

A research agenda for economic evaluation of substance abuse services

Michael T. French, (Ph.D.)^{a,b,c,*}, Michael Drummond, (Dr. Phil.)^d

^a*Department of Sociology, University of Miami, Coral Gables, FL 33124-2030, USA*

^b*Department of Economics, University of Miami, Coral Gables, FL 33124-2030, USA*

^c*Department of Epidemiology and Public Health, University of Miami, Coral Gables, FL 33124-2030, USA*

^d*Center for Health Economics, University of York, York, UK*

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Abstract

Economic analyses of substance abuse interventions play a critical role in informing the decision makers involved in funding these programs. Despite the emergence of new and more effective interventions, the adoption of costlier services still demands justification based on economic evidence. Updated and more rigorous economic information allows patients, health care professionals, insurance companies, policymakers, and others to allocate scarce resources more efficiently. To prepare for the next wave of addiction health services research, this article presents background information on the economics of addiction health services, reviews recent empirical and methodological contributions, and provides 15 research recommendations. © 2005 Elsevier Inc. All rights reserved.

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1. Introduction

Economics deals with the allocation of scarce resources in a society with unlimited desires. When resources become scarce, people face difficult choices. This general concept holds true in the field of health economics as well. Health economists study the allocation of scarce health care resources among consumers (e.g., patients), producers (e.g., health care professionals, hospitals), payers (e.g., taxpayers, insurance companies), and others (e.g., intermediaries; Phelps, 2003). Health care providers, insurance companies, patients, and policymakers must confront the challenges of allocating scarce medical resources as efficiently as possible (i.e., to achieve the greatest social welfare). In addition to improved outcomes from substance abuse services, payers often demand economic justification prior to the adoption of more costly interventions. Economic

evaluations of substance abuse programs play a role in providing that justification.

Economic findings for substance abuse services have also become increasingly important as the need for evidence-based practices has grown. Services are often based on traditional and sometimes outdated approaches, which may lead to undesirable and/or inefficient outcomes (Drake et al., 2001; Lamb, Greenlick, & McCarty, 1998; Marinelli-Casey, Domier, & Rawson, 2002). New and rigorous information must be disseminated in a clear and nontechnical manner to demonstrate the benefits of adopting services based on evidence rather than on tradition. If properly explained and disseminated, the results of economic evaluations have the potential to lead to further improvements in service development and delivery.

The literature indicates that substance abuse interventions are often economically beneficial, usually meaning that economic costs are offset by the economic benefits of programs (McCollister & French, 2003; The Lewin Group, 2002). It is important for policymakers to understand that with more research evidence and greater collaboration within and across disciplines, it may be possible to discover ways to further reduce the costs and increase

* Corresponding author. Department of Sociology, University of Miami, 5202 University Drive, Merrick Building, Room 121F, P.O. Box 248162, Coral Gables, FL 33124-2030, USA. Tel.: +1 305 284 6039; fax: +1 305 284 5310.

E-mail address: mtfrench@miami.edu (M.T. French).

the benefits of these programs, thus elevating overall social welfare.

The overarching goals of this article are to provide a status report on the economics of substance abuse services, to increase awareness of recent conceptual and empirical contributions in the area, and finally to propose an agenda for future research. We also address the challenges of conducting rigorous economic research on substance abuse services, some of which explain the gaps found in the literature. Identifying these gaps will call attention to new research opportunities. As a relatively new yet growing field, the economics of addiction health services contains ample room for innovative ideas and ambitious initiatives. A forward-looking status report can provide a roadmap for future research to ultimately improve the delivery, effectiveness, and cost-effectiveness of substance abuse services.

2. Summary of a blue ribbon task force report on National Institute on Drug Abuse health services research

In May 2003, a blue ribbon task force (BRTF) was formed to assess the status of addiction health services research at the National Institute on Drug Abuse (NIDA) and to develop recommendations to strengthen the NIDA's research portfolio and involvement (NIDA, 2004). The BRTF report stressed that future health services research should be applicable to and suitable for use by all individuals involved in substance abuse services, including patients, clinicians, administrators, policymakers, insurance companies, and researchers. Furthermore, the report stated that health services researchers need to extend their focus to investigate the connection between cost, organization, and financing of addiction health services. Through greater collaboration, individuals and organizations from different fields can contribute their expertise to addiction health services research and facilitate the transition of research into practice. The working definition of health services research set forth by the BRTF serves multiple aims by uniting the various disciplines at work in the field under a general, shared guideline. According to this guideline, the main goals of health services research are to investigate and publicize the most effective approaches to organize, administer, finance, and provide quality care.

The BRTF report identified several research gaps related to costs, financing, and economic evaluation of prevention and treatment services. Funding for research projects that study financing or organizational factors made up 15% of the NIDA's health services research budget at the time of the report. Of the 125 grants funded by the NIDA in prevention research, only 7 were focused on financing and other economic analyses. Overall, prevention research lacks an emphasis on economic incentives, efficient allocation of resources, costs of programs with positive outcomes, cost-effectiveness analysis (CEA), and

benefit-cost analysis (BCA). Although an increasing number of research grants at the NIDA are studying the costs and financing of substance abuse treatment, not much is understood about how to implement the findings to improve practice. The BRTF emphasized the need for additional research related to financing and organizational issues, CEAs, BCAs, and research on how economic incentives affect outcomes. Health economists specializing in these areas could contribute their expertise and should be actively recruited to participate in future NIDA grants. Once the NIDA and other organizations develop a research consensus on a set of threshold cost-effectiveness ratios and other economic measures for addiction intervention outcomes, benchmarks can be established to systematically evaluate future interventions.

Although the BRTF report contains important information on all aspects of addiction health services research, it lacks a comprehensive economic perspective. To elaborate, the BRTF report makes several economic analysis recommendations in the areas of cost, financing, and economic evaluation, but these recommendations are not fully developed or extensive. Therefore, the present article aims to provide more detailed background information on the economics literature and to augment the research recommendations of the BRTF.

3. Review of recent developments in the economics literature

There have been several recent and noteworthy methodological and empirical advances in research on the economics of addiction services and interventions. This section provides a brief review of some recently published research studies that, in our estimation, have set the direction for the field. The review is organized into six categories: cost studies, financing studies, economic benefits studies, CEA, BCA, and general methodological developments. Much of these information are also summarized in Table 1.

3.1. Cost studies

Early evaluations of substance abuse interventions often calculated accounting costs although economic or opportunity costs are a conceptually superior measure (Graves, Walker, Raine, Hutchings, & Roberts, 2002). To enable better analyses of economic costs in the addiction treatment field, researchers have developed rigorous and more comprehensive instruments to estimate total cost of service delivery for an entire program, unit costs for individual services, and costs incurred by treatment clients.

The Drug Abuse Treatment Cost Analysis Program (DATCAP), a data collection instrument and interview guide, has been applied successfully to generate economic and accounting cost estimates for numerous substance abuse programs in the United States. The data collected from

Table 1

Summary of recent methodological and empirical developments in economic analysis of addiction services and interventions

Development	Focus	Sources(s)	Possible extension(s)
Data collection instruments and analysis programs for treatment cost estimation	Cost	French, Dunlap, Zarkin, McGeary, and McLellan (1997); French, Roebuck, and McLellan (2004); Roebuck, French, and McLellan (2003); www.DATCAP.com	Interactive program for electronic data entry and analysis
Data collection instrument for client cost estimation of treatment services	Cost	Salomé, French, Miller, and McLellan (2003); www.DATCAP.com	Interactive program for electronic data entry and analysis
Unit cost estimation for treatment services	Cost	Anderson, Bowland, Cartwright, and Bassin (1998); French, Roebuck, McLellan, and Sindelar (2000); Zarkin, Dunlap, and Homsy (2004)	Interactive program for electronic data entry and analysis
Cost–utility analysis applied to substance abuse programs	CEA	Barnett (1999); Barnett, Zaric, and Brandeau (2001); Wutzke, Shiell, Gomel, and Conigrave (2001); Zaric, Barnett, and Brandeau (2000)	Better methods and data for estimating QALYs
CEA of prison-based substance abuse programs	CEA	Griffith, Hiller, Knight, and Simpson (1999); Hughey and Klemke (1996); McCollister, French, Inciardi, et al. (2003); McCollister, French, Prendergast, et al. (2003); McCollister, French, Prendergast, Hall, and Sacks (2004)	BCA of prison-based substance abuse programs
Economic evaluation of brief interventions	CEA/BCA	Fleming et al. (2000); Fleming, Mundt, French, Manwell, Stauffacher, and Barry (2002); Kunz, French, and Bazargan-Hejazi (2004); Zarkin, Bray, Davis, Babor, and Higgins-Biddle (2003)	Different populations and settings
Economic evaluation of substance abuse interventions using economic and clinical instruments	BCA	Brodey et al. (2004); French, Salomé, and Carney (2002); French, Salomé, Sindelar, and McLellan (2002)	Improvements in the ASI for better economic evaluations
Economic evaluation of drug testing programs and EAPs	Benefits	French, Roebuck, and Alexandre (2004); Zarkin, Bray, and Qi (2000)	More advanced research designs for evaluating EAPs
Complexities of using economic analysis for evaluating addiction services	CEA/BCA	Dismuke et al. (2004); Sindelar, Jofre-Bonet, French, and McLellan (2004)	Guidelines for the selection of appropriate economic evaluation techniques
Measuring society's willingness to pay for substance abuse treatment	Benefits	Borisova and Goodman (2003); Zarkin, Cates, and Bala (2000)	Expand this pilot study in size, scope, and technique
Economic evaluation of treatment services for adolescents	CEA/BCA	French et al. (2003); Schoenwald, Ward, Henggeler, Pickrel, and Patel (1996)	More studies with different settings and samples
Monetary conversion factors for criminal activity outcomes	Benefits	Miller, Cohen, and Wiersma (1996); Rajkumar and French (1997)	Update estimates; monetary conversion factors for adolescents
Monetary conversion factors for health outcomes	Benefits	French, Mauskopf, Teague, and Roland (1996)	Update estimates; include more health outcomes
Economic evaluation of drug courts	CEA/BCA	Belenko (2002); Byrne, Schauffler, Lightman, Finigan, and Carey (2004); Logan et al. (2004)	Test methods in more drug courts
Financing guidelines and effects for public and private substance abuse services	Financing	Frank and McGuire (1997); Galanter, Keller, Dermatis, and Egelko (2000); Hodgkin, Horgan, Garnick, and Merrick (2003); Jacobsen and McGuire (1996); Oggins (2003); Olmstead, White, and Sindelar (2004); Rodgers and Barnett (2000); Schoenbaum, Zhang, and Sturm (1998); Weisner, McCarty, and Schmidt (1999); Wheeler, Fadel, and D'Aunno (1992)	Re-examine financing changes to keep current with new developments
Economic evaluation of addiction services in HMOs	CEA/BCA	Parthasarathy, Weisner, Hu, and Moore (2001); Parthasarathy, Mertens, Moore, and Weisner (2003); Weisner et al. (2000); Weisner, Matzger, Tam, and Schmidt (2002)	Better access to proprietary data and more private sector studies

treatment providers are used to estimate the opportunity costs of all treatment resources, including personnel, facilities, supplies, and materials (French et al., 1997; French, Roebuck, & McLellan, 2004; Roebuck et al., 2003). Salomé et al. (2003) introduced the Client DATCAP, a standardized, self-administered instrument, to measure the costs incurred by individuals receiving treatment. The DATCAP family of instruments (Program, Brief, and Client) enables researchers and treatment providers to estimate the

costs of treatment more accurately and to compare different programs (French et al., 1997; www.DATCAP.com).

Researchers have also been improving methods to estimate the unit costs and patient-specific costs of treatment services. Zarkin et al. (2004) developed the Substance Abuse Services Cost Analysis Program to derive unit cost estimates for methadone treatment services. They found that estimates based solely on direct costs, rather than on patient-specific costs of treatment, greatly undervalue actual service

costs. Anderson et al. (1998) also developed a method to measure the unit costs of specific drug treatment services. Their approach was based on a diary method over the course of 1 month. By applying the Treatment Services Review to collect information about the cost and use of services at the patient level, French et al. (2000) identified standardized estimates for unit costs such as blood alcohol tests. Improvements are needed to make the Treatment Services Review, an evaluation instrument designed for service use information, more conducive to full cost analysis.

An interactive program for electronic data entry and analysis would increase the comprehension and use of these cost instruments. By administering these and other cost instruments at a variety of substance abuse programs, economists hope to gain a deeper understanding of the programs, units, and client costs associated with substance abuse interventions.

3.2. Financing studies

Numerous studies have focused on the financing of private and public substance abuse services and the effect of managed care on substance abuse treatment (Galanter et al., 2000; Oggins, 2003; Olmstead et al., 2004; Weisner et al., 1999). There are important differences between public and private substance abuse programs in terms of funding sources, access to services, staffing levels, organization, size, and finances (e.g., revenues earned and prices charged; Rodgers & Barnett, 2000; Wheeler et al., 1992). It is essential to keep abreast with changes in public and private financing so that funding agencies and policymakers are fully informed when making resource allocation decisions.

Weisner et al. (1999) found that managed care has greatly impacted the organization and provision of substance abuse treatment services. This trend has been associated with a reduction in the frequency and duration of inpatient hospitalization for substance abuse treatment without a corresponding increase in outpatient services (Galanter et al., 2000). Although managed care increases the chance that an assessment will be performed to avoid relapse, it limits the availability of follow-up services once a patient has been discharged from treatment (Olmstead et al., 2004).

As the systems used to finance addiction interventions change, individuals show greater levels of uncertainty about whether substance abuse treatment is covered by insurance, and many report paying for their treatment out of pocket (Oggins, 2003). The cost of substance abuse treatment accounted for approximately 13% of all insurance payments for behavioral health care services, yet less than 1% of plan members took advantage of the addiction services available (Schoenbaum et al., 1998).

Other issues in financing are related to parity in coverage for services and the interactions of the federal government with private organizations and state and local governments (Hodgkin et al., 2003). Researchers have also studied the impact of contract incentives between Medicaid and

managed care organizations to achieve savings (Frank & McGuire, 1997) and the effect of block grants on state-level spending for substance abuse programs (Jacobsen & McGuire, 1996).

3.3. Economic benefits studies

In addition to developing more accurate methods to estimate the costs related to substance abuse treatment, researchers have also improved the techniques used to study economic benefits. Both the tangible and intangible nature of economic outcomes for programs, clients, and society make benefits estimation a challenging endeavor. Some of the methods involve measuring society's willingness to pay for successful addiction treatment (Borisova & Goodman, 2003; Zarkin, Cates, et al., 2000), estimating the avoided costs associated with reduced criminal activity (Miller et al., 1996; Rajkumar & French, 1997), and valuing quality-of-life improvements (French et al., 1996).

Employers are especially interested in the benefits of employee assistance programs (EAPs) and other workplace policies, but only a few economic evaluations have been carried out in this area (French, Roebuck, & Alexandre, 2004; Zarkin, Bray, et al., 2000). Employee assistance programs seem to impact health services use by encouraging individuals to seek substance abuse treatment (Zarkin, Bray, et al., 2000). French, Roebuck, and Alexandre (2004) concluded that drug testing has a negative and significant impact on the use of illicit drugs by employees.

Although willingness-to-pay studies have been applied frequently by environmental economists, health economists have been slower to use this method (Olsen & Smith, 2001). Borisova and Goodman (2003) surveyed patients from methadone maintenance clinics to estimate their willingness to pay to reduce travel time and found that this valuation of time (more comprehensive than the wage rate alone) may account for more than half of total costs incurred by clients. In a pilot study, Zarkin, Cates, et al. (2000) surveyed individuals from North Carolina and Brooklyn, New York, to estimate their willingness to pay for different types of drug treatments. This is an important study for its methodological (i.e., development of a new instrument to estimate willingness to pay) and empirical findings, and future research should attempt to expand this study in size, scope, and technique. Although methodological challenges persist, wider application of this method has great potential for valuing the tangible and intangible benefits of treatment for patients and the community at large.

To strengthen economic evaluations, researchers have developed monetary conversion factors for outcomes associated with substance abuse treatment. French et al. (1996) estimated the dollar value of drug treatment in terms of preventable negative health outcomes. Researchers have introduced techniques to estimate the economic costs (i.e., tangible and intangible losses) of criminal activity and the monetary value associated with crime that may be avoided

through effective substance abuse treatment (Miller et al., 1996; Rajkumar & French, 1997). These techniques permit more appropriate comparisons between the costs and benefits of substance abuse interventions.

3.4. Cost-effectiveness analysis

Cost-effectiveness analysis compares incremental opportunity costs and incremental nonmonetary health outcomes, which are common to competing projects (Drummond, O'Brien, Stoddart, & Torrance, 1997; Garber, 1999). Incremental analysis assesses the additional cost or outcome that would arise if a program were implemented. However, as explained by Sindelar et al. (2004), CEA is best suited for programs with single or dominant outcomes. Addiction services and interventions often result in multiple outcomes that impact the individual, the provider, and the society. Standard CEA can be altered to take multiple outcomes into account, but this can be difficult (Björnera & Keiding, 2004). Some recent CEAs have been performed with prison-based substance abuse programs, brief interventions, and addiction services in HMOs.

Previous evaluations of prison-based substance abuse programs have focused on the outcomes related to reincarceration or relapse without considering cost-effectiveness. A series of economic analyses (McCollister, French, Inciardi, et al., 2003; McCollister et al., 2004; McCollister, French, Prendergast, et al., 2003) suggested that providing treatment to individuals in prison followed by aftercare services postrelease can be a cost-effective combination. Hughey and Klemke (1996) performed a CEA of a day treatment program offered in jail and found that incarceration costs of those who completed the program were lower than the costs of those who did not. Griffith et al. (1999) determined that treatment was most cost-effective for those at high risk who completed the entire program.

Economic evaluations of brief interventions have demonstrated their potential as cost-effective approaches that benefit patients and lower health care costs (Fleming et al., 2000, 2002; Kunz et al., 2004; Zarkin et al., 2003). A recent study found that problem drinkers who received a brief intervention at an inner-city emergency department had better outcomes after 3 months compared with those who did not receive a short counseling session (Kunz et al., 2004). Additional research following more subjects for a longer period could have results that prove the intervention to be even more cost-effective. When Zarkin et al. (2003) compared the startup and implementation costs of two models of screening and brief interventions, results showed that both interventions could be useful for managed care organizations, considering their modest costs. We believe that economic evaluations of brief interventions should continue to be performed on multiple populations in different settings.

The organization of the health care and health insurance industries impacts the choices available for individuals

seeking substance abuse treatment. Economic evaluations of addiction services provided through HMOs yield important information for consumers, administrators, and policy-makers. By comparing the costs and outcomes of the day hospital and outpatient programs offered by a managed care organization, Weisner et al. (2000) found that the day hospital was more cost-effective for some clients. In a more recent study, Weisner et al. (2002) concluded that insurance status did not predict entry into treatment by dependent and problem drinkers. Additional research on private sector addiction services, particularly those offered through HMOs, would offer greater insights into the costs and economic benefits of treatments available to individuals enrolled in these plans.

Barnett (1999), Barnett et al. (2001), and Zaric et al. (2000) measured the cost-effectiveness of addiction treatment in terms of life-years gained or quality-adjusted life-years (QALYs). They demonstrated that methadone and buprenorphine maintenance are cost-effective treatment options under certain conditions. Researchers in Australia used life-years saved as the primary outcome to study whether a brief intervention was cost-effective (Wutzke et al., 2001). Using quality and duration of life as an addiction treatment outcome is a promising new line of research, but the methods and data for estimating QALYs need to be strengthened.

3.5. Benefit-cost analysis

Although BCA is applied less frequently than CEA, it is more comprehensive and has a broader spectrum of applications (French, 2000; Kenkel, 1997). Essentially, BCA directly compares the opportunity cost of a project with the total project benefit, expressing both in a common monetary metric. Although BCA is well suited for the analysis of substance abuse interventions, the absence of certain market price information and the multitude of posttreatment outcomes make obtaining an accurate and comprehensive estimate of the dollar benefit very difficult. Nevertheless, BCA has been applied to several substance abuse interventions, including inpatient treatment, outpatient treatment, brief interventions, addiction services in HMOs, treatment services for adolescents, and drug courts.

French, Salomé, and Carney (2002) recently evaluated the benefits and economic costs of five residential addiction treatment programs using the DATCAP and Addiction Severity Index (ASI). Although the findings revealed that the economic benefits were significantly greater than the costs, their study established that the DATCAP and ASI could be used together to perform a BCA (French, Salomé, Sindelar, & McLellan, 2002). Both instruments have great potential for future economic evaluations of substance abuse interventions. New versions of the ASI that respondents complete through the telephone or internet could also prove useful for economic evaluations (Brodey et al., 2004).

Finally, research is underway to improve the format and content of the ASI to make it more conducive to economic evaluations.

Fleming et al. (2000, 2002) conducted some of the first BCAs of brief interventions through analyses of Project TrEAT (Trial for Early Alcohol Treatment). These studies demonstrated that brief counseling delivered by a physician in a primary care office can generate tangible benefits for patients and reduce costs in the health care system and for the society at large.

The relationship between interventions provided by HMOs and posttreatment patient costs was explored by Parthasarathy et al. (2003) and Parthasarathy et al. (2001). Medical costs and health care use in the year before and in the year following treatment were compared for two groups of patients receiving different models of care. Total medical costs, inpatient days, emergency department use, and hospitalization rates all dropped significantly for patients with substance abuse-related medical conditions who received primary care along with the substance abuse intervention (Parthasarathy et al., 2003). In a sample of adults entering treatment in a managed care organization, it was determined that medical, inpatient, and emergency department costs all decreased after treatment. A longer follow-up period could demonstrate whether these patterns of decreased health care use and costs continue over time (Parthasarathy et al., 2003).

Previous research on adolescent addiction treatments have focused on clinical outcomes, with economists only recently performing empirical economic studies of these programs (French et al., 2003; Schoenwald et al., 1996). In one of the few BCAs of adolescent interventions, French et al. (2003) evaluated outpatient marijuana services for adolescents and found that the benefits to society were greater than the economic costs in 4 of 12 treatment conditions. These results imply that some adolescent treatments could potentially reduce the costs to society following intervention. There is a clear need for additional research in this field to study different groups of adolescents, interventions, and settings. The unique nature of adolescent substance abuse requires that evaluation techniques and measures be adjusted and adapted to this specific area.

Logan et al. (2004) recently performed a BCA of several drug court programs, taking into consideration accounting and opportunity costs and a range of economic outcomes. Participation in drug courts was related to reductions in the costs for legal and mental health services. The highest economic return was for graduates of the programs, but the overall net benefits were still positive when program dropouts were considered together with program graduates. Similar results were found in another study (Byrne et al., 2004) that determined that participation in drug courts saved taxpayers' money over time regardless of whether the participants graduated. The empirical challenges associated with performing economic research on drug courts were explored by Belenko (2002).

3.6. General methodological developments

In addition to specific research advances, it is necessary to consider general methodological developments in economics and to assess their relevance to substance abuse treatment evaluation. A comparison of the second and third editions of one of the most popular textbooks in the field (Drummond et al., 1997; Drummond, Sculpher, Torrance, O'Brien, & Stoddart, 2005) suggests that the developments explained in the following subsections are of greatest interest.

3.6.1. Measuring the economic benefits of health care programs

Over the past 10 years, the QALY has established itself as the most widely used measure of health benefits (Richardson & Manca, 2004). However, it is not without its critiques. Some of the criticisms relate to methodological issues that are beyond the scope of this article, but others relate to the fact that QALYs may not capture some of the economic benefits of medical/social programs such as increased convenience to patients and reduced negative externalities (e.g., crime) to other members of the community.

This has led some to propose the valuation of benefits through the use of conjoint analyses and discrete choice experiments (Ryan & Gerard, 2003). In these approaches, treatments or services are assumed to have different characteristics (e.g., efficacy, convenience, side effect profile). Respondents are then presented with a series of scenarios to explore tradeoffs between the different characteristics. In addition, willingness to pay can be estimated if the payment vehicle of "cost" is included as one of the characteristics. This approach is particularly useful where treatments have a range of different characteristics and where it is useful to know which characteristics are most important to service users.

3.6.2. Incorporating equity considerations in estimating health benefits

Although the main purpose of economic evaluation is to assess the efficiency (i.e., cost-effectiveness or net benefits) of health care programs, it is impossible to ignore equity considerations. Standard economic evaluations using QALYs assume that the benefits from producing a QALY are the same no matter who receives the health gain. In the estimation of willingness to pay (or in discrete choice experiments), the values generated reflect the income of the individuals surveyed.

In recent years, researchers have investigated different ways of explicitly incorporating equity considerations into economic evaluations. For example, it may be possible to weight QALYs according to whether they are gained by the rich or the poor or by those in poor health as opposed to those in good health. One approach, proposed by Williams

(1997), is to weight QALYs inversely in relation to the amount of good health a person has experienced throughout his or her lifetime. The main unresolved question is whether equity considerations should be addressed explicitly in the analysis or taken into account within the broader decision-making process itself.

3.6.3. Increasing the generalizability of economic evaluations

Whereas the clinical benefits of health care interventions are often transferable from setting to setting, the transferability of economic findings is less certain. For example, in comparing different locations, there may be substantial differences in the availability of resources, clinical practice patterns, and relative prices that could all affect the cost-effectiveness of a given health care program.

Therefore, those performing economic evaluations are beginning to pay considerable attention to the applicability of their results. Some analysts have used decision analytic models to adjust the findings of studies from setting to setting (Palmer et al., 2005). Other researchers have considered how statistical approaches such as multilevel modeling can be applied to the analysis of economic clinical trials undertaken in multiple sites (Manca, Rice, Sculpher, & Briggs, 2004). One important consideration for all economic evaluations is that the methods used should be transparent so that those in other settings can assess the applicability of results to their location (Drummond, Manca, & Sculpher, 2005).

3.6.4. Characterizing uncertainty in economic evaluations

There is often considerable uncertainty surrounding the estimates produced by economic evaluations. Some of it relate to imprecision in the estimation of input parameters. Other uncertainties relate to methodological controversies still existing in economic evaluations such as the inclusion or exclusion of indirect (e.g., productivity) costs.

Decision makers need to know (1) what level of confidence they can place on the results of economic evaluations and (2) whether it would be worthwhile investing in further research studies to reduce decision uncertainty. In the past, simple sensitivity analysis was the primary approach used to explore the impact of uncertainty. However, there have been several advances in the statistical analysis of patient-level data and in the application of probabilistic sensitivity analysis in modeling studies. One of the benefits of using probabilistic sensitivity analysis is that a value-of-information analysis can be conducted to determine priorities for further research (Claxton & Posnett, 1996).

3.7. Synthesis

In summary, research should be extended to perform BCAs in understudied areas such as adolescents, prisons,

drug courts, and HMOs. Despite the demonstrated promise of CEA and BCA when applied to substance abuse interventions, complexities and challenges exist. These issues must be addressed and guidelines must be developed to help researchers select appropriate economic evaluation techniques (Sindelar et al., 2004). Inappropriate selection and/or application of economic techniques could result in misguided interpretations by policymakers and program administrators (Sindelar et al., 2004).

This brief review of recent empirical and methodological contributions provides a platform for future cost, financing, and economic evaluation research. Just as a thorough understanding of the clinical objectives and outcomes of substance abuse interventions can lead to improvements in the quality and effectiveness of patient care, so can understanding its economic aspects lead to maximized net benefits for the society (Dismuke et al., 2004). The potential societal value of further growth in the economic research of addiction interventions cannot be overstated.

4. Proposed research agenda

Table 2 presents an overview of the proposed research agenda for the economic analysis of substance abuse services and interventions. We have limited our list to 15 items representing immediate needs that could feasibly be addressed in the short term. The list includes all types of economic analyses and pertains to a variety of populations and settings. In addition to explaining these recommendations, this section also calls attention to possible research obstacles and suggests ways to overcome these challenges.

Prior to advancing a research agenda, several major gaps in the literature should be identified. First, most economic evaluations have focused on publicly funded programs serving primarily low-income clients. These programs deliver most substance abuse services in the United States, and very minimal information is available on privately funded treatment services. Second, research findings are similarly lacking on special populations such as women, minorities, dually diagnosed patients, criminal offenders, and adolescents. Third, because of the difficulty and cost associated with collecting long-term data, most published studies pertain to short-term follow-ups. Fourth, among the few studies that are truly randomized, most contain small sample sizes. The nonrandomized studies include patients who self-selected various treatments, which causes potential selection bias. The primary reason why studies are not randomized involves the ethical problems associated with denying treatment to an eager substance abuser. This limitation compromises some of the research findings and reduces the reliability of interstudy comparisons. Finally, much of the misunderstanding associated with the economics literature is due to inconsistent definitions, per-

Table 2

Suggested research agenda for economic analysis of addiction programs and services

Research recommendation	Research focus
Perform more economic evaluation studies of privately funded (e.g., EAPs, HMOs, self-pay, philanthropic) substance abuse interventions	CEA/BCA
Conduct economic analyses of substance abuse consequences and costs for adolescents as well as economic evaluations of adolescent addiction interventions	Cost
Collect long-term data (i.e., >2 years postintervention) to more fully analyze intervention costs and economic benefits	Various
Develop more efficient methods to estimate unit costs for treatment services	Cost
Explore alternative methods for capturing the economic benefits of substance abuse programs	Benefits
Perform BCAs of prison-based substance abuse programs	BCA
Design economic evaluation modules for analyzing the benefits of substance abuse interventions	Benefits
Perform more economic evaluations of drug courts	Various
Publish a reference document to promote standardization and consistency in economic evaluation techniques, analysis perspectives, economic concepts, and methods	Various
Seek opportunities to evaluate randomized controlled trials and natural experiments of substance abuse programs and services	Various
Avoid studies with poor research designs, weak measures, and/or small sample sizes	Statistical
Develop technical and practical suggestions for improving the quality of abstracted data from insurance records and medical providers	Various
Encourage more economic evaluations of substance abuse interventions, especially prevention programs	Various
Consider equity issues when performing economic evaluations of substance abuse programs	Various
Investigate the transferability of economic evaluation data to other populations and settings	Various

spectives, and valuation methods that hamper the ability to make valid comparisons.

Future economic research needs to broaden the range of topics to encompass new populations and treatments while improving methods and making adjustments based on recent findings. An important objective should be the collection of more reliable and longer-term data for the many types of patients receiving various kinds of treatments. As the BRTF emphasized, appropriate dissemination of new findings will lead to more standardized methods and more efficient policies.

The research agenda discussed through the following subsections is based on the contributions and shortcomings of recent studies as well as emerging policy questions. The recommendations are both methodological and empirical and are presented in no particular order. The potential challenges to completing this research agenda will be addressed in the concluding section.

4.1. Perform more economic evaluation studies of privately funded (e.g., EAPs, HMOs, self-pay, philanthropic) substance abuse interventions

Most economic evaluations have been conducted with publicly financed programs serving mostly poor and socially disadvantaged clients. Very few studies have analyzed privately financed programs that derive most of their revenue from private insurance, employers, philanthropy, and/or patient self-pay (Rodgers & Barnett, 2000; Wheeler et al., 1992). This uneven distribution of studies is not surprising or alarming as most programs in the United States are largely financed with public funds. Nevertheless, forging research collaborations with privately financed programs could provide valuable economic information that could be beneficial to all types of addiction treatment programs.

4.2. Conduct economic analyses of substance abuse consequences and costs for adolescents as well as economic evaluations of adolescent addiction interventions

The vast majority of research on the economic consequences and costs of substance abuse has been conducted using adult samples (Roebuck et al., 2003; Salomé et al., 2003). The same can be said about CEAs and BCAs of addiction interventions (Fleming et al., 2000, 2002; French, Salomé, & Carney, 2002; Zaric et al., 2000). Designing and delivering effective addiction interventions for adolescents are difficult and costly. The potential economic benefits of these programs, however, are also high because untreated adolescent substance abusers can generate costly consequences for themselves and others for many years. Some recent studies have begun to investigate the costs and benefits of adolescent addiction interventions (French et al., 2003; Schoenwald et al., 1996), but not much is known in this area, especially in comparison with the growing literature on adult treatment.

4.3. Collect long-term data (i.e., >2 years postintervention) to more fully analyze intervention costs and economic benefits

One of the enduring questions about addiction interventions is whether the benefits that accrue shortly after intervention delivery continue for longer periods. Given the chronic relapsing nature of addiction, it would be useful to know the trend of economic benefits over 2 or more years postintervention. This would indicate when benefits peak for the average client and when relapse typically occurs. In addition, long-term follow-up data would provide the information necessary to derive more stable cost-effectiveness and benefit-cost ratios.

4.4. Develop more efficient methods to estimate unit costs for treatment services

Unit cost estimates for services such as individual and group counseling, medical examinations, and job training courses furnish the information necessary to calculate patient-specific costs for treatment episodes. These patient-specific estimates would be extremely useful for billing/reimbursement, cost analyses, and BCAs. The current approaches for deriving unit cost estimates are either too burdensome or imprecise because they require detailed journals from treatment personnel or expert judgment from a treatment director. Better methods are needed to reduce respondent burden without compromising precision.

4.5. Explore alternative methods for capturing the economic benefits of substance abuse programs

The economic benefits of addiction interventions have been estimated for labor market improvements, reduced criminal activity, and reduced health services use (McCollister & French, 2003; Parthasarathy et al., 2003, 2001). Important outcomes such as avoided illness and disease (e.g., HIV, STDs), quality-of-life improvements for family members, and better school performance have not been adequately valued. New methods and techniques are necessary to value a wider range of addiction outcomes and thereby expand the scope of economic benefits estimation. Furthermore, the process for disseminating new economic methods and techniques is fragmented and inefficient. A central repository such as the NIDA could regularly assemble this information and make it available to all interested analysts.

A seminal study by Zarkin, Cates, et al. (2000) questioned a small sample of American citizens about their willingness to pay for successful substance abuse treatment in their community. Although similar surveys have been administered frequently to gauge society's willingness to pay for environmental amenities and better health, this study was the first to apply this approach to substance abuse treatment. We believe that economists should design and administer similar surveys to estimate society's willingness to pay for a variety of different treatment and prevention outcomes. This information could be used to set budget priorities and allocate resources.

Some promising recent research have estimated the QALYs gained from successful methadone treatment (Barnett, 1999; Barnett et al., 2001; Zaric et al., 2000). These efforts however have significant empirical limitations because strong assumptions are necessary to project health status changes beyond the typically short follow-up periods of most studies. Better methods and data are necessary to estimate long-term differences in QALYs between treated and untreated drug abusers. With proper qualifications regarding the presence of other important outcomes, QALY estimates would be useful in constructing

cost-effectiveness ratios that are standardized and comparable across programs.

4.6. Perform BCAs of prison-based substance abuse programs

The last 10 years have witnessed a dramatic increase in addiction programs based within the criminal justice system (Leukefeld, Logan, Martin, Purvis, & Farabee, 1998). As the number of substance abusers involved with the criminal justice system increases, these programs could be an effective approach for addressing substance abuse in the offender population. Unfortunately, we only know so much about the costs and economic benefits of these programs. Some initial economic research have completed CEAs of prison-based substance abuse treatments (Griffith et al., 1999; McCollister, French, Inciardi, et al., 2003; McCollister et al., 2004; McCollister, French, Prendergast, et al., 2003), but we are not aware of any rigorous BCA of criminal justice-based interventions.

4.7. Design economic evaluation modules for analyzing the benefits of substance abuse interventions

When analyzing the potential economic benefits of addiction interventions, economists have had to rely on data obtained from clinical instruments or abstracted records. The latter source can be expensive to obtain and somewhat limiting for the full range of economic benefits. Clinical instruments are generally good sources of clinical outcomes (e.g., drug use, alcohol use, mental health problems) but often inadequate for the type of information needed to estimate economic benefits (e.g., criminal activity, health services use, labor supply, and earnings). Although it may be desirable to fully integrate important questions for economists into a clinical instrument such as the ASI, this may not always be feasible due to length and objectives. An alternative approach is to develop economic evaluation modules that contain sets of core questions for intervention settings (e.g., outpatient, inpatient, criminal justice) and populations (e.g., adults, women, adolescents, elderly persons). Future studies could then add these modules to their instrumentation if they decide to include an economic evaluation component.

4.8. Perform more economic evaluations of drug courts

One of the fastest growing treatment approaches in the United States is drug courts. Many counties and states now operate adult and/or juvenile programs. Early evaluations suggest that these programs are effective (Guydish, Wolfe, Tajima, & Woods, 2001; Hicks, 1999; Peters & Murrin, 2000), but we were able to find only one published study on costs and economic benefits (Logan et al., 2004). Criminal justice agencies would certainly appreciate rigorous and standardized information on the costs and benefits of these programs before allocating additional resources.

4.9. Publish a reference document to promote standardization and consistency in economic evaluation techniques, analysis perspectives, economic concepts, and methods

Economics, like most disciplines, has its own set of unique techniques and terminology. Analysts who may be less familiar with economic analyses can sometimes misuse this terminology. To promote standardization in methods and consistency in explanations, it would be useful to publish a reference document that clearly defines economic concepts, evaluation techniques, analysis perspectives, and methods. This reference document could be updated periodically to incorporate new material and offer contemporary examples.

4.10. Seek opportunities to evaluate randomized controlled trials and natural experiments of substance abuse programs and services

Given the rarity of randomized designs and natural experiments in substance abuse research, it is imperative for these studies to include an economic evaluation component whenever possible. Randomized designs and natural experiments are free of the biases often present in field experiments. Economic evaluation results could be more reliable and informative if derived from experimental studies. These unusual opportunities can be seized if economists can be linked with other project staff during the early stages of design development. When such opportunities are not available, economists should strive to improve and use rigorous statistical methods to minimize the potential bias when analyzing self-selected intervention samples.

4.11. Avoid studies with poor research designs, weak measures, and/or small sample sizes

On the surface, this recommendation may seem obvious and unnecessary. However, the eagerness to include an economic component in a clinical study not explicitly designed for economic analysis sometimes overwhelms better judgment. Once an economic component has been entrenched in a research design, it becomes difficult to extract the analysis. With a relatively small number of health economists devoting significant time to substance abuse research, it would be best to align their expertise with the most advanced treatment and prevention studies (i.e., best measures, largest samples, longest follow-up).

4.12. Develop technical and practical suggestions for improving the quality of abstracted data from insurance records and medical providers

Evaluations of addiction interventions often rely on self-reported information for outcomes such as drug use,

criminal activity, and employment earnings. Many analysts believe that abstracted health services use data should be used in place of self-reported data whenever possible. Although abstracted data can be superior to self-reported data if health care records are complete, accurate, and accessible, these conditions are rarely satisfied. Part of the difficulty is that few analysts have sufficient experience working with abstracted health records to know their pitfalls. An updated reference document that outlines the best approaches for abstracting health care records and summarizes the challenges therein would be valuable for future economic studies.

4.13. Encourage more economic evaluations of substance abuse interventions, especially prevention programs

Unlike most medical care services, substance abuse interventions involve costs and benefits for a wide range of individuals, communities, institutions, and governments. A sometimes unrecognized outcome of economic evaluation is that it can identify the affected parties and measure the relative magnitude of losses and gains. This information can be used to develop incentive schemes (e.g., subsidies, budgetary reform, income transfers) to ensure that programs with the greatest net benefit to society are identified and implemented. Such programs may be left in obscurity without the aid of economic evaluation data.

The BRTF report highlighted the research void that is present for substance abuse prevention programs. The NIDA's health services research portfolio has approximately 1.8 times as many treatment grants as prevention grants. Opinions differ on why prevention research is lagging so far behind treatment research, but most agree that more prevention research are needed, particularly in the form of economic evaluations. To move in this direction, it may be necessary for the NIDA to establish research incentive programs (e.g., request for proposals with set-aside dollars, research awards for exemplary studies, research supplements to extend existing studies) to spawn more prevention grant applications.

4.14. Consider equity issues when performing economic evaluations of substance abuse programs

Due largely to the negative externalities caused by substance abusers, society is willing to direct public funds to substance abuse interventions. One can speculate as to whether public support would wane if the distribution of economic benefits tilted more toward the substance abuser and away from other affected individuals. Would governments continue to fund programs that significantly reduced patients' substance use but had minimal effect on criminal activity, use of social services, and employment? What if these same programs continued to generate net benefits for society as a whole? Equity issues and their relationship to public decision making are an

important area of research that is rarely addressed in economic evaluations.

4.15. Investigate the transferability of economic evaluation data to other populations and settings

As noted throughout this article, substance abuse programs deliver both medical and social services. Thus, economic benefits have both a medical and a social context. With underlying differences in patient demographics, cultures, and social systems, it is uncertain whether exemplary substance abuse programs can be transported to other populations and settings. The ambiguity is even greater when considering whether a successful program in the United States can attain the same success in Europe or Asia. One way to start filling this research void is to initiate multisite research studies (including economic evaluation components) with both American and international settings.

To maximize the clinical and policy impact of this research agenda, greater collaboration among and within organizations must be achieved. This is one of the main themes of the BRTF report. With increased information sharing and technology transfers, standardized approaches and definitions can be established and evidence-based practices can be implemented. Because of the multidisciplinary nature of health care and addiction research, different types of professionals must work together to facilitate the conversion of new research findings into practice. Dissemination of knowledge to policymakers and funding agencies in nontechnical terms is essential for research findings to inform policy. If the key results and implications of economic research studies are clearly presented, clinical practice might change and resources might flow to the most effective and cost-effective substance abuse services.

5. Summary and conclusion

The growing participation of health economists in substance abuse studies has coincided with the development of new types of interventions along with a heightened interest in evidence-based practices. Decision makers involved in substance abuse interventions rely on economic analyses to help allocate scarce resources efficiently. New findings must therefore be disseminated widely and made available outside of scientific journals to be most influential with administrators and policymakers.

The BRTF report on health services research offers a scorecard on the NIDA's health services research portfolio and a set of recommendations for future research. Given the unique outcomes associated with substance abuse interventions and the multiple stakeholders, the BRTF calls for a wider perspective in research with more studies related to finance, cost, and organizational issues. Despite the flurry of economic studies in recent years and the noteworthy contributions to the literature, many excellent opportunities

remain to fill research gaps. Methodological improvements could strengthen cost and benefit estimates and make comparisons across interventions more accurate. Statistical techniques need to be improved and used to compensate for potential bias caused by lack of randomization, small sample sizes, unobserved heterogeneity among patients, and short follow-ups. Economic benefits estimates can become more comprehensive and accurate by including a wider range of outcomes. Important economic research developments need to be reported periodically (i.e., annually) by the NIDA to avoid duplication of efforts and provide ideas for new research topics. Finally, like the broader BRTF report, a more detailed assessment of research progress and a complementary research agenda for the economic analysis of addiction services and interventions should be completed every 5 years.

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