (especially in pre-treatment characteristics), specification of treatments, outcome variable assessment, follow-up, and treatment effect (primarily the low power of most study designs). This means that most studies would not be able to detect small differences between in-patient and out-patient modalities even if they exist.

Summary:

The existing literature does not, in general, detect outcome differences between in-patient and out-patient modalities. The published literature does not directly compare hospital to non-hospital-based treatment settings and therefore does not directly compare AADAC versus non-AADAC treatment settings. There is no strong evidence of differential treatment effectiveness between in-patient and out-patient treatment settings, irrespective of how these settings are defined.

4.1.2 Patient matching

One argument forwarded for the lack of emphatic results for the effectiveness of various treatment programs is that patients are mismatched and placed in programs that are inappropriate for their needs. It is recognised that averaging over a heterogeneous group of patients can obscure the distribution of costs between groups of patients (French, 1995). A program could have a relatively low level of cost-effectiveness simply because a high level of cost-effectiveness for patients who benefit considerably from a small amount of care may be far outweighed by a low level of cost-effectiveness by a minority of patients who have multiple re-admissions and benefit little from treatment. One question which has been inadequately dealt with is what type of patients benefit from what types of treatments. Although virtually every clinician would feel that different patients are best served by different programs, it has been difficult to scientifically verify this due to the exclusion criteria that are set by most studies.

Miller and Hester (1986) reviewed evidence which they interpret as showing that clients fare better when the treatment allocated takes into account particular alcohol problems, varying levels of alcohol dependence, and different cognitive styles. They also found evidence showing that when clients are allowed to participate in the choice of treatment approach and goals, greater acceptance of, compliance with, and improvement following treatment can be demonstrated.

However, it has thus far proven difficult to provide **empirical** evidence for the "matching hypothesis" which **begins** with the assumption that different clients respond differentially to different kinds of treatment and, indeed, to different treatment goals, such as total abstinence or controlled drinking. That is, the hypothesis which predicts clients who are appropriately matched will show superior outcomes to those who are unmatched or mismatched. In this way, failure to demonstrate clear evidence of the superiority of treatment results over rates of spontaneous remission is explained **by** the failure to match clients to treatment, **as** is the uniformity of results across different methods.

Project MATCH (1997)

This study applied careful scientific methods to evaluate the matching hypothesis, recognizing that most treatment programs offer multiple therapeutic components to a rather heterogeneous group of clients. The impact of treatment is likely to be modest, and it makes sense to **take** steps that might better match a particular treatment with a specific patient.

Two parallel, but independent clinical trials were conducted; one with alcohol dependent clients receiving out-patient therapy (N=952; 72% male) and one with clients receiving **aftercare** therapy following in-patient or day hospital treatment (N=774; 80% male). Clients were randomly assigned to one of three **12-week**, manual-guided, individually delivered treatments: Cognitive **Behavioural** Coping Skills Therapy, Motivational Enhancement Therapy, or Twelve-Step Facilitation Therapy. The primary outcome measures were days abstinent and drinks per drinking day during a one year post-treatment period.

This carefully designed, national, multi-site, **randomised** clinical trial failed to detect significant differences **between** matched and unmatched patients. One would expect this study to find evidence of the matching hypothesis given that the design involved eight hours of client **assessment--much** more than would be expected in a less well controlled environment. Yet despite this, there was no strong evidence for the efficacy of matching, and it is difficult to make a case for the effectiveness of matching in a naturalistic environment. The study suggests that psychiatric severity is the only client characteristic that should be considered when assigning clients to one of the three treatments studied.

Summary:

Although the matching principle is intuitively plausible and was mildly supported by some literature in the early 1990s, it is very difficult to find empirical evidence of the matching hypothesis. In general, the literature does not present those involved in treatment with useful guidelines as to how to make treatment more cost-effective using matching. Without effectiveness data, it is not possible to do cost-effectiveness analysis (without assuming equal effectiveness across modalities). Project MATCH is important as it appears to have been well-designed to find matching effects, and it consistently demonstrates a great level of improvement in multiple life domains for individuals who participated in the study. At the same time, there were no strong indicators (aside from psychiatric severity) that the ten characteristics of the individuals entering care predicted a specific response to any of the three treatment approaches incorporated in the investigation.

4.2 Cost-Effectiveness Literature

There are a limited number of studies that simultaneously compare the cost and effectiveness of two different interventions. Therefore, a sufficient body of cost-effectiveness studies do not yet exist to answer the question of which treatment modalities are most cost-effective. To overcome this limitation, two important studies by Holder et al., (1991) and Finney and Monahan (1996) combined a large number of effectiveness studies with additional cost information which was gathered from experts in the addictions field. Yet even these efforts turned up less than definitive results across treatment modalities. Alcohol detoxification interventions are an exception to the general rule of inconclusive cost-effectiveness results in substance abuse interventions. For detoxification, there are well-established guidelines for cost-effective service, with the majority of patients not requiring hospital-based or medically-oriented treatment

4.2.1 Synthesis of Cost and Effectiveness Studies

Holder et al., (1991) attempted to use the available effectiveness literature (141 studies), combined with national and regional U.S. data on the costs of applying treatment in typical settings using typical providers, to synthesize cost-effectiveness ratings for 33 treatment modalities. In general, they found a negative relationship between effectiveness and cost of treatment, which again does not provide evidence of superior outcomes for in-patient types of modalities. Finney and Monahan (1996) reappraised the work of Holder and his colleagues and found that, "...at best, there is no relationship between cost and effectiveness."

This is not to say that the individual treatment modalities are ineffective relative to no treatment. Dennis et al., (1996) suggest common, non-specific effects across modalities may exist. This means that while we expect effects from specific services (e.g.,

methadone dosage, days of in-patient care, number of counseling sessions), we also believe that there are non-specific effects, which are, in part, due to factors that we cannot measure (e.g., the clinician convincing the patient that the problem is understood, both parties believing that the treatment is effective). If these non-specific effects are common across modalities, then such treatment comparisons may have trouble discriminating outcome differences.

In fact, there are no studies which randomly assign abusers from a common population to either a treatment or a no-treatment group. Holder and Blose (1986) note that there are unlikely to be any studies of this type as no ethics committee would allow a randomized study to withhold treatment from those who need it.

Summary:

According to some recent synthesis and review of the very large body of literature on comparisons across treatment modalities, there is no strong relationship between the costs of various treatment modalities and their effectiveness. The inconclusive nature of the research suggests that discriminating between modalities is difficult. There are no randomized studies which compare an intervention to a no-treatment option, thus no evidence exists to suggest that treatment is cost-ineffective relative to no-treatment.

4.2.2 Alcohol Detoxification

One particular area of treatment which has a large body of relevant literature on cost-effectiveness is that of alcohol detoxification. According to a review by Howard et al., (1996), once it has been established that medical detoxification is required, there exists a choice between in-patient and out-patient settings. Historically the in-patient setting has been the one of choice, but available data do not support the assumption that in-patient treatment is invariably necessary for safe and effective detoxification. For example, Feldman et al., (1975) reported that only about half of 564 patients attending a large out-patient detoxification program required medical detoxification; and of these, only 19% needed in-patient treatment.

Controlled trials indicate that many people can complete detoxification in out-patient settings without incident. Stockwell et al., (1991) retrospectively matched 41 patients undergoing out-patient detoxification with an in-patient comparison group. Despite significant levels of alcohol consumption and alcohol-related problems prior to detoxification, completion and complication rates did not differ significantly between groups. In a controlled prospective evaluation, Hayashida et al., (1989) showed that out-patient detoxification was as safe as in-patient detoxification for patients with mild-to-moderate alcohol withdrawal symptoms (i.e., no impending delirium tremens, no recent history of seizures of unknown origin, and no serious medical or psychiatric symptoms requiring immediate hospitalization). In that study, conducted between 1985 and 1987,

the cost **differential between** the two settings was large, with costs ranging from \$175 to \$388 for out-patients and \$3,319 to \$3,665 for in-patients.

The difference between AADAC detoxification costs and hospital-based treatment costs are also considerable. In Alberta, the average cost per admission for **detoxification** in an AADAC facility is \$436.61 (AADAC, 1995). By comparison, the cost **per admission** for treatment in Alberta hospitals has **been** estimated at **\$2041.15** for opioid abuse, \$1,646.09 for alcohol abuse or dependence, and between \$1106.78 and \$3,282.43 for cocaine and other drug abuse (Jacobs, Hall, & Bachynsky, 1996).

Gallant (1994) advocates that the following criteria should be used to decide between out-patient or **in-patient** detoxification. Out-patient **detoxification** is appropriate for individuals who have no previous history of **alcohol-related seizures** or delirium tremens, and scoring less than ten on the Clinical Institute Withdrawal Assessment for Alcohol Scale (CIWA-Ar, 1989); a brief measure **assessing** withdrawal symptoms. **In-patient detoxification** is generally warranted for individuals who continue to drink sporadically during out-patient detoxification, have serious concurrent illnesses complicating withdrawal, a history of seizures, or who have extremely high blood alcohol levels (e.g., 250 to 300 mg/dl) at intake yet appear relatively unimpaired.

Summary:

The literature indicates that hospital-based treatment is not required for the safe and cost-effective detoxification of patients, with the exception of those who continue to drink sporadically during out-patient detoxification, have serious concurrent illnesses, a history of seizures, or who have extremely high blood alcohol levels (e.g. 250 to 300 mg/dl) at intake yet appear relatively unimpaired.

4.2.3 Methodological Challenges

If economic evaluations are so useful, why are there so few studies? In addition, why are the results of these studies viewed with such caution? The **following** list illustrates the difficulties in carrying out and interpreting results in the substance abuse field.

1. Data are provided on limited populations, such as enrollees in a **particular** insurance plan or HMO.
2. Study subjects (programs and participants) are not selected using representative sampling designs.
3. The study design does not include a non-treatment control **group** for separating the "unique" contributions of treatment from behaviours that could be observed without treatment. Unlike most medical conditions, **drug** and alcohol problems show an extremely variable and inconsistent course. For this reason, determining the effects

of treatment on the recovery course, compared with the effects of other influences, is an extraordinarily complex issue. As such, it is often very difficult to establish that treatment is, in fact, responsible for any observed recovery. Added to this, the effects of a particular treatment are **often** contaminated with those of other treatments or types of **help** the individual may have received.

4. Benefit measures are not comprehensive. Studies generally present only crime, health, or productivity measures, but seldom all three.
5. Individuals may abuse substances when they are young, but when they are older the probability of continued substance **abuse** falls, even if their prior substance abuse was never treated.
6. Abstinence and sustained recovery are not always achieved after a single treatment intervention. Many individuals have multiple treatment interventions, leading to treatment "careers". Thus, the probability that a single episode of substance abuse treatment will improve short and long-term outcomes **is** less than one.
7. Previous substance abuse treatment may change the **probability** of successfully completing subsequent **treatment**, but the direction of the change is uncertain. Some investigators suggest that treatment effects may be cumulative.
8. What is an intervention and how do we measure the outcome? A wide range and diversity of **problems** caused by **drug** and alcohol abuse exist, including problems in the physiological, psychological and social domains. These possible problems also show variations among different cultures and among various socio-economic groups within the same culture. Thus, there **are** great differences in the patterns of **impairment** shown by different individuals and consequent disagreement over valid criteria for defining the success of the treatment. As a result, direct comparisons among the results of competing treatment regimes, which may have been directed at qualitatively different groups of problem drinkers or **drug-takers**, are always hazardous. This is especially true if, as is typically the case, distinct ways of measuring crucial outcome variables are employed by different investigators.
9. There is no single etiology for **drug** and alcohol problems or even an identifiable collection of etiological factors. Instead, there exist a multiplicity of possible causative factors and, again, the manner of development of problems varies widely from one individual to the next.
10. There are motivational issues involved in the treatment of drug and alcohol problems which make it a quite different enterprise from the treatment of medical conditions. Many clients do not attend treatment **of** their own volition but have been compulsorily referred by the courts or, at least, coerced into attending by family,

employers, or other interested parties. Thus, motivation for recovery, and cooperation with assessment and treatment are highly variable and fluctuating

11. A central feature of all drug problems is that the individual is in a state of conflict about what to do about them. A desire to solve a drug problem is normally pitted against an overwhelming attraction for continued use of the substance involved. Many individuals with problems that may be detectable by the specialized helper are reluctant to admit that such a problem exists because of the stigma and sense of personal failure attached to the admission. In other cases, it may be recognized that a drug or alcohol problem exists, but not that it is sufficiently severe to warrant treatment. One consequence of all this is that there is often doubt about the validity of self-reports of progress made by the recipients of treatment.
12. If a patient suffers from a disorder that has a highly predictable clinical course, it is often possible to test how a specific intervention will alter that outcome. However, for a disorder like alcohol dependence, the evaluation of the relative assets and liabilities of therapeutic intervention is much more difficult. Problems stem from the highly variable nature of alcohol-related life problems on a week-to-week basis, along with what appears to be a substantial rate of 'response to non-specific interventions' or "spontaneous remission".
13. Existing studies do not follow some of the conventions which have been established for the economic evaluation of health care programs (Drummond, et al., 1987). For example, no substance abuse study uses discounting to account for the differential timing of costs and benefits, nor does any study explicitly state any sensitivity analysis which was performed.
14. Substance abuse and some associated behaviours carry a stigma, which may result in under-reporting, since many studies rely on self-reported behaviour.

Summary:

All substance abuse evaluations are hindered by a variety of methodological problems. The chronic and variable nature of substance abuse problems makes it very difficult to establish a study design which can definitively attribute the role that treatment plays in determining outcome.

5. Economic Studies Of Substance Abuse And Problem Gambling Treatment

This section summarizes a number of studies which have carried out economic evaluations of substance abuse/problem gambling treatment. No individual study is definitive given the number of methodological issues which were raised previously, but taken as a whole, there are some generalizations that can be made.

For a number of reasons, it is generally easier to produce estimates of the costs of various addiction treatment programs than to produce estimates of their benefits. First, addiction is often a chronic and dynamic process in which patients enter and leave treatment (the rate of readmission is relatively high). Second, there are many comorbidities associated with substance abuse, such as (a) health problems, (b) high-risk behaviours (e.g., needle use, sexual practices) related to transmitting infectious diseases and impulse control problems, (c) high rates of depression and personality disorder, (d) environmental and coping problems such as violence and victimization, (e) illegal activity and legal problems, (f) barriers to accessing services, and (g) vocational problems at work/school, financial problems, and gambling problems. Third, clients presenting with comorbidities are often looking for assistance in these other spheres of their lives rather than just help in dealing with an addiction per se. These comorbidities and their interaction with an addiction mean that the benefits of substance abuse are broad, and therefore difficult to track down comprehensively, as the utilization of resources in different areas of abusers' lives must be identified and measured. There are three general areas in which the benefits of substance abuse treatment are measured: health status, employment, and criminal activity. Only rarely, however, will a study tackle all areas at the same time, as the data must be obtained from different sources.

Most treatment effectiveness studies provide standard measures of outcome. When Young (1994) surveyed state jurisdiction studies, for example, Minnesota reported an abstinence rate of 64% for clients six months after treatment, while Kentucky reported that the rate of abstinence from alcohol at one year follow-up was 41%. These measures are important in the domain of treatment, but much of the costs of substance abuse are due to consequent behaviors in other domains. Hence, it is difficult to use the abstinence figures to attempt to quantify the benefits of treatment. It is entirely possible that most of the benefits attributed to abstinence might be achievable by harm reduction or more controlled use, reducing substance abuse-related comorbidities.

The three broad areas of economic outcome measures are health care offsets, productivity or employment-based measures, and crime related measures. It is important to note that these three functional areas are generally under the jurisdiction of different groups and it is unusual for a study to examine each area comprehensively.

5.1 Health Care Offsets

The motivation behind examining health care offsets is that there are strong links between substance abuse and certain illnesses which decrease the health status of the client. Much of the literature focuses on alcoholism treatment which has well-defined codes, making it easy to identify clients who have received treatment from HMO administrative data bases. After treatment, the improved health status of the client may yield a reduction in health care utilization, even if this utilization is not related to substance abuse. However, Holder (1987) points out that a client who has completed treatment may also demonstrate more interest in their health status and might therefore utilize more resources in the **post-treatment** phase. The purpose of this **strand** of the literature is to answer the question: "Are total health care costs following the **initiation** of alcoholism treatment lower than costs before treatment?"

Jones & Vischi (1979), Holder (1987)

There are several reviews of studies **which** address the issue of alcoholism treatment offsets. Jones and Vischi (1979) reviewed 12 studies and found that there was consistent evidence of health care cost reductions ranging from 26% to **69%**, with a median figure of 40%. At 12-month follow-up, the range of reduced utilization produced benefits of \$0.41, \$0.45, and \$1.10 (U.S.) for each dollar spent for alcoholism treatment. Holder (1987) also reviewed 12 studies and reached the following conclusions:

"...taken as a group, the studies reviewed confirm the potential of alcoholism treatment to contribute to sustained reductions in total health care utilization and costs. They also suggest that reductions in post-treatment costs are likely to continue into the fourth and fifth year following the start of alcoholism treatment."

Young (1994)

Young (1994) compiled outcome measures **from** studies **carried** out by various state jurisdictions in the U.S. (see Appendix E). Many of these were hindered by looking at outcome measures which are difficult to quantify in monetary **terms** and which do not therefore have a **return-on-investment** interpretation. For example, Kansas presented results based on scores from the Addiction Severity Index (ASI), indicating that, "...the average severity of health-related problems at admission was 0.124 and at discharge it had decreased to 0.101." It is obviously quite difficult to translate these findings into a statement about what specific health-related resources have been freed up after the treatment **intervention**. A statement that is more easily translated into resource usage terms came from Ohio: "...hospital **admissions** among those treated decreased from 32% to 11%, while emergency room utilization decreased from 34% to **20%**." With more **information** about the types of admissions and their costs, this could potentially give a tangible estimate of the amount of health care offset. Even more useful was the

information presented from a Washington study: "...clients who received treatment incurred half the in-hospital costs of non-treated clients during a 12-month follow-up period."

In the published literature, there are studies which look only at post-treatment health care costs without considering pre-treatment costs (McLellan, et al., 1982) or capture only post-treatment outcome measures such as hospital days, general practitioner visits, and out-patient visits. The pre-treatment period is important to establish a baseline and limits the usefulness of some studies in producing a return-on-investment estimate. Other published studies do examine pre and post-treatment outcomes, but express the outcomes in physical units rather than in monetary units. For example, the study by Hayashida and Freeborn (1981) of a sample of alcoholic clients in an Oregon HMO demonstrates that although resource utilization rises six months after the initiation of treatment, by 12-month follow-up, office visits, emergency room visits, and hospital admissions have all fallen below pre-treatment levels (no monetarization of these benefits was reported).

Gregory et al. (1981)

This study was based on a sample of 2,362 clients who received alcoholism treatment in Oklahoma between 1974 and 1978. The estimated total cost of health care for the year prior to treatment was \$1,883 per client. The estimated total health care costs for the year after alcoholism treatment was \$1,391. The study concluded that if clients were able to maintain their post-treatment level of health care costs without incurring any additional costs for alcoholism treatment, then treatment would pay for itself within a period of 22 months.

Holder and Blose (1986)

An additional cost offset not considered above is the possible decrease in health care costs, not just for the client, but also for family members. This four year, longitudinal study sampled 1,645 families where at least one member filed a claim for alcoholism treatment, and was continuously enrolled in the population served under the Federal Employees Health Benefit Program with Aema Life and Casualty Company (1980-1983). The total population covered by the plan was 390,000 enrollees and about 980,000 beneficiaries. In addition, a comparison group of 3,598 families without an alcoholism treatment claim were randomly selected from the population and stratified by age to match the first group.

The study examined pre and post-treatment costs for the families with an alcoholic member. The primary form of treatment was in-patient care, with an average length of stay of 21.7 days, accounting for 95% of all alcohol treatment costs. The high cost of the initial treatments obscured the pattern of general health care utilization and so were excluded from the analysis (although subsequent alcohol treatment costs were included.) The basic pattern of health care costs showed that mean monthly total health care costs

gradually increased in the 12 to 36 month period before the initiation of alcohol treatment, declined immediately following treatment, and continued to decline at least into the second year.

Thus, this study confirms the existence of a sharp upward "ramp" in which the emotional and physical problems of the alcoholic escalate until finally treatment is sought; after treatment, costs decline. The large sample size of the study allowed the authors to examine health care costs by age group of the alcoholic. They found that the health care costs of the youngest age group (< 45 years) fell to a level comparable with the lowest pre-treatment levels; the older age groups also experienced a decline, albeit not to their pre-treatment levels. Although some of the post-treatment cost declines may be due to a regression to the mean effect, this is more likely to apply to the short-term decline in costs and it is more probable that the long-term decline in costs is related to the treatment. Moreover, the study indicates that the health care costs of not just the alcoholic, but also of the family unit may be reduced after treatment. One cautionary note is that the study only deals with those who have been motivated enough to seek out treatment in the first place. As such, reductions in health care utilization and costs need not be applicable to the general population.

Holder and Hallan (1986)

This six-year longitudinal study sampled health care costs and utilization for 90 families enrolled with Blue Cross/Blue Shield through the Health Benefits Division, California Public Employees Retirement System. Each family selected had at least one member who filed an insurance claim for alcoholism treatment. A comparison group of 83 families without a filing for alcoholism treatment was selected after stratifying for family composition, age, and sex. The focus of the study was to see if providing alcohol treatment to a family member reduced general health care utilization for the family unit as well as the alcoholic member.

The basic pattern of findings is quite similar to that reported by Holder and Blose (1986). Total average monthly health care costs for the alcoholic individuals were nearly \$100 (U.S.) in the pre-treatment period, but by the fifth year had dropped to \$13.34. Total health care expenditures for non-alcoholic family members as well as total family expenditures also fell. At the end of the study period, health care utilization and the costs of in-patient care for the alcoholic family member converged to that of matched companion family members. The total costs of the alcoholic family as well as that of the comparison family both rose in years two and three, perhaps due to relapse among the alcoholic family or maturation in the case of both family groups. The study emphasizes that after treatment the cost offsets are incurred not just by the alcoholic, but also by family members. There is also a change in the mix of services utilized with alcoholic families substituting out-patient care for the more expensive in-patient care. The authors estimated that the costs of alcoholism treatment are recovered within three years.

Gerstein et al. (1994)

In terms of health status and utilization, this California study looked at mean reported health, hospitalizations, physician visits, and emergency room visits. The main conclusions were that improvements in health status and decreases in health care utilization were not restricted to any particular modality of treatment, length of treatment, category of **drug user**, or demographic category. The authors noted that improvements in health status may also be responsible for the improved employment status of clients.

In monetary terms, the average pre-treatment health care costs for enrolled clients was **\$3,227 (U.S.)** per person, per year. The average annual health expenditures for similar gender and age groups in the U.S. are about 51,800, or a little over half the pre-treatment, per capita expenditure of those enrolled in programs. It was found that annual per capita health care expenditures declined \$758 for discharged clients to a post-treatment average of \$2,469. The average cost of a treatment episode was **\$1,425**. Thus, health care benefits in the year **after** discharge alone, offset about 55 percent of the cost of a treatment episode.

Finigan (1996)

This Oregon study compared those who completed treatment with those who dropped out of treatment using medical claim amounts for public assistance and emergency room visits, and costs as outcome measures. In terms of health care costs, **both** categories of clients across residential, out-patient, and methadone treatment modalities all showed increases in paid claim amounts from **the** pre-treatment period to the post-treatment period (three years later). However, claim increases for clients who completed treatment were lower across all treatment modalities compared to **non-completers**. Particularly large claim increases were found for those in the methadone modality who did not complete treatment.

According to Finigan, these increases in health care expenditures are **attributed**, in part, to clients' **sober** status allowing **unmet** medical needs to be **attended** to. As well, the author points out that a number of slots were opened up for pregnant women. In fact, when only male clients' medical claims were examined, a reduction in paid claims for those completing treatment is apparent across all modalities.

Emergency **room** visits showed a large increase for those that did not complete treatment compared to a slight decrease in use **by** those who completed treatment. The cost of claims for emergency room use were less for the treatment group than for the group of **non-completers**, with differences ranging from 30% to 55% depending on the treatment modality. The study did not report a separate health care offset which could be used to calculate the ROI for health **status** improvements.

Summary:

A variety of U.S. studies involving HMO populations have demonstrated that health care costs and utilization of both an individual who has undergone alcohol treatment as well as members of his/her family exhibit a "ramping" effect. That is, costs rise and peak prior to treatment, but following treatment, health care costs fall dramatically and continue to decline until they are roughly the same as comparison families who do not have a member who has undergone treatment. The costs for both groups tend to rise in years three and four, but the treated alcoholic families continue to have the same health care costs as the comparison families for four years after treatment, thus indicating long-term effects. Considering only health care costs, the investment in treatment pays for roughly half of the cost within one year, and costs are fully recovered within two to three years.

5.2 Employment

Lost productivity represents one of the major costs of substance abuse identified by cost-of-illness studies. The magnitude of these costs, for Canada and Alberta, can be seen in Appendix B and C, respectively.

Young (1994)

The review by Young (1994) identified many studies which demonstrate the improved employment functioning of clients after undergoing treatment. In terms of outcome measures, a variety have been used and these vary in the extent to which they are effective in estimating a return-on-investment per treatment dollar owing to increased productivity. As with health status, the Kansas study cited framed its outcomes in terms of the ASI: "...there was a 9% decrease in the severity of employment problems between client admission and discharge." It is difficult to put into concrete terms what impact this has on lost productivity. Another statement that is difficult to interpret was from the Kentucky study: "41% of clients report having held full-time employment in the 12 months after treatment." There is no reported pre-treatment employment rate given, so it is not possible to see if there was any post-treatment improvement. Ohio reported a number of different outcome measures related to work performance such as absenteeism, tardiness, problems with supervisor, and incomplete work. Some are more easily quantifiable than others. For example, absenteeism is easy to measure, while it is difficult to know what effect a problem with a supervisor would have in terms of lost productivity.

In any case, one needs to be careful not to over-attribute lack of employment as being related only to substance abuse as comorbidities (like mental illness) may exist which contribute to lost productivity. The viewpoint of the analyses are particularly important

in measuring the benefits of substance abuse treatment. From a societal viewpoint, welfare and illegal **income** are considered transfer payments, while a reduction in these items could be viewed as a benefit from a taxpayer's point of view.

Gerstein et al. (1994)

Despite reported improvements in health status, this study did not find evidence of improvement in clients' income and employment. The most common form of income both before and after treatment was full-time employment. The next most common sources of income before treatment were welfare, illegal activities, and disability payments. After treatment, welfare was hardly changed and disability expanded, but illegal income became less prevalent. Yet, the rates of employment and income from employment were generally lower after treatment than before. Overall, employment earnings declined even more, which according to the authors can be explained either by respondents taking on different jobs at lower rates of pay after treatment, or by respondents staying at the same job, but suffering pay cuts. Both explanations are consistent with the slow-down experienced by the California economy over the period of the study.

Finigan (1996)

This study examined the amount of work and wages from employment **pre** and post-treatment. The average number of weeks worked per year increased in the **post-treatment** for both treatment completers and non-completers. Those **who** completed residential treatment averaged 50 more weeks in the three year period compared with the two years prior to treatment. **Non-completers** averaged 23 more weeks. The figures for out-patient and methadone modalities were 58 more weeks for completers, 39 more weeks for **non-completers**, and 41 weeks for completers and 13 for non-completers, respectively. Of course we would expect an increase since the length of time worked in the pre-treatment period was two **years** and three years in the post-treatment period.

Three **years** after treatment, the wages paid to treatment completers were 65% higher than the wages paid to non-completers. Both completers and non-completers in every modality (residential, out-patient and methadone) had increases in average earnings, but the increases were larger for those who completed treatment. The increases for **non-completers** in the three modalities were \$49, \$96, and \$89 (U.S.) per week on average as compared with an average increase of \$178, \$154, and \$278 per week for those completing treatment.

Summary:

Productivity losses are one of the major costs of substance abuse, and although some studies have found evidence of improved employment functioning, it has not been demonstrated that substance abuse treatment aids productivity in terms of producing a large cost-offset.

5.3 Criminal Activity Offsets

The next category of outcome measures are related to crime. Again, note that from the societal point of view, victim losses are a transfer of resources and do not count as a use of resources. The costs of crime include such items as the costs of incarceration and criminal justice system costs.

Young (1994)

Some of the studies cited by Young do not show much improvement in this domain. For example, the Kentucky study found that 24% of the clients were referred to treatment by the criminal justice system. After treatment, 76% of clients reported having spent no time in jail in the previous 12 months (presumably 24% did spend some time in jail). However, most other studies showed that criminal activity decreased after treatment. In Colorado, the average rate of arrest in the 24 months prior to treatment was 58.5% and this declined to 18.9% after treatment. Among treated and untreated prisoners in Florida, matched by age, treated clients had a recommitment rate of 26% compared to untreated inmates who had a 40% recommitment rate. In Iowa, in the 12 months prior to treatment, 51% of clients had been arrested. At follow-up, one year later, 75% of clients had not been re-arrested. Similar decreases in criminal and/or legal problems were reported by state agencies in Georgia, Kansas, New Mexico, Ohio, Maine, Texas, and Washington.

Generally, cost savings in monetary terms are not available for these studies, but the Chemical Dependency Division of the Minnesota Department of Human Services reported both significant decreases in criminal activity and subsequent cost savings. It was estimated that the substantial decreases in criminal activity for the 18,400 clients who had undergone substance abuse treatment in 1991-1992 resulted in an estimated \$17 million (U.S.) in savings for the state. Savings in DWI arrests alone amounted to \$9.2 million.

The following studies converted decreases in criminal activity into measurable benefits which are amenable to estimating the return-on-investment.

Moberg et al. (1993)

The Wisconsin Bureau of Substance Abuse Services conducted a client outcome study of its Treatment Alternative Program (TAP) between 1990 and 1991. TAP is a program for offenders which provides treatment for substance abusers in lieu of imprisonment. The program demonstrated that recidivism rates were lower after treatment. Of the offenders who completed the program, 57% were not re-arrested during the 18-month follow-up period compared to 26% of non-completers. Estimates of the benefits provided by the TAP program were based on the reductions in jail days served, reduction in the number of arrests, reductions in the cost to crime victims, reductions in the number of visits to lawyers, and changes in productivity losses. Depending on the figure which was used to assess the cost per jail day, the ROI was between \$1.40 and \$3.30 (U.S.) per dollar invested in the program after an average of 18 months. Although not explicitly stated, from the items which are included in the benefits, this analysis was conducted from a state, rather than a societal viewpoint.

Harwood et al. (1988)

This study compared the benefits of reduced criminal activity after treatment with the costs of drug abuse treatment for three different modalities: out-patient methadone, residential, and out-patient drug free treatment. Since only crime-related benefits were examined and other benefits ignored, it tends to understate the cost-benefit ratio. The components of drug-related crime which were quantified were victims' costs, criminal justice system costs, and criminal career productivity costs. Since the victims' costs were included, the perspective of the study is not clear, as these should not be included from the societal point of view. Comparisons were made between the average cost of a treatment episode and the reduction in crime-related costs during the year following discharge from treatment. Overall, the study found that before treatment, crime-related costs averaged \$15,262 (U.S.) per client, per year, and after treatment these costs fell to \$14,089. The ratio of costs to benefits ranged from 1.28 to 4.04, depending on treatment modality and perspective, indicating that drug abuse treatment pays for itself in regards to decreased crime costs.

There are some methodological problems in this study such as the lack of a control group, which means that all crime-related improvement is attributed to treatment, when it may simply be mean-reverting behaviour or non-specific improvement. As well, the perspective of the study is unclear from the cost items that are included in the analysis. Finally, the study relies on unverified self-reports of crime-related behaviour.

Gerstein et al. (1994)

This California study found a marked reduction in criminal behaviours after treatment as compared with pre-treatment levels. The data was obtained by self-reports for a number of categories: sold or helped to sell drugs, had sex for money or drugs, broke into

house/vehicle, used weapon/physical force, and an indicator of whether the client had been arrested/booked or taken into custody. As might be expected, the use of self-reports may understate the true incidence of crime. Results showed that the percentage of clients who committed any of these individual crimes declined following treatment. Before treatment, 73.6% said they had committed any illegal activity versus 20.3% after treatment. Regardless of modality, reductions in criminal activity post-treatment were substantial and statistically significant. The percentage reduction in criminal activity was larger for clients whose main drug was alcohol than for participants whose main drug was heroin.

The cost savings due to these reductions in crime were large. Prior to treatment, each client cost the criminal justice system an average of \$7,935 (U.S.). After treatment, this declined to an average of \$6,151 per client. From a taxpayers' perspective, some additional benefits must be considered. Victim losses and theft losses prior to treatment were \$3,834 and \$5,960 (U.S.) per client, respectively. Two years after treatment, these figures declined to \$2,268 and \$1,851.

An interesting observation is that the average daily treatment costs ranged from \$6.37 for continuing methadone treatment to \$61.47 for residential treatment. Meanwhile, the average daily costs per client for crime-related categories were \$12.20 for police protection and \$9.54 for adjudication and corrections; for a total average daily cost from the criminal justice system of \$21.74. If additional items relevant to the taxpayers' viewpoint are added, such as victim losses (\$10.50 on average, per client, per day) and theft losses (\$10.33 on average, per client, per day), the grand total is \$42.57. Thus, if criminal activity can be avoided during treatment, the benefits may not completely outweigh the costs of treatment, but the cost offset is significant.

Finigan(1996)

This study confirms that criminal activity is lower after treatment when compared to pre-treatment levels. This applies to both those who completed treatment as well as to non-completers. Although there were no statistically significant differences between completers and non-completers in their arrest and conviction histories prior to treatment, nearly half of those who completed treatment (who had prior arrest records) were arrest-free in the three years after treatment as compared to only a third of non-completers. This applies to both male and female clients in all treatment modalities. The results were similar for convictions and incarcerations.

Summary:

Virtually all studies indicate that criminal activity is reduced substantially after treatment as compared to pre-treatment levels. The cost offsets attributable to crime reductions are higher from a taxpayers' perspective than from a societal perspective due to victim cost offsets being excluded from the latter perspective. The evidence indicates that criminal-related cost offsets alone (during, and two to three years after treatment), may offset the costs of treatment from a taxpayers' viewpoint, but not from a societal viewpoint.

5.4 Overall Returns-on-Investment

The overall returns-on-investment, incorporating benefits from a variety of improvements in life functions have been summarized in Appendix D. Only Gerstein et al., (1994) attempted to summarize the cost offsets across all functional spheres, and this is the only study that presents results from a societal as well as a taxpayers' perspective. Finigan (1996) reported results from all of the **three** major spheres, but only incorporated crime and public assistance costs into the ROI calculations. The chief findings from these studies are as follows.

From a taxpayers' perspective, **one year after treatment**, the return-on-investment for each dollar invested in substance abuse treatment ranges from \$4.31 to \$12.58 (U.S.), depending on the modality. Summing across modalities, the overall ROI is \$7.14. Benefits were accounted for by reduced criminal justice expenses, reductions in victim losses, and lower Levels of health care utilization, but were offset by modest increases in welfare and disability payments. The health care benefits alone offset about 55% of the treatment costs during the first year. In terms of total benefits due to crime and productivity improvements, the ROIs 18 months after treatment in Wisconsin ranged from \$1.40 to \$3.30 (Moberg et al. 1993). The benefits reported by Finigan (1996) only include criminal and welfare costs, but after three years the return-on-investment was estimated to be \$5.60.

From a societal perspective, **one year after treatment**, the return-on-investment for each dollar invested in **non-methadone** substance abuse treatment ranges from \$2.40 to \$2.87 (U.S.), depending on the modality. The returns for methadone discharged clients were \$2.98 for each dollar invested in treatment; a result attributed to the progressively poorer employment prospects for these particular clients (Gerstein et al., 1994). The health care benefits alone offset about 55% of the treatment costs within one year. This appears to be consistent with the results of alcohol cost offset studies which indicate that offsets in health care utilization alone are unlikely to allow treatment to pay for itself within one year, but are likely to allow the investment to be recouped within two or three years. The health care cost offsets will then continue to accrue for a period of up to five years.

In every case, the ROI is larger from a taxpayers' viewpoint than from society's viewpoint, as the latter excludes victim losses, theft losses, and welfare transfers, but includes employment effects. The return-on-investment figures are likely to be overstated as they do not include adjustments for the 35% of the clients who had re-entered treatment at the time of the follow-up.

Summary:

Only one U.S. study aggregates benefits across the three functional domains of health care, productivity, and crime. The return from each dollar invested in a program, one year after treatment, from a taxpayer perspective, ranges from \$4.31 to \$12.58, depending on the modality. Summing across modalities, the overall return on investment is \$7.14. From a societal perspective, one year after treatment, the return on investment for each dollar invested in non-methadone substance abuse treatment ranges from \$2.40 to \$2.87, depending on the modality. The return on investment figures are likely to be over-stated as they do not include adjustments for the 35% of the clients who had re-entered treatment at the time of the follow-up.

5.5 Substance Abuse Prevention Programs

Kim et al. (1995)

This is the only published study located which attempts cost-benefit analysis of alcohol and drug abuse prevention programs. It begins with the observation that the prevalence of substance abuse declined as the amount of spending on prevention programs rose between 1979 and 1992. The authors recognize that there may be other factors which are responsible for the decline in prevalence; namely, (1) natural cycles, (2) secular change towards conservatism, and/or (3) drug interdiction efforts. The study does not spend much time addressing these potential covariates. Instead, it frames a qualitative argument against these factors having a significant influence on prevalence rates, and then proceeds to attribute all of the fall in prevalence to prevention program spending.

The study attempts to monetarize the benefits of prevention programs with reference to five different costs of substance abuse in the U.S. Avoided costs are calculated as the total costs of substance abuse multiplied by the proportional change in the prevalence rate. Thus, an implicit assumption is made that a 1% fall in the prevalence rate will produce a 1% fall in the costs of substance abuse. These avoided costs are then viewed as a proxy for the benefits of the program.

A range of estimated prevalence rates, economic costs, and substance abuse costs are then used to estimate the mean and variance of each of the variables. Assuming a normal

distribution for each of these variables, Monte Carlo sampling yields an estimate of \$14.89 (U.S.) to 1 for the cost-benefit ratio (i.e., the avoided costs divided by the cost of prevention programs) with a 95% confidence interval of (\$13.66 - \$16.13). The authors suggest caution in interpreting the results due to the sensitivity of the results to the base period of 1979, and the 100% attribution of cost avoidance to treatment programs.

Summary:

The only study of substance abuse prevention programs produces a large cost-benefit ratio (14 to 1) for U.S. substance abuse prevention programs, but overstates the benefits by attributing all declines in substance abuse prevalence to prevention programs without making a persuasive case for doing so. The economic evaluation of substance abuse prevention programs appears to be under-researched.

5.6 Pathological Gambling

Politzer et al. (1985)

This is the only cost-benefit study of Pathological gambling located in the published literature. The group studied were 102 pathological gamblers who were treated at the John Hopkins Center for Pathological Gambling in Maryland. The program philosophy is that abstinence from gambling is a necessary first step. This is then followed by weekly counseling sessions with an optional residential program. Family involvement, if appropriate, is also encouraged.

This study uses the concept of abused dollars, which are defined as the average annual amount obtained legally and/or illegally which would have been used by the Pathological gambler, his family, or his victims, for other essential purposes. These abused dollars include (1) earned income put at risk in gambling, (2) borrowed and/or illegally obtained dollars spent on basic needs and/or provided to the family which otherwise would have been "covered" by that fraction of earned income which was used for gambling, and (3) borrowed and/or illegally obtained dollars for the partial payment of gambling related debts.

Politzer and his colleagues used a survey to assess the outcomes for each pathological gambler. Questions encompassed seven general areas: (1) annual dollars placed "at risk", (2) pre-post treatment employment status, (3) pre-post treatment family status, (4) annual bailout dollars, (5) accumulated personal gambling-related debts and subsequent restitution, (6) legal problems and their resolution, and (7) violations of the law. The authors estimated that each client placed an average of 542,900 (U.S.) at-risk each year and that during six months of treatment \$21,450 was not placed at-risk due to the

therapeutic **intervention**. The average cost of treating each patient was 51,008, therefore the cost-benefit ratio was calculated at \$21.3 for each dollar invested in treatment.

One of the limitations of this study is that the perspective taken here is very different from the standard societal perspective of most substance abuse cost-benefit studies. From a societal viewpoint, the money borrowed by the gambler is a transfer, not a net use of resources. In addition, substance abuse **cost-of-illness** studies generally do not include the cost of the abused substances themselves as they are considered to be part of the private costs borne by the abuser. Here the costs of "purchasing" the abused substance are included. Therefore, there are private costs included which will tend to **over-estimate** the cost-benefit ratio. Another limitation of the study is that the population consists of "pure" Pathological gamblers, without comorbidities or other addictions problems. It is not clear if **this** is the case with general populations who present with gambling problems.

Summary:

*Only one study, published in 1985, has estimated **cost-benefit** ratios for Pathological gambling treatment. The **very** high cost-benefit ratio estimated (\$20 **return** for every **dollar** invested in **treatment**) **is** **probably** an over-estimate, **especially** from a societal perspective. There is much confusion in this study about what the perspective **of the study** is and therefore what **constitutes** a cost. The area of economic evaluation for problem gambling remains under-researched*

6. Conclusions

The literature on economic evaluations in the areas of substance abuse and problem gambling treatment highlights the following observations and general conclusions.

Costs of Substance Abuse and Problem Gambling in Canada

The latest available (1996) estimated costs of substance abuse are large in both Canada and Alberta (at 2.67% and 2.19% of **GDP**, respectively). While previous studies may have produced larger estimates, they are methodologically flawed and reference to the earlier estimates should be avoided.

Although such large figures may **capture** the attention and imagination of decision makers, from an economic standpoint, the total cost of a disease is not a suitable **basis** for either investment in research or the funding of prevention and treatment. The relevant **information** needed to substantiate such investments is whether the benefits (in terms of enhancements to the length and quality of life), at the margin of investing in the substance abuse field per unit cost, is greater than the marginal **benefit/cost** results achieved elsewhere.

There are recent estimates available for the prevalence of problem and pathological gambling for most of the provinces in Canada. These indicate that the prevalence of problem and pathological gambling is higher in Alberta than in any other province. However, there appears to be little or no research on estimating the economic costs of **problem** and pathological gambling, and there is little in the way of **objective**, scholarly study of the economics of gambling.

There are **no** cost-benefit economic evaluations available for Canada in the areas of substance abuse and problem gambling treatment. All such studies available are from the United States.

Cost-Effectiveness Between Modalities and Client Types

The existing **literature** does not, in general, detect outcome differences between in-patient and out-patient modalities. The published literature on in-patient versus out-patient treatment does not directly compare hospital to **non-hospital-based** settings and therefore does not **directly** compare AADAC versus non-AADAC treatment. There is no strong evidence of differential treatment effectiveness between in-patient and out-patient treatment settings, irrespective of how these are defined.

Although the matching principle is intuitively plausible and was mildly supported by some literature in the early 1990s, it is very difficult to find empirical evidence of the matching hypothesis. In general, the literature does not present those involved in

treatment with useful **guidelines** as to how to make treatment more **cost-effective** using matching. Without effectiveness data, it is not possible to do cost-effectiveness analysis (without assuming equal effectiveness across **modalities**). Project MATCH is an important study as it appears to have been well-designed to find **matching** effects. Although Project MATCH consistently demonstrates a great level of improvement in multiple life domains for individuals who **participated** in the study, there were no strong indicators (aside from **psychiatric** severity) that the ten characteristics of the individuals entering care predicted a specific response to any of the three treatment approaches incorporated in the investigation.

According to some recent synthesis and review of the very large body of literature on comparisons across treatment modalities, there is no strong **relationship** between the costs of various treatments and their effectiveness. The inconclusive nature of the research suggests that discriminating between modalities is difficult. In addition, there are no randomized studies which compare an intervention to a no-treatment option; thus no evidence **exists** to suggest that treatment is **cost-ineffective** relative to no-treatment. One exception to these inconclusive results is in the area of alcohol detoxification. The literature indicates that **hospital-based** treatment is not required for the safe and **cost-effective** detoxification of patients, with the exception of those who meet **well-specified** clinical criteria.

All substance abuse evaluations are hindered by a variety of methodological problems. The **chronic** and variable nature of substance abuse makes it very difficult to establish a study design which can definitively attribute the role that treatment plays in **determining** outcome.

Cost-Benefit Evaluation • Substance Abuse Treatment Programs

The three broad areas of economic outcome measures are health care offsets, productivity or employment-based measures, and crime related measures. It is important to note that these three **functional** areas are generally under the jurisdiction of different groups and it is unusual for a study to examine each area comprehensively.

A variety of U.S. **studies** involving HMO populations **have** demonstrated that health care costs and utilization for both an individual who has undergone alcohol treatment as well as members of **his/her** family exhibit a "ramping" effect. That is, costs rise and peak prior to treatment, but following treatment, health care costs fall dramatically and continue to decline until they are roughly the same as comparison families who do not have a member who has undergone treatment. The costs for both groups tend to rise in years three and four, but the families with treated alcoholic members continue to have the same health care costs as the comparison families for four years after treatment, thus indicating **long-term** effects. Considering only health care costs, the investment in treatment pays for roughly half of the cost within one year, and costs are fully recovered within two to three years.

Productivity losses are one of the major costs of substance abuse. Although some studies have found evidence of improved employment functioning, it has not yet been demonstrated that substance abuse treatment aids productivity in terms of producing a large cost offset.

Virtually all studies indicate that criminal activity is reduced substantially after treatment when compared to pre-treatment levels. The cost offsets attributable to crime reductions are higher from a taxpayers' perspective than from a **societal** perspective due to **victim** cost offsets being excluded from the latter perspective. The evidence indicates that criminal-related cost offsets alone (during, and two to three years after treatment), may offset the cost of treatment from a taxpayers' viewpoint, but not from a societal viewpoint.

Only one U.S. study has aggregated benefits across the three functional domains of health care, productivity, and crime. As reported, the return from each dollar invested in a program (one year after treatment), from a taxpayer perspective, ranged from \$4.31 to \$12.58, depending on the modality. Summing across modalities, the overall ROI was \$7.14. From a societal perspective, one year after treatment, the ROI for each dollar invested in non-methadone substance abuse treatment ranged from \$2.40 to \$2.87, depending on the modality. These return-on-investment figures are likely to be overstated as they do not include adjustments for the 35% of the clients who had re-entered treatment at the time of the follow-up.

Cost-Benefit Evaluation - Substance Abuse Prevention Programs

The only study of substance abuse prevention **programs** produces a large cost-benefit ratio (14 to 1) for U.S. programs, but over-states the **benefits** by attributing all declines in substance abuse prevalence to prevention programs without **making** a persuasive case for doing so. The economic evaluation of substance abuse prevention programs is under-researched.

Cost-Benefit Evaluation - **Pathological** Gambling Treatment Programs

Only one study, published in 1985, has estimated cost-benefit ratios for pathological gambling treatment. The very high cost-benefit ratio estimated (\$20 return for every dollar invested in treatment) is probably an over-estimate, especially from a societal perspective. There is much confusion in this study about what the perspective of the study is, and therefore what constitutes a cost. The area of economic evaluation of problem gambling remains under-researched.

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APPENDIX A

Taxonomy of Substance Abuse Costs (based on Collins and Lapsley, 1994)

A. TANGIBLE

I. Direct morbidity

- (a) Health care costs
- (b) Productivity
- (c) Welfare costs of victims, dependents and carers
(primarily a pecuniary cost)

II. Direct mortality

- (a) Health care benefits
- (b) Productivity
- (c) Welfare costs of dependents (primarily a pecuniary cost)
- (d) Welfare benefits

III. Drug-Induced Crime

- (a) Indirect morbidity
 - health care costs
 - **productivity**
 - welfare costs of victims dependents and carers
- (b) Indirect mortality
 - health care benefits
 - productivity
 - welfare costs of dependents
 - welfare benefits
- (c) Other costs
 - police
 - **judicial**
 - penal
 - customs and immigration
 - **property**
 - welfare costs of victims, dependents and carers
 - health costs of victims, dependents and carers

IV. **Drug-Induced** Accidents

- (a) Indirect mortality
 - health care costs
 - productivity
 - welfare costs of victims, dependents and carers
- (b) Indirect mortality
 - **health** care benefits
 - productivity
 - welfare costs of dependents
 - welfare benefits

- (c) Other costs
 - police
 - judicial
 - penal
 - **property**
 - welfare costs of dependents victims and carers

V. Associated Drug Costs

- (a) Research
- (b) Prevention
 - screening
 - **education**

VI. Costs of Consumed Drugs

B. INTANGIBLE

I. Mortality (direct and indirect)

- (a) Value of loss of **life** to deceased
- (b) Consumption forgone by **deceased**
- (c) Suffering imposed on rest of community

II. Morbidity (direct and indirect)

- (a) Pain and suffering of sick (including reduced quality of life)
- (b) Suffering unposed on rest of community

APPENDIX B

The Costs of Alcohol, Tobacco and Illicit Drugs in Canada, 1992

	Alcohol	Tobacco	Illicit drugs	Total
1. Direct health care costs: total	\$1,300.6	\$2,675.5	\$88.0	\$4,064.1
1.1 morbidity - general hospitals	666.0	1,752.9	34.0	2,542.9
- psychiatric hospitals	29.0	-	4.3	33.3
1.2 co-morbidity	72.0	-	4.7	76.7
1.3 ambulance services	21.8	57.2	1.1	80.1
1.4 residential care	180.9	-	20.9	201.8
1.5 non-residential care	82.1	-	7.9	90.0
1.6 ambulatory care: physician fees	127.4	339.6	8.0	475.0
1.7 prescription drugs	95.5	457.3	5.8	558.5
1.8 other health care costs	26.0	68.4	1.3	95.8
2. Direct losses associated with the workplace	14.2	0.4	5.5	20.1
2.1 EAP & health promotion programs	14.2	0.4	3.5	18.1
2.2 drug testing in the workplace	NA	-	2.0	2.0
3. Direct administrative costs for transfer payments	52.3	-	1.5	53.8
3.1 social welfare and other programs	3.6	-	NA	3.6
3.2 workers' compensation	48.7	-	1.5	50.2
3.3 other administrative costs	NA	NA	NA	NA
4. Direct costs for prevention and research	141.4	48.0	41.9	231.1
4.1 research	21.6	34.6	5.0	61.1
4.2 prevention programs	118.9	13.4	36.7	168.9
4.3 training costs for physicians and nurses	0.9	NA	0.2	1.1
4.4 averting behaviour costs	NA	NA	NA	NA
5. Direct law enforcement costs	1,359.1	-	400.3	1,759.4
5.1 police	665.4	NA	208.3	873.7
5.2 courts	304.4	NA	59.2	363.6
5.3 corrections (including probation)	389.3	NA	123.8	513.1
5.4 customs and excise	NA	NA	9.0	9.0
6. Other direct costs	518.0	17.1	10.7	545.8
6.1 fire damage	35.2	17.1	NA	52.3
6.2 traffic accident damage	482.8	-	10.7	493.5
7. Indirect Costs	4,136.5	6,818.8	823.1	11,778.4
7.1 productivity losses due to morbidity	1,397.7	84.5	275.7	1,757.9
7.2 productivity losses due to mortality	2,738.8	6,734.3	547.4	10,020.5
7.3 productivity losses due to crime	NA	NA	NA	NA
Total	7,522.1	9,559.8	1,371.0	18,452.9
Total as % of GDP	1.09%	1.39%	0.20%	2.67%
Total per capita	\$265	\$336	\$48	\$649
Total as % of all substance - related costs	46.5%	45.2%	7.4%	100.0%

(millions of dollars)

Source: Costs of Substance Abuse in Canada, Canadian Centre on Substance Abuse (1996).

APPENDIX C

The Costs of Alcohol, Tobacco and Illicit Drugs in Alberta, 1992

	Alcohol	Tobacco	Illicit drugs
1. Direct health care costs: total	\$123,518	\$215,464	\$10,775
1.1 morbidity - general hospitals	64,271	135,905	5,435
- psychiatric hospitals	1,931	-	94
1.2 co-morbidity	6,947	-	756
1.3 ambulance services	1,016	2,148	86
1.4 residential care	19,600	NA	2,260
1.5 non-residential care	7,283	NA	702
1.6 ambulatory care: physician fees	11,353	30,261	711
1.7 prescription drugs	8,838	42,330	537
1.8 other health care costs	2,279	4,820	193
2. Direct losses associated with the workplace	1,313	37	508
2.1 EAP & health promotion programs	1,313	37	328
2.2 drug testing in the workplace	NA	NA	180
3. Direct administrative costs for transfer payments	6,289	NA	192
3.1 social welfare and other programs	231	NA	NA
3.2 workers' compensation	6,058	NA	192
3.3 other administrative costs	NA	NA	NA
4. Direct costs for prevention and research	20,193	3,630	5,043
4.1 research	3,100	3,100	730
4.2 prevention programs	17,000	530	4,290
4.3 training costs for physicians and nurses	93	NA	23
4.4 averting behaviour costs	NA	NA	NA
5. Direct law enforcement costs	111,300	NA	29,830
5.1 police	61,700	NA	16,500
5.2 courts	28,400	NA	4,500
5.3 corrections (including probation)	21,200	NA	8,000
5.4 customs and excise	-	NA	830
6. Other direct costs	41,417	1,211	858
6.1 fire damage	2,707	1,211	NA
6.2 traffic accident damage	38,710	NA	858
7. Indirect Costs	445,299	508,247	88,052
7.1 productivity losses due to morbidity	129,565	5,540	25,886
7.2 productivity losses due to mortality	315,734	502,707	62,166
7.3 productivity losses due to crime	NA	NA	NA
Total	749,330	728,589	135,258
Total as % of GDP	1.02%	0.99%	0.18%
Total per capita	\$285	\$277	\$51
Total as % of all substance - related costs	40.8%	51.8%	8.4%

(thousands of dollars)

Source: Costs of Substance Abuse in Canada. Canadian Centre on Substance Abuse (1996).

APPENDIX D

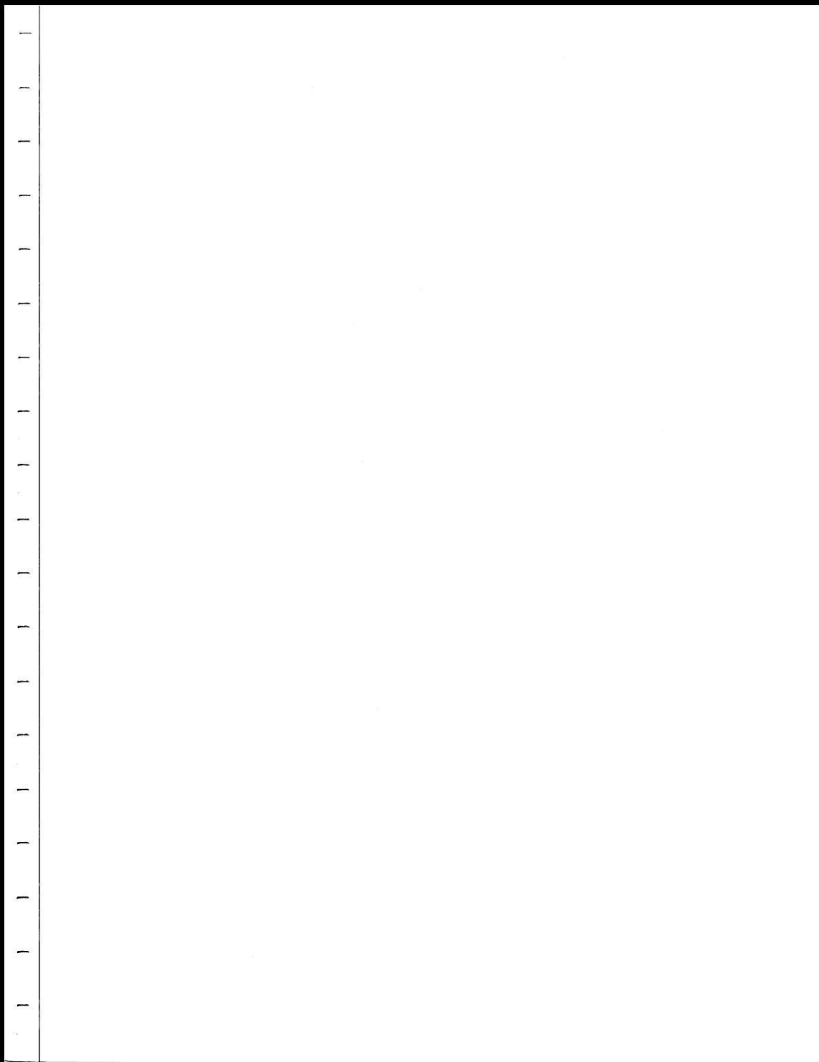
Substance Abuse Cost-Benefit Studies

Study	Treatment	Return on Investment of \$1	Location	Benefits included
Rundell & Paredes (1979)	Alcoholism treatment	\$1.98	Oklahoma	health care costs only
Kim et al. (1995)	Drug Abuse Prevention	14.81	US	
Politzer et al. (1985)	Pathological gambling treatment	>20	John Hopkins	
Harwood et al. (1988) (tax-payers perspective)	Residential Outpatient drug free Outpatient methadone	3.84 1.28 4.04	TOPS	crime-related only
Harwood et al. (1988) (societal perspective)	Residential Outpatient drug free Outpatient methadone	2.10 4.28 0.92	TOPS	crime-related only
Moberg (1993)	Treatment Alternative Program (TAP) - a joint AOD and criminal justice system program	1.40-3.30	Wisconsin	Reductions in jail days served, reduction in number of arrests, cost to victims of crime, employment earnings
Gerstein et al. (1994) From tax payers perspective)	Residential Social Model Outpatient Discharged methadone Continuing methadone Overall public treatment	4.8 4.3 11 12.6 4.8 7	California	criminal justice costs, victim losses, theft losses, health care costs
Gerstein et al. (1994) (From societal perspective)	Residential Social Model Outpatient Discharged methadone Continuing methadone	2.44 2.4 2.88 -2.98 4.66	California	criminal justice costs, health care costs
Finigan (1996) (From tax payers perspective)	Drug and Alcohol treatment	5.6	Oregon	Criminal justice costs,

Treatment Effectiveness Studies by U.S. State Alcohol and Drug Abuse Agencies. 1994

(based on Young, 1994)

State	Sample Size	Treatment Pop Size	Control Group	Health Status	Employment	Time at follow-up
California	3,000	150,000	No	for: physical health problems - 36% drug overdose - 58% mental health - 44% emergency room visits - 38% hospital days - 25%		15 months
Colorado (90-91)	868	26,000 (public)	No		Full/part-time: Before: 36% After: 61% Average monthly incomes Before: \$605 After: \$835	Average of 16 months
Florida	~97,000 Total inmate population		Yes			
Georgia	80		Yes			At least one year
Iowa	1,407	7,330 (state-funded)	No	12% increase in no-hospitalizations	Employment up by 9.3% Missed work days in last 6 months: Before: 3.2 days After: 0.7 days	6 months
Kansas (92-93)	2,700	18,000 (state-funded)	No	18.5% reduction in Addiction Severity Index	Addiction Severity Index improvement: (9% decrease in severity of employment problems)	At discharge
Kentucky (1992)	1,968	8,984	No		41% of clients had full-time employment, 17% were in school	One year
Maine	180		No			At least one year
Minnesota	~16,000	~64,000	No	Medical Before: 17.5% After: 12.8% Psychiatric Before: 7.4% After: 2.6% Detox Before: 18.7% After: 5.3%	Full time employment rate: Before: 43.8% After: 53.8%	Six months
Missouri	280		No		28% reported an improvement in employment status 8% reported an increase in employment income	During treatment
New Mexico	2,360		No			
Ohio	668		No	# of hospital admissions before: 32% after: 11% # of emergency room visits before: 34% after: 20%	Reductions in: Absenteeism: 89% Tardiness: 92% Problems with supervisors: 56% On the job injury: 57% Mistakes in working: 70% Incomplete work: 81%	One year
Oregon			Yes			
Texas (1992)	739		Yes (Non-completers)		Of unemployed clients, 59% were employed at follow-up; 75% of clients who completed were employed compared to 58% of non-completers	One year
Washington	1,118	4,907	Yes (ineligible for program)	Clients who received treatment had 1/2 the in-hospital costs of those ineligible		
Wisconsin						





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