Center on Addiction
and Substance Abuse
at Columbia University

152 West 57th Street
New York, NY 10019

phone 212 841 5200
fax 212 956 8020

The Cost of Substance Abuse to America's Health Care System

Report 1: Medicaid Hospital Costs

A CASA REPORT

This study was conducted by Jeffrey Merrill, Vice President for Policy and Research at CASA; Kimberley Fox, Senior Program Manager; and Han-hua Chang, Research Assistant. The study was funded by a grant from the Henry J. Kaiser Family Foundation, with some additional core support from The Robert Wood Johnson Foundation; Carnegie Corporation of New York; The Commonwealth Fund; The Charles A. Dana Foundation, Inc.; and the Ford Foundation.

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Foreword

Substance abuse and addiction is Public Health Enemy Number One in America. The grim reality, shrouded for so long in our individual and national self-denial, is that any health reform that hopes to offer care to all Americans at a reasonable cost must mount an all-fronts attack on all substance abuse--legal and illegal drugs, alcohol and nicotine.

The central missions of CASA--the Center on Addiction and Substance Abuse at Columbia University--are to identify the cost of substance abuse throughout American society and inform the American people of those costs and the impact of substance abuse on their lives; to find out what works for whom in prevention and treatment; and to encourage all individuals and institutions to take responsibility to deal with substance abuse.

This CASA study, largely funded by the Henry J. Kaiser Family Foundation* , is the initial component of the first comprehensive and systematic analysis of the cost that all substance abuse imposes on America's health care system. This report, the first in a series, assesses the impact of substance abuse and addiction on inpatient hospital costs in the Medicaid program. Future studies will identify the costs of substance abuse to the rest of the Medicaid program and to other payers like Medicare, the Blues, commercial insurers, self-insured corporations and individuals.

We began our work with Medicaid because the program serves some of the most vulnerable individuals in our society, including poor pregnant women and infants and a

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disproportionate number of AIDS victims disenfranchised from private coverage; because most governors regard this program as the greatest burden on their state budgets; and because the Kaiser Family Foundation had identified Medicaid as one of its top priorities, establishing a distinguished commission to examine the program last year.

The results have profound implications for those who would reform America's health care system: at least one of every five dollars Medicaid spends on hospital care, and one in every five Medicaid hospital days, are attributable to substance abuse. For 1991, the latest year for which detailed information is available and the year on which this study is based, that is $4.2 billion of the $21.6 billion Medicaid paid for hospital care. Based on the fiscal year 1994 estimates of Medicaid expenditures of $41 billion for hospital care, the portion attributable to substance abuse will exceed $7.4 billion.

I say "at least" because these numbers are certainly low. The research is incomplete in documenting the full impact of substance abuse on morbidity. The incidence of alcohol and drug abuse is underreported due to physicians concern about confidentiality and patient embarrassment. There is little identification of cigarette smoking or abuse of prescription drugs in hospital records, so nicotine addiction as a complicating factor is understated, as are complications from addictive prescription drugs. While the study counts the extra days of care used by substance abusers, the estimates do not adequately reflect the increased resources used during many of these additional days, e.g., in an Intensive Care Unit. Moreover, our analysis does not account for costs of individuals who go on Medicaid as a result of disability or poverty related to substance abuse.

Among the new and deeply troubling information in this report:

- More than 70 conditions requiring hospitalization are attributable in whole or in part to substance abuse.

- On average, Medicaid patients with substance abuse as a secondary diagnosis are hospitalized twice as long as patients with the same primary diagnosis and no substance abuse problem.

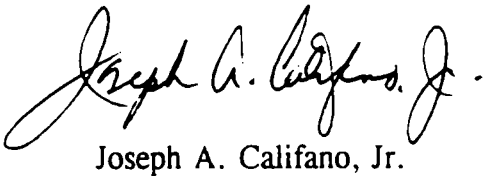
- Males under 15 years of age with substance abuse as a primary or secondary diagnosis stay four times longer than those with no such diagnoses (16.4 days compared to 3.9 days). Females in the same age group stay almost three times longer (9.8 days compared to 3.6 days).

- Substance abuse problems complicate treatment for specific illnesses. Patients treated for burns, pneumonia, and septicemia who have a secondary diagnosis of substance abuse stay more than twice as long as those without such a diagnosis.

We are releasing these results of the hospital segment of our analysis now because we believe they are of critical significance to the Administration, the Congress, state government and other policymakers who are considering reform of the Medicaid program and the health care system. Medicaid provides no explicit benefit for prevention or treatment of substance abuse and there is no federal requirement that states provide such benefits, although some states offer limited coverage. Yet, funds invested in substance abuse prevention and treatment would seem to offer an opportunity for substantial immediate and long term savings. Indeed, the potential for savings in this connection dwarfs possible cost containment in many other areas, such as eliminating unnecessary procedures or excess capacity. Failure to deal with substance abuse will sentence Medicaid to continuing escalating costs, which for the past several years have run at triple the rise in the consumer price index. The implications for the entire health care system are obvious.

This study was conducted by CASA under the direction of Jeffrey Merrill, CASA's Vice President for Policy and Research and a professor at Columbia University School of Public Health, and Kimberley Fox, senior program manager and health policy analyst. Their research could not have been accomplished without the valuable advice of a number of distinguished physicians, epidemiologists, and economists. For their time, assistance, and expertise, I would like to thank Wendy Chavkin, M.D.; Mary Dufour, M.D.; Oliver Fein, M.D.; Lewis Goldfrank, M.D.; Harry Haverkos, M.D.; Jeffrey Kelman, M.D.; Ellen Morrison, M.D.; Michael Thun, M.D.; Joan Bartlett; Mimi Fahs, Ph.D.; Rick Harwood, Ph.D.; and the remarkable Dorothy Rice, ScD, to whom I have been indebted since my years as Secretary of Health and Education and Welfare in the late 1970's. I extend special appreciation to Dr. Ray Arons and his dedicated staff at the Office of Casemix Studies at The Presbyterian Hospital who did much of the hospital discharge data analysis and Eileen Connolly in the Medical Records Department, who provided her expert advice on medical coding.

The remaining studies in this series on the health care system are scheduled for completion by the end of next year. When all phases of this study are completed, we will be able to portray an accurate -- and, I believe, frightening -- picture of the impact of substance abuse, not only on rising health care costs, but on the health of our nation's citizens.



Joseph A. Califano, Jr.

Chairman and President, CASA

I. INTRODUCTION

Health care reform has emerged as a major issue on our nation's domestic agenda. But, as the history of health system reform efforts has repeatedly demonstrated, providing quality care to all Americans at reasonable cost is no mean task. It requires an examination of all the factors that contribute to health care inflation, including administrative costs and inefficiency, inappropriate and excessive use of services, malpractice and defensive medicine, emerging technologies, and excess capacity. Eliminating unnecessary Cesarean sections may save $1 billion, eliminating unnecessary bypass surgeries may save a little more, reducing excess capacity might save several billion, but, in the hierarchy of cost containment opportunities, another cost of far greater magnitude ranks high on the list: that of reducing substance abuse and addiction in all its forms--including tobacco, alcohol and drugs.

CASA -- The Center on Addiction and Substance Abuse at Columbia University -- is conducting the first national, comprehensive study of the costs of all substance abuse -- legal and illegal drugs, alcohol, and tobacco -- to the nation's health care system. The first phase of this study, funded by the Henry J. Kaiser Family Foundation, focuses on the inpatient hospital costs of the Medicaid program. Subsequent reports will assess the costs of substance abuse to the rest of Medicaid (e.g., outpatient hospital costs, emergency room services, payments to physicians), Medicare, other public programs, Blue Cross/Blue Shield, commercial insurers, institutions and individuals.

Impact of Substance Abuse and Addiction on Health Care

Substance abuse and addiction is not confined to one illness. Its costs to the system go well beyond what is spent on direct treatment. Substance abuse is ubiquitous, reaching every corner of health care from ailments such as cancer and cardiovascular disease to trauma, birth complications and AIDS. Substance addiction and abuse is the sole cause for diseases such as alcohol cirrhosis and fetal alcohol syndrome. It is also a major risk factor for other costly health problems, including lung cancer and coronary heart disease. It complicates all sorts of otherwise unrelated diseases and ailments, such as severe burns and pneumonia, adding days and dollars to treatment.

Estimates vary about the total direct and indirect cost of substance abuse to the health care system: they run as high as $140 billion a year and, thus, represent a significant portion of the total health care bill. Whatever the cost, it is clear that achieving meaningful health care reform will be difficult without addressing the problem of substance abuse.

Substance abuse affects health care expenditures in both the long-term and the short-term. What we are seeing in health care expenditures, including Medicaid's, is the result of the cumulative effects of using and abusing substances over many years. This leads to illnesses such as heart disease and cancer. However, some costs stem from the more immediate medical effects of substance abuse -- birth complications, injuries resulting from violence and accidents, AIDS, and strokes among younger people who overdose on drugs. Reducing the longer-term costs is important, but these shorter-term costs have special relevance in the context of health care

reform, since they promise more immediate savings. While substance abuse will never be eliminated entirely, some consequences are so immediate that even gradual reductions in use will produce savings in the short term.

Medicaid and Substance Abuse

Medicaid was chosen as the initial area for analysis for a variety of reasons. First, the skyrocketing costs of the Medicaid program top the concerns of nearly every governor in our nation. The program does not provide adequate health care to poor people, yet its costs are breaking state budgets. The current crisis prompted the Henry J. Kaiser Family Foundation to create a commission to examine Medicaid and investigate ways to improve the program while containing costs.

Second, the Medicaid program covers a large number of pregnant women and children. Substance abuse has a significant impact not only on pregnancy and birth outcomes but also on life-long health care costs for infants born to substance-abusing mothers. Lastly, the growing problem and mounting costs of AIDS is disproportionately borne by the Medicaid program since it is often the payer of last resort for a population disenfranchised from the private insurance system.

In any assessment of where best to target limited resources, the impact of substance abuse on Medicaid expenditures must be considered. This study demonstrates that substance abuse takes a heavy toll on already limited Federal and state tax dollars, yet there is no explicit

reimbursement of substance abuse treatment or prevention services under Medicaid, nor are states required to offer such benefits (though some states offer limited services).

Substance abuse is not a problem only for Medicaid recipients, nor are they necessarily the most costly population in this regard. Smoking, alcohol and drug abuse are equal opportunity problems affecting all segments of our society regardless of income, race or social status. Indeed, the techniques we have developed to analyze Medicaid costs through medical and epidemiologic evidence forms the foundation for our broader study of the relationship between substance abuse and morbidity across all populations and all payers.

Background

Enacted in 1965, Medicaid was intended to take care of the medical needs of low-income individuals who were either part of families with dependent children, permanently and totally disabled, or elderly. The program is not only directed at the acute care needs of this population, but also finances long-term care for the needy elderly and chronically ill.

Unlike Medicare, which is considered social insurance and funded through a combination of payroll taxes, premiums, and general Federal revenues, Medicaid is a welfare program, with eligibility linked to the Aid to Families with Dependent Children (AFDC) and Supplemental Security Income (SSI) programs, and is funded through general revenues generated by the states and Federal government.

Medicaid is a state-administered program in which the Federal government matches state payments on a formula basis. While all states are required to meet certain federal requirements with respect to eligibility and benefits, considerable latitude is permitted in determining eligibility, the inclusion of additional benefits, and the method and level of payment for services.

In fiscal year 1994, the combined Federal and state payments under the Medicaid program are estimated to reach $146 billion. Of this, total hospital costs (including psychiatric facilities) will represent 28 percent or $41 billion. Since 1980, Medicaid costs have grown at an annual average rate of 13 percent, as opposed to only a 4.4 percent annual increase in the Consumer Price Index (CPI).

II. METHODS

Many studies have sought to estimate the cost of substance abuse, in one form or another, to society (See Chapter V). For the most part, these studies have analyzed the cost of one or two substances. None has estimated the costs of all substances to a particular insurer.

While building upon earlier work, we go beyond it in a number of ways. CASA's study quantifies in a single report the total cost of substance abuse in all its forms (tobacco, alcohol, and legal and illegal drugs). It enlarges earlier efforts to incorporate findings from epidemiologic research in health care cost analyses. Based on the best available epidemiologic studies, we have determined the proportion of patients who acquired diseases or conditions as a result of the abuse of alcohol, drugs, or tobacco. These related costs are factored into our total cost estimate. Finally, this study suggests areas for further research and for new policy directions to address the problem of substance abuse and its costs.

The following section briefly describes CASA's methodology for estimating Medicaid inpatient hospital costs related to substance abuse. A technical paper describing this methodology in more detail is being prepared for subsequent publication.

General Hospital Inpatient Costs

In order to estimate hospital costs associated with substance abuse, we have divided these costs into four general categories:

1) Direct treatment of substance abuse;

2) Treatment of medical conditions totally attributable to substance abuse;

3) Treatment of medical conditions where substance abuse is a major risk factor; and

4) Treatment for medical conditions whose length of stay was extended due to complications arising from a secondary diagnosis of substance abuse.

We calculated the costs for each category by multiplying the number of hospital days attributable to substance abuse for the diseases and conditions in each category by an average inpatient hospital cost per day. To estimate the number of Medicaid substance abuse-related days in each category, we used hospital utilization data from the 1991 National Hospital Discharge Survey (NHDS) [1] applying the following criteria:

1) Direct Treatment - If the discharge had a primary diagnosis of either substance dependence or substance-induced psychosis or poisoning, the hospital stay was assumed to be for the direct treatment of the substance abuse problem. For these diagnoses, 100% of the hospital days were attributed to substance abuse.

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[1] *The National Hospital Discharge Survey is conducted annually by the National Center for Health Statistics. It is a national sample of more than 400 short-stay hospitals, producing over 200,000 discharges annually. The data are abstracted from the patients' medical records and include demographic information, up to five diagnoses coded according to the International Classification of Disease (ICD-9-CM), surgical procedures, length of stay, and expected source of payment. The sample is weighted to derive national estimates of hospital utilization.*

2) Treatment of Diseases Totally Attributable to Substance Abuse - In Category 1, the hospital stay was specifically for the treatment of the substance abuse problem. For this and the next category, the hospital stay was for treatment of a medical disease that may have been caused by the use or abuse of a substance. In this category are discharges that had a diagnosis that either specifically mentioned a substance in its name (e.g. alcoholic cirrhosis), or that the National Institute on Alcoholism and Alcohol Abuse considers as solely attributable to alcohol (e.g. pellagra), or that involve a secondary diagnosis of substance abuse in 100% of the NHDS cases reported (e.g. esophageal varices). Since the hospital stay was for medical treatment of diseases caused solely by substance abuse, 100% of these hospital days were attributed to substance abuse.

3) Treatment of Diseases Where Substance Abuse is a Major Risk Factor - From an extensive review of epidemiologic research (see Bibliography), CASA identified 72 conditions and diseases that have substance abuse as a major, but not the exclusive risk factor. These include diseases such as lung cancer and low birth weight associated with smoking; accidents and cardiovascular diseases associated with alcohol use; and premature strokes and AIDS associated with drug use. The prospective, population-based or case control studies used for this analysis often calculated (or provided sufficient data for CASA to calculate) a Population Attributable Risk (PAR) for a specific substance and disease. PAR is an epidemiologic term meaning the percentage of a given illness that could be prevented if the use of the substance were eliminated.[2] In other words, the

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[2] *These PARs are based on the best available epidemiologic research investigating the relationship between substance abuse and* ***morbidity****. For some diseases and conditions, there was clear evidence that a relationship exists between substance abuse and the occurrence of the condition, but prospective or case control studies which calculate PARs had not been conducted. In these cases, we employed other*

PAR for cigarettes and lung cancer is 87% indicating that 87% of lung cancers could have been prevented if there were no cigarette smoking. Based on extensive research, we assigned a PAR for each of the 72 substance-abuse related diseases (which are listed in the Appendix). With the help of a medical records coder, we then identified the diagnostic codes associated with these diseases. For each Medicaid discharge that involved any of these primary diagnoses, we multiplied the associated PAR for that disease by the total number of Medicaid days reported for that diagnosis to determine the days attributable to substance abuse.

Two health problems, AIDS and birth complications proved particularly difficult with respect to estimating their costs resulting from substance abuse. For example, determining AIDS days was difficult, given that an AIDS-related condition (such as pneumocystosis) is often the primary diagnosis and AIDS is only listed secondarily. In fact, only 10,000 Medicaid discharges had AIDS as the primary diagnosis, clearly an underestimate. To further complicate matters, not all cases that have AIDS as a secondary diagnosis are hospitalized due to AIDS: someone may be hospitalized for an appendicitis and only coincidentally have AIDS. Thus, these hospital days could not be attributed to AIDS or substance abuse. To get a more precise estimate of AIDS-related hospital days, we identified the primary diagnoses for all Medicaid discharges that had

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measures than PARs, including estimates from large surveys and from medical experts. For example, in the case of AIDS, we used 1992 Center for Disease Control (CDC) surveillance data to estimate the percentage of these cases that were caused by intravenous drug use (IVDU). This surveillance data does not establish causality, it merely categorizes new cases by the risk groups they fall into. In 1992, 55% of new pediatric AIDS cases, and 33% of adult cases fell into the IVDU risk group. We applied these percentages to total reported Medicaid AIDS days to estimate those that were substance abuse-related.

a secondary diagnosis of AIDS. Then, consulting with physicians specializing in AIDS care and research, we selected those primary diagnoses that are AIDS-related. These AIDS-related hospital days were added to the hospital days for patients discharged with a primary AIDS diagnosis and then multiplied by the percentage of Intravenous Drug Use (IVDU) as determined by the Center for Disease Control (CDC) AIDS Surveillance (see Footnote 1) to determine substance abuse related AIDS days.[3]

Birth complications also required special analysis. Since the abuse of a substance is not responsible for the admission (i.e., the birth itself), but only for certain associated complications, we needed to calculate the marginal impact of those complications. For alcohol, the number of incremental days was a simple calculation of the difference in the number of days where alcohol was indicated as a secondary diagnosis. With respect to the impact of smoking, a PAR was applied to low birth weight babies and the number of days was calculated as described above. However, the length of stay for a normal neonate (2.3 days for each discharge) was deducted from this since, absent the complication, this number of days still would have been used. For cocaine-exposed babies, costs related to birth complications were estimated based upon a 1986 study by Phibbs, et al of the added days associated with babies exposed to cocaine and other drugs. The results of this study (based upon a multivariate analysis) estimated that, in

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[3]A similar problem exists for other diseases such as lung cancer where, after the initial diagnosis, future hospitalizations would be for other problems or procedures such as respiratory distress or chemotherapy. However, disentangling the overlap between alternative causes for these other diagnoses and those attributable to the lung cancer made it difficult to count those days in our estimates. Thus, there is reason to believe that our estimates are low since this problem would exist for a number of diagnoses.

the case of a baby exposed to cocaine, the average length of stay was eleven (11) days longer than for one without this exposure. To estimate the incremental days attributable to drugs, the total number of Medicaid births involving maternal cocaine use (8% of all births) was multiplied by 11 days.

4) Additional Days for Medical Treatment Due to Substance Abuse Complications - In addition to being a risk factor for getting certain illnesses, active substance abuse at the time of hospitalization can also complicate an illness and add to the patient's length of stay. For example, substance abuse can compromise the immune system, reducing the body's ability to fight infection or some substance abuse problems (e.g., delirium tremens) need to be stabilized before doctors can treat the primary medical condition. To estimate the cost of substance abuse comorbidity, we computed the difference in length of stay between those discharges with the same primary diagnosis with and without substance abuse as a secondary diagnoses, controlling for age and sex. The total number of incremental days identified in this way were counted as substance abuse-related Medicaid days.[4]

For each of these four categories, we estimated 1991 costs by multiplying the identified substance abuse-related days by an average hospital inpatient per diem cost of $750. This per diem estimate was based on 1990 Medicaid costs per day inflated by the hospital component of

[4] *With respect to this fourth category, our analysis understates the impact of substance abuse comorbidity due to limitations of medical reporting (See Underestimation Issues).*

the CPI to 1991 levels.

Psychiatric Hospital Inpatient Costs

Since the National Hospital Discharge Survey only includes general hospitals, we employed a different method to estimate substance abuse-related Medicaid psychiatric hospital inpatient costs. The 1991 Survey of the National Association of Psychiatric Health Systems indicates that 11% of patients in their facilities had a primary diagnosis of alcohol or substance-related disorders. Multiplying this percentage by 1991 Medicaid expenditures on psychiatric inpatient care, we estimated that substance abuse-related illness in psychiatric hospitals accounted for $238 million in Medicaid costs in 1991.

This is a conservative estimate of substance abuse's impact on psychiatric hospitals. Psychiatric hospitals often do not list substance abuse as the primary diagnosis because many insurers will not pay for psychiatric care unless the primary diagnoses is a specific psychiatric disorder. A large percentage of the psychiatric inpatient population are dual-diagnosed with a psychiatric disorder as the primary diagnosis and a substance abuse disorder as the secondary diagnoses. The limitations of our data restricted us from estimating the costs of these clients, but anecdotally we know that the dual-diagnosed population is increasing and that these clients use a much greater percentage of psychiatric hospital staff resources.

Underestimation Issues

These estimates of the cost of substance abuse to Medicaid are likely to be lower than the actual

costs. First, while we have attempted to pull together all available epidemiologic research on the health effects of substance abuse, more research is needed. Our results only reflect the current state of the art in this area.[5] Second, studies reveal that identification and reporting of substance abuse problems by medical practitioners is poor. For example, estimates of underreporting of substance abuse secondary diagnoses run as high as 60%. For reasons of confidentiality and concern over insurance reimbursement, physicians are reluctant to record substance abuse unless it relates directly to the primary diagnosis or the treatment plan. Assuming that only 40% of cases with substance abuse actually listed it on the medical record, the complicating costs of substance abuse comorbidity may be two and a half times higher than estimated here. Third, there is little identification of tobacco use or abuse of prescription medications on the medical record: our estimates only include the complications of alcohol and illicit drug abuse. Fourth, using an average hospital cost of $750 per day may be low if substance abusers require a greater intensity of services. For example, if substance abuse burn patients are more likely to stay longer in the Intensive Care Unit (ICU) at an average cost per

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[5] *The association between illegal drug use and resulting illness has not been as thoroughly studied as that of smoking and alcohol because drug use is less prevalent in the general population and more difficult to identify since subjects are reluctant to admit openly to illegal conduct. Alcohol studies are also somewhat limited, due in part to the greater difficulty in establishing level of use (self-reporting of alcohol use is less reliable than that of tobacco because heavy use of alcohol has a negative social stigma). Even for cigarette smoking, a great deal of research is available on illnesses highly prevalent in the population such as lung cancer and heart disease, but less is available for less prevalent diseases, such as Crohn's disease. Thus, our study only includes those diseases and conditions that have been clearly documented as related to substance abuse. We attempted to use the best research available, recognizing that the field of epidemiology is constantly evolving and sharpening its findings. Further inquiry into other related conditions would most likely significantly increase substance abuse-related Medicaid hospitalization costs.*

day of $3,000, these additional costs would not be captured in our analysis[6]. Finally, our estimates do not include general hospitalization costs of caring for people who join the Medicaid rolls, and benefit from its coverage, due to job loss, disability, or poverty, related to substance abuse.

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[6] *A study at Johns Hopkins Hospital revealed that 28 percent of 435 ICU admissions and 39 percent of ICU costs were substance abuse-related (Baldwin et al).*

III. RESULTS

In 1991, Medicaid spent $4.2 billion, or 19.2 percent, of its $21.6 billion in inpatient hospital expenditures on substance abuse-related care. Based upon these results, it is estimated that for fiscal year 1994, substance abuse related costs would rise to $7.4 billion. The largest share of Medicaid substance abuse costs in hospitals -- $3.4 billion or 81 percent of the total costs -- was for medical treatment of substance abuse-related illnesses and conditions and for the increased length of stay required for patients with a coexisting substance abuse disorder. Treatment for obvious substance abuse disorders such as drug overdoses, delirium tremens, drug or alcohol dependence and abuse, and substance abuse psychoses in general and psychiatric hospitals accounted for $0.7 billion of the $4.2 billion.

Most surprising, our analysis of the epidemiologic evidence reveals that 72 conditions requiring hospitalization are wholly or partially attributable to substance abuse (they are listed in the Appendix). And this list is probably not complete; though we reviewed more than 3,000 articles and papers, we were limited by what epidemiologic research has been done to date.

The following charts and tables display and describe our findings in detail.

Charts 1-4

Charts 1 and 2 summarize the impact of substance abuse on Medicaid inpatient hospital utilization and costs. Charts 3 and 4 break down these results by substance and by the short and long-term savings that can be accrued as a result of reducing substance abuse.

Substance abuse-related hospital care accounted for 19.2% of total Medicaid hospital costs and 20% of total days in 1991. The reason for the discrepancy between the percentage of costs and days is that some of the days are in psychiatric hospitals which have a lower average cost per day than that of acute care, general hospitals.

Chart 3 breaks down substance abuse-related costs by the substance involved. Tobacco and illicit drugs contribute more to Medicaid hospital costs than alcohol. The unexpectedly high proportion of hospitalizations attributed to illicit drug use is due to birth complications resulting from cocaine use (Phibbs et al). Since Medicaid disproportionately serves women and children, a very large share of overall Medicaid hospitalization costs are, therefore, for births and birth complications.

The drug-related costs associated with birth complications may be somewhat overstated: while a significant portion of these costs were attributable to drugs, some may also be attributable to alcohol since many drug addicts also abuse alcohol. The high correlation between drug and alcohol use among these pregnant women makes it hard to separate out the effects or determine

which substance is the real culprit. In either case, whether as a result of alcohol or drugs, or both, the problem of adverse birth outcomes is strongly associated with substance abuse.

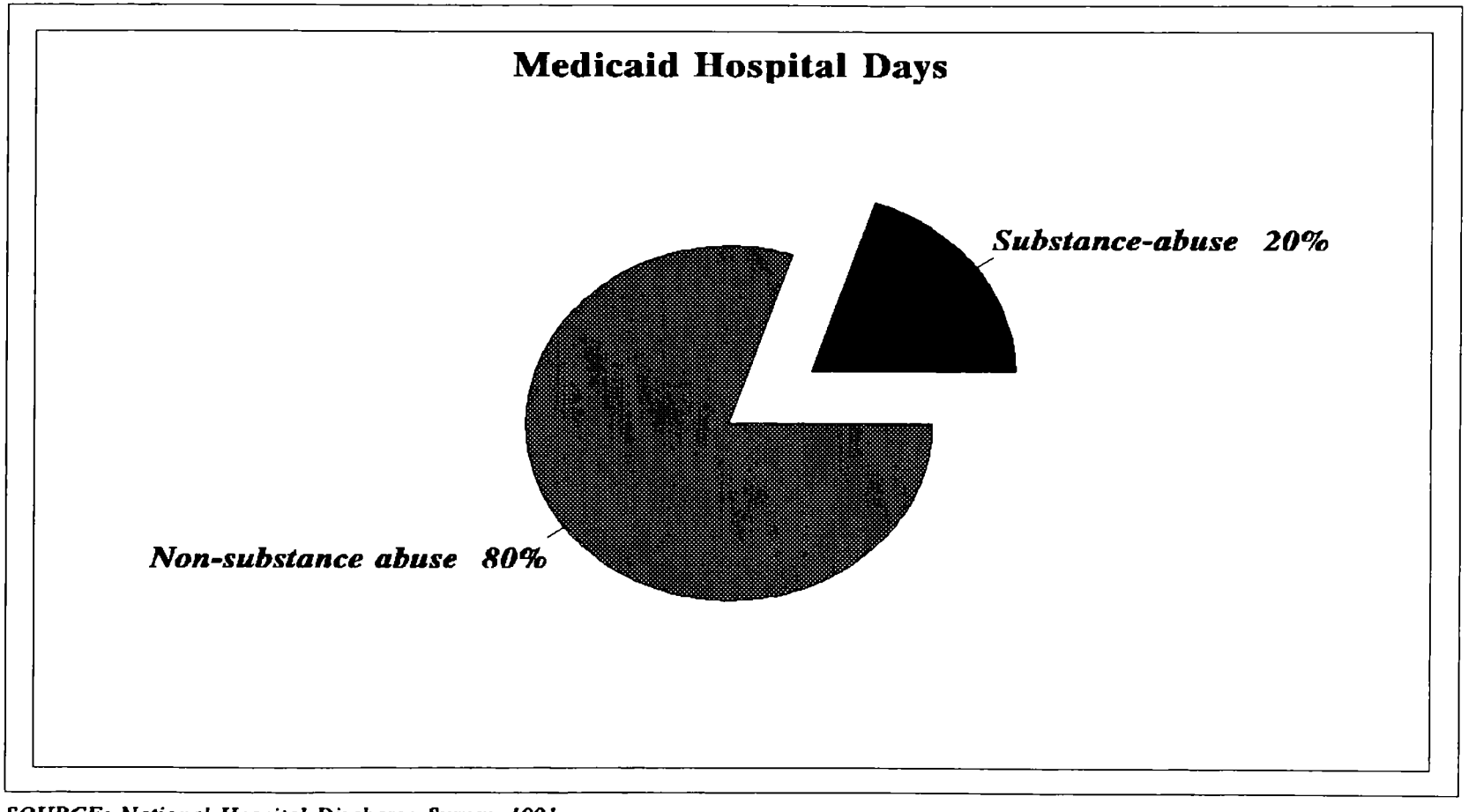
Chart 4 breaks down the short- and long-term impact of substance abuse on morbidity. The $2.93 billion total in Chart 4 does not add to the total in Chart 1, since Chart 4 includes only costs related to substance abuse as a risk factor in other conditions and does not take into account substance abuse as either a secondary diagnosis or a direct treatment cost. The reason for including this table is to note that reductions in substance abuse can have a real and immediate impact on costs. In the case of birth outcomes, trauma, AIDS, and strokes among younger people, reducing substance abuse can have a significant immediate effect on health spending. By contrast, in the case of diseases like lung cancer, where the disease is acquired through long term abuse of a substance, reducing current substance abuse will not immediately affect health care costs -- the savings would be accrued over time as less people in the future acquire those diseases.

Chart 1: Estimated 1991 Substance Abuse Impact on Medicaid Inpatient Hospital Costs

Substance Abuse-Related Costs	$4.2 billion
Total Hospital Costs	$21.6 billion
% of Total	19.2%

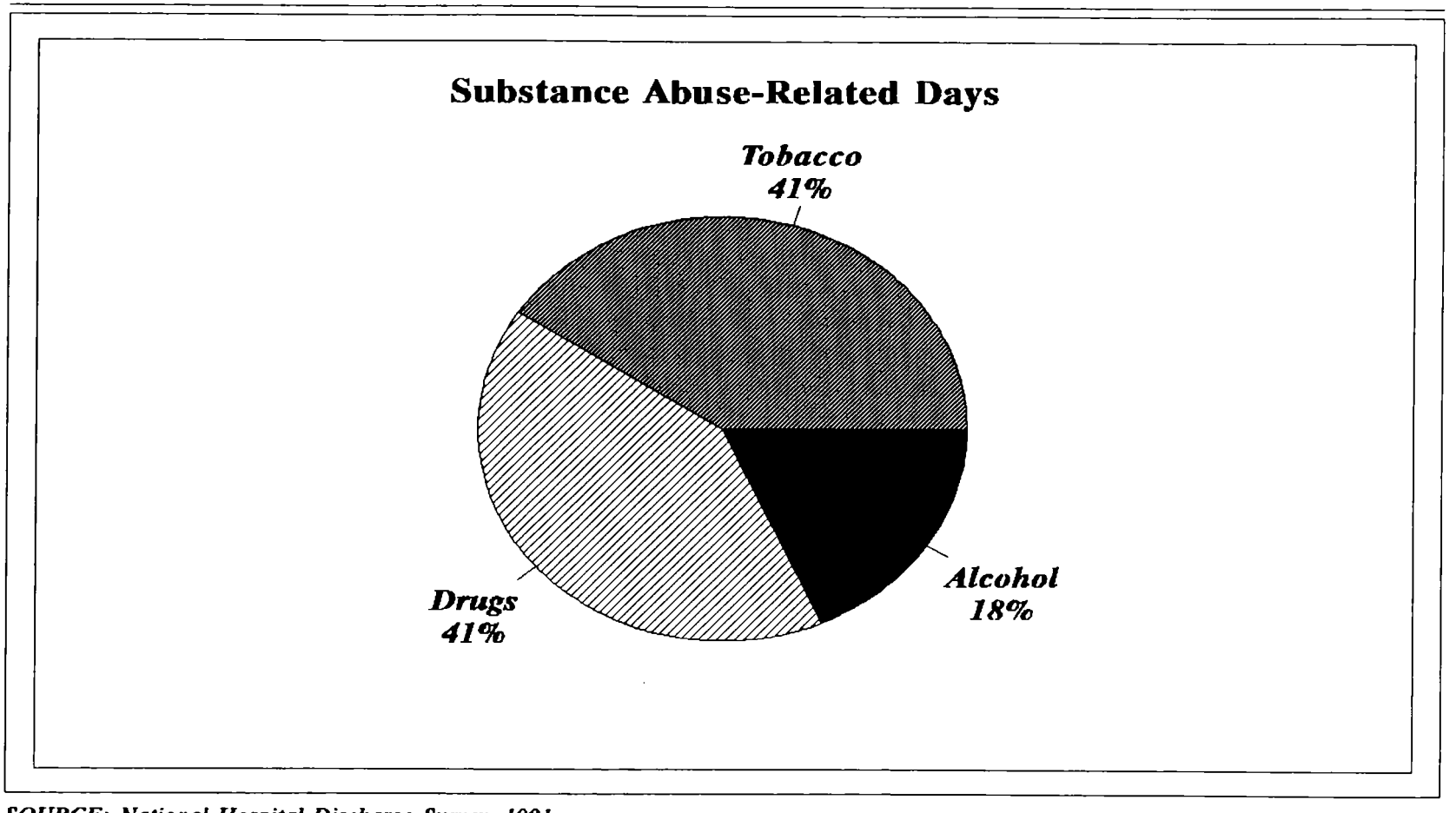
SOURCES: National Hospital Discharge Survey 1991; Health Care Financing Administration - Office of the Actuary - 1993 Medicaid Statistics

Chart 2: 1 out of 5 Medicaid Hospital Days Associated with Substance Abuse



SOURCE: National Hospital Discharge Survey, 1991.

Chart 3: Medicaid Substance Abuse-Related Hospital Days by Substance



SOURCE: National Hospital Discharge Survey, 1991.

Chart 4: Substance Abuse and Medicaid

Short and Long-Term Costs

- Short-term Costs $1.93 billion
- Long-term Costs $1.00 billion

Chart 5

Chart 5 breaks out the substance abuse costs in terms of the four categories of costs.

The largest share -- 71 percent -- of substance abuse costs are for treatment of diseases and conditions where substance abuse is a major risk factor. Direct treatment of substance abuse disorders, such as detox units, accounted for only 19 percent of substance abuse-related Medicaid costs.

Chart 5: Substance Abuse Costs to Medicaid

Total Hospital Care, 1991

			% of Total
1. Direct Treatment for Substance Abuse		$776,305,150	18.7
General Hospitals - Inpatient	$538,607,250		
Psychiatric Hospitals	$237,697,900		
2. Treatment for Diseases/Conditions Totally Attributable to Substance Abuse		$112,014,143	2.7
3. Treatment for Diseases/Conditions Where Substance Abuse Is a Major Risk Factor		$2,932,558,132	70.5
4. Additional Days Required for Patients with A Secondary Diagnosis of Substance Abuse		$336,461,250	8.1
Substance Abuse Total		$4,157,444,995	

SOURCES: National Hospital Discharge Survey, 1991; 1992 HCFA Statistics; National Association of Psychiatric Hospitals Annual Survey 1992.

Chart 6

Chart 6 details the direct treatment costs for substance abuse in general hospitals. These costs break down fairly evenly between alcohol and drugs. This chart does not include the approximately $240 million for substance abuse treatment in psychiatric facilities. The direct treatment costs in general hospitals are often not for any therapeutic treatment but, rather, for short-term treatment of immediate symptoms (e.g., stabilizing or detoxifying the patient). Costs in psychiatric hospitals include more long-term therapies such as psychotherapy and drug rehabilitation.

Chart 6: Medicaid Direct Treatment Days and Costs of Substance Abuse

in U.S. General Hospitals, 1991

DIRECT TREATMENT CLASSIFCIATION	DAYS	% of all Direct Treatment Days
Alcohol Dependence Syndrome	290,934	
Alcohol Psychoses	65,539	
Nondependent Alcohol Abuse	23,024	
Alcohol Poisoning	931	
SUBTOTAL - Alcohol	380,428	53%
Drug Dependence	218,066	
Drug Poisoning	53,095	
Nondependent Abuse of Drugs	51,861	
Drug Psychoses	14,692	
SUBTOTAL - Drugs	337,715	47%
DIRECT TREATMENT DAYS	718,143	100%
DIRECT TREATMENT COSTS (DIRECT TREATMENT DAYS X $750/day in 1991)	$538,607,250	

SOURCE: National Hospital Discharge Survey, 1991.

Charts 7-8

The next two charts portray in some detail the impact of substance abuse as a major risk factor in a variety of diseases. For 1991, 3.9 million hospital days costing Medicaid close to $3 billion dollars were due to diseases or trauma where substance abuse was a major attributable risk factor. These charts portray the pervasive impact substance abuse has on all aspects of health care. Babies born with complications due to the mother's abuse of substances during pregnancy are the major contributor to these costs and account for 32% of all Medicaid hospital days. Cardiovascular diseases (15.7%) and respiratory diseases (15.7%) are the second and third leading diseases where substance abuse is a major risk factor. The Appendix shows the specific attributable risks of the various substances to diseases identified through the review of the epidemiologic literature.

Chart 7: Medicaid Days for Diseases with Substance Abuse as a Major Risk Factor

U.S. General Hospitals, 1991

Disease/ Condition	Days	% of Total Days
Newborn/Neonate Complications	1,261,366	32.3
Cardiovascular Disease	614,463	15.7
Respiratory Disease	612,974	15.7
Burns/Trauma	355,791	9.1
Neoplasms	265,899	6.8
AIDS	211,627	5.4
Cerebrovascular Disease	189,406	4.8
Pregnancy Complications	155,483	4.0
Digestive Disease	113,343	2.9
Other	129,726	3.3
TOTAL 1991 MEDICAID DAYS	3,910,078	
TOTAL 1991 MEDICAID COSTS	$2,932,558,132	

SOURCES: National Hospital Discharge Survey, 1991;
CASA Substance Abuse Epidemiologic Database, 1993.

CHART 8: DETAILED BREAKDOWN OF MEDICAID DAYS ATTRIBUTABLE TO SUBSTANCE ABUSE AS A MAJOR RISK FACTOR

Disease	Days
AIDS	**211,627**
Complications in Pregnancy	**155,483**
Abortion	1,067
Abortion Placentae	4,878
Ectopic Pregnancy	23,970
Premature Rupture of Membrane	11,163
Spontaneous Abortion	11,452
Placenta Previa	40,981
Preterm Delivery	61,971
Neoplasms	**265,899**
Bladder	4,077
Brain	16,923
Breast	4,183
Cervix	8,873
Colon/Rectum	16,968
Esophagus	20,396
Kidney	5,953
Larynx	15,890
Liver	3,562
Lung	77,955
Oral Cavity	21,199
Pancreas	4,497
Stomach	12,503
Ureter	1,749
Other	51,171
Respiratory Disease	**612,974**
Asthma	102,447
Bronchitis	50,405
COPD	125,828
Emphysema	16,754
Influenza	7,237
Pneumonia	224,787
Other Respiratory	85,517

Disease	Days
Cardiovascular Disease	**614,463**
Cardiomyopathy	5,271
Coronary Heart Disease	324,114
Endocarditis	48,894
Hypertension	21,148
Myocardial Infarction	87,741
Peripheral Vascular Disease	127,296
Cerebrovascular Disease (Stroke)	**189,406**
Trauma	**339,478**
Burns	**16,313**
Newborns	**1,261,366**
Congenital Defects	79,616
Low Birth Weight	155,006
Birth w/Cocaine Complications	1,026,744
Digestive System	**113,343**
Crohn's Disease	7,516
Pancreatitis	84,468
Peptic Ulcer	1,102
Stomach Ulcers	9,470
Duodenal Ulcer	10,787
Other	**129,726**
Dementia	8,101
Epilepsy	14,878
Hepatitis A-C	5,756
Diabetes	3,405
Leukemia	40,243
Low Back Pain	4,026
Pelvic Inflammatory Disease	35,705
Rheumatoid Arthritis	9,832
Seizures	7,780
Total 1991 Days	**3,910,078**
Total 1991 Medicaid Costs	**2,932,558,132**

**Numbers may not add to total due to rounding*

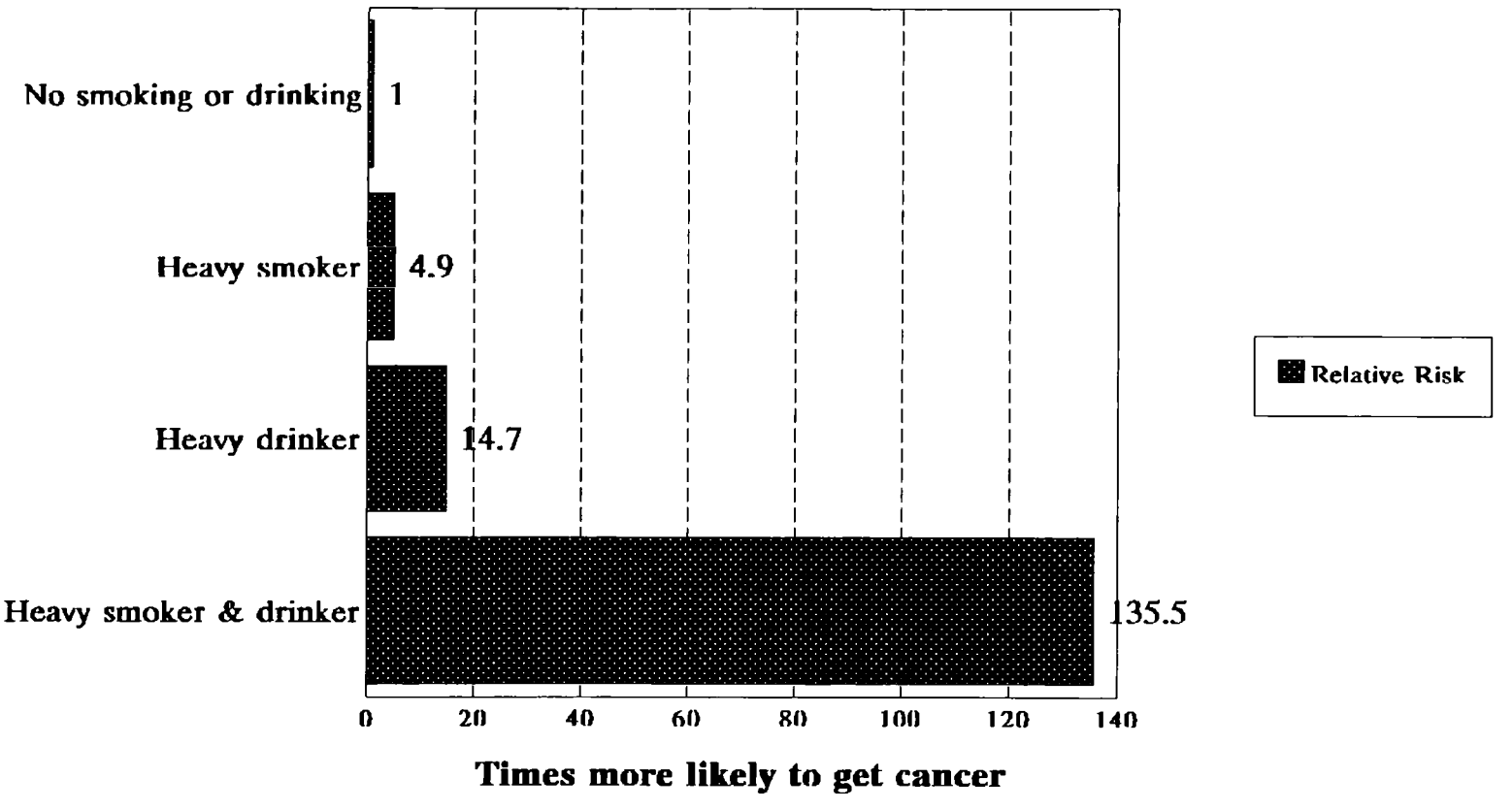
Chart 9

The attributable risks used for this study may understate the impact of substance abuse in precipitating some diseases because they were primarily based upon only one substance. People who abuse multiple substances have a much higher risk of getting these diseases than those who abuse only one substance. Our PARs do not take into account the synergistic effect of the abuse of multiple substances in part because epidemiologic research has not thoroughly assessed the synergistic effects of poly-substance use, and because prevalence rates for people who abuse more than one substance -- on Medicaid or in the general population -- are not available.

Chart 9 highlights the synergistic effect of dual-drug use: heavy drinking combined with heavy smoking dramatically increases the risk of throat cancer. People who smoke and drink are 135 times more likely to get throat cancer than those who abstain from both. In addition, they are 27 times more likely to get this disease than people who only smoke. This is also true for oral cavity cancer. Those who drink and smoke are 24 times more likely to contract oral cavity cancer than those who do not smoke or drink; they are 10 times more likely to contract this cancer than those who only drink.

Chart 9: Heavy Smoking and Drinking Increases the Risk of Throat Cancer Synergistically

Relative Risks for Hypopharyngeal/Epilaryngeal Cancer by Substance Abuse



SOURCE: Tuyns. Cancer of Larynx/Hypopharynx, Tobacco & Alcohol. Int. J. Cancer: 41, 483-491 (1988).

Charts 10 - 14

Charts 10 through 14 highlight the differences in length of stay for Medicaid patients with and without a secondary diagnosis of substance abuse -- by substance, by age and sex, and by selected diseases and conditions. As noted in the methods section, our estimates of the additional days of care required to treat patients with a secondary diagnosis of substance abuse are limited by the medical reporting of these problems.

Cigarette smoking is rarely if ever recorded as a secondary diagnosis: yet, for some conditions such as pneumonia continued heavy smoking lengthens the course of recovery.

Even for alcohol and drugs, studies show that as much as 60% of cases with secondary substance abuse problems go unrecorded. If true, many patients who have a substance abuse problem are incorrectly placed in the category of patients with no secondary diagnosis; since they have a longer average length of stay (ALOS), they artificially inflate the ALOS for the category without a substance abuse diagnosis, thus reducing the true difference in length of stay.

Moreover, the data can demonstrate a longer length of stay for many diseases where substance abuse is a comorbid condition, but they cannot portray the greater intensity of care that many of these patients must receive as a result of a substance abuse problem. As discussed above, many of the additional burn days may be spent in the Intensive Care Unit (ICU) where additional costs per day are much higher than the $750 average daily cost we used to compute cost differences in length of stay. This also understates the cost of substance abuse to Medicaid.

Chart 10 shows that the ALOS of the Medicaid patient without a secondary diagnosis of substance abuse is 4.99 days. When a patient has a secondary diagnosis of drug abuse the ALOS jumps to 8.4 days. With a secondary diagnosis of alcohol abuse, the ALOS increases to 8.94. If the patient has a secondary diagnosis of both alcohol and drug abuse, the ALOS jumps to 9.83 days, nearly double the ALOS for the patient without a secondary diagnosis of substance abuse. These figures represent average lengths of stay, but as can be seen from Charts 12-14, some diseases demonstrate much more significant differences.

The ALOS was in fact shorter for some patients with a secondary diagnosis of substance abuse. This does not imply that these patients benefitted from the use of alcohol or drugs. Rather, the differences probably result from an aberration in the data due to the small sample of patients within these diagnoses, or from the financial or social undesirability of these patients, which can lead to early discharge or transfer (dumping) to another facility. More research is needed to examine the disposition of such patients with respect to inadequate or incomplete medical care, or a lack of sufficient attention to treating their substance abuse problem.

Chart 11 compares the ALOS by sex and age for those with and without a secondary diagnosis of substance abuse. Males stay 4.2 days longer with a substance abuse problem, and females 3.1 days longer.

Much of the difference in ALOS in the under 15 age group is accounted for by the effect of substance abuse on newborns (see the next chart). Note that the ALOS is greater for both genders and all age levels for those with a secondary diagnosis of substance abuse with the exception of males in the 15-44 age bracket. Given the fact that Medicaid covers men in much

of the age range from 21 to 64 only when they have a serious and permanent disability, the "undesirable" hypothesis described previously may explain this, since this group includes those with chronic alcohol or drinking problems as well as those diagnosed as having both mental illness and chemical dependency problems. Hospitals may stabilize these individuals and then discharge or transfer them quickly to nursing homes or psychiatric facilities, accounting for their shorter length of stay.

According to **Chart 12**, babies born to mothers who abuse substances during pregnancy remain almost three times longer in the hospital than babies born to mothers who did not abuse substances. In utero substance abuse exposure often results in low birth weight, premature delivery, and its sequelae, mental retardation, and congenital malformations. Here again, the difference in ALOS does not include the effect of smoking during pregnancy, which would likely make these differences even more dramatic since smoking is associated with low birth weight and other adverse effects.

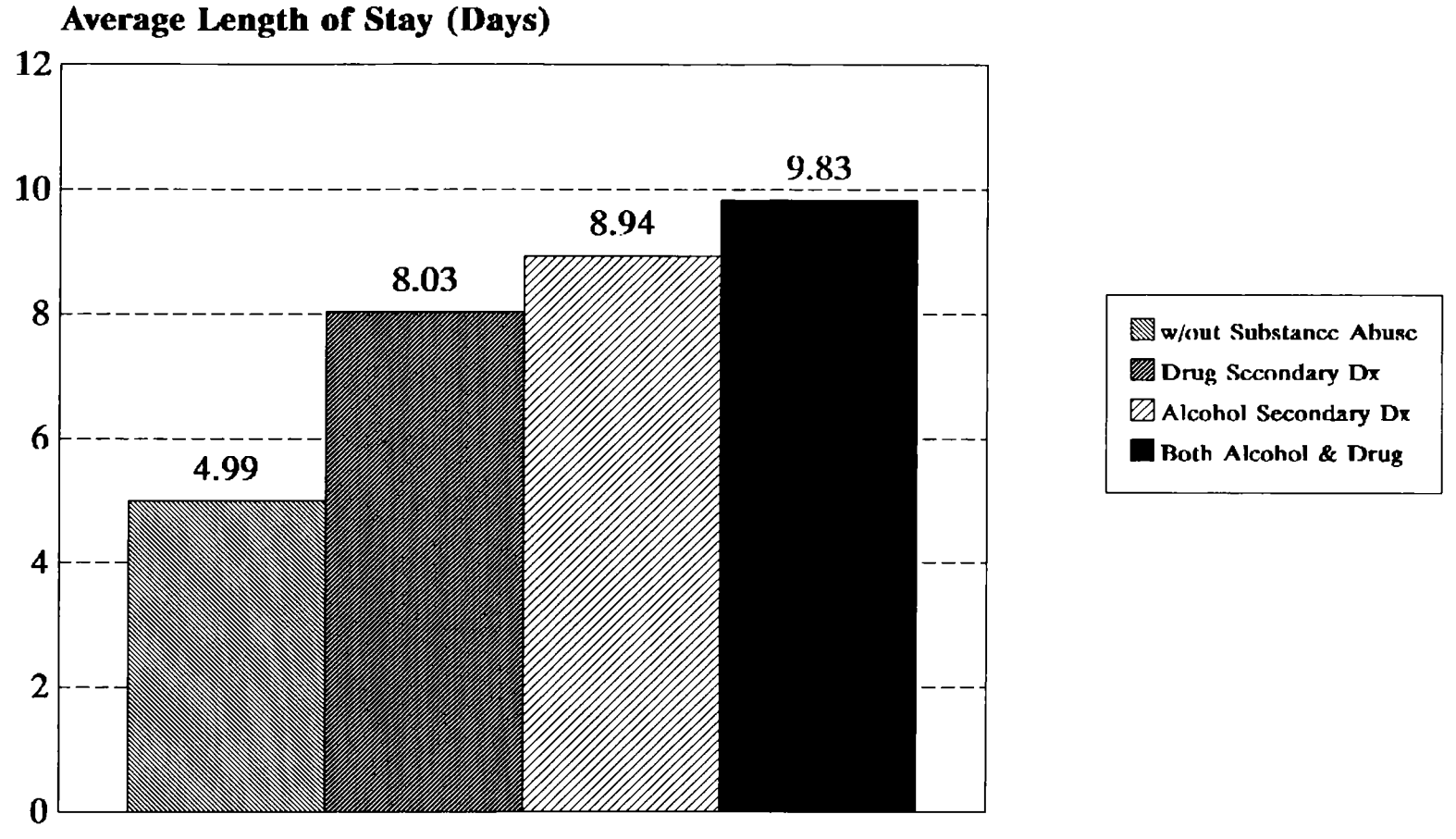
Chart 13 reveals that AIDS patients with substance abuse as a secondary diagnosis stay about one-third longer than those without this diagnosis. Nationwide, 32% of all adult and 55% of all pediatric AIDS cases are attributable to intravenous drug use. Considering that AIDS is a protracted disease that may take ten years or more to run its course and involves multiple hospital stays, the total impact of even a third longer length of stay has significant cost implications.

Medicaid patients with a primary diagnosis of burns, pneumonia, or septicemia and a secondary diagnosis of substance abuse stay more than twice as long in the hospital as Medicaid patients

with the same primary diagnosis but no substance abuse (**Chart 14**). For example, burn patients with a secondary diagnosis of substance abuse have an ALOS of 12.6 days compared to 5.6 days for burn patients without the secondary diagnosis.

Chart 10: Medicaid Length of Stay

With and Without Substance Abuse Secondary Dx



SOURCE: National Hospital Discharge Survey, 1991.

Chart 11: Medicaid Average Length of Stay, 1991

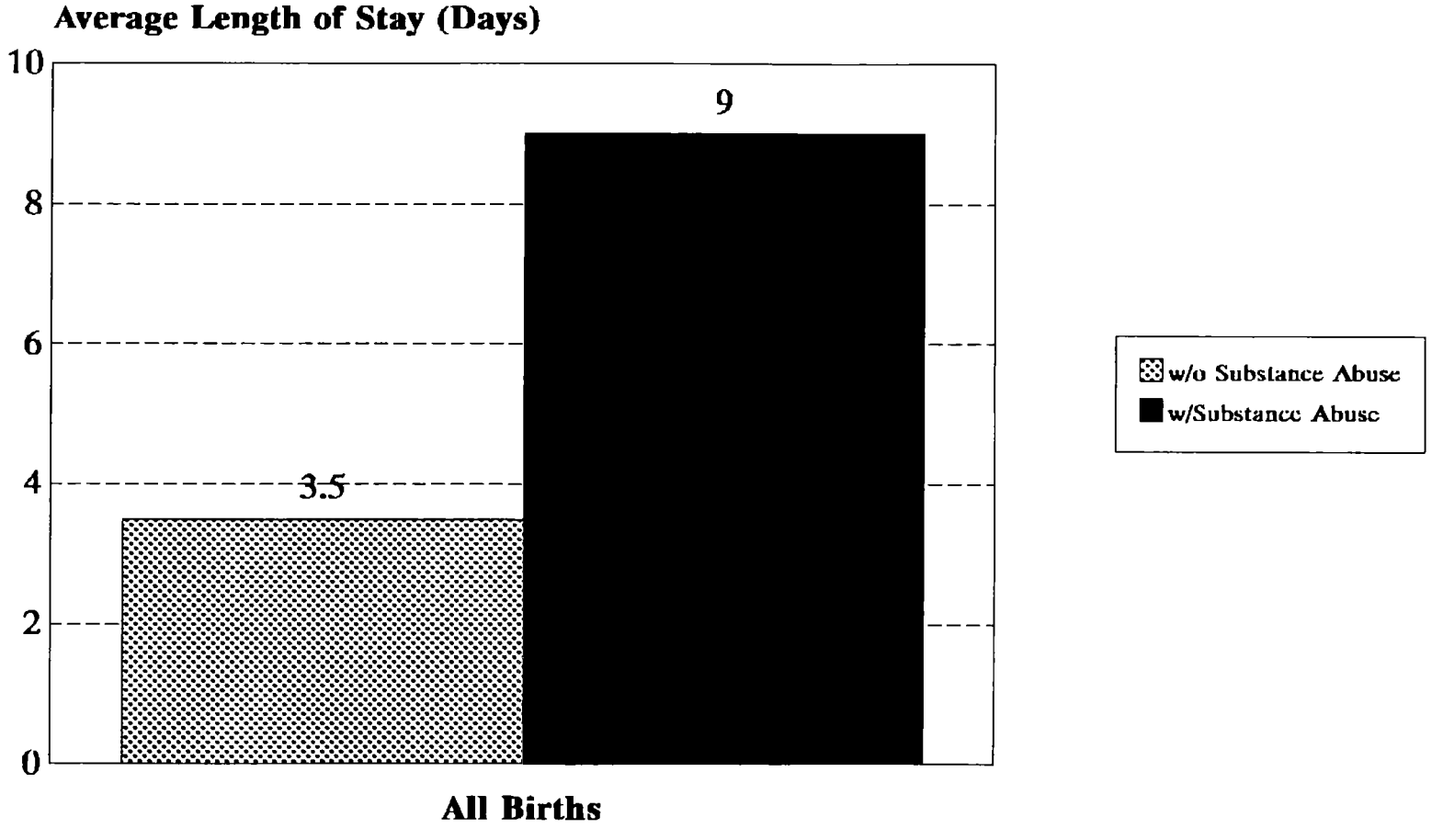
W/ and W/out Secondary Diagnosis of Substance Abuse

	Without Substance Abuse	**With** Substance Abuse	Total Additional Costs
Male	5.5	9.7	$101,577,000
<15	3.9	16.4	
15-44	9.9	8.8	
45-64	8.2	9.9	
65+	8.9	14.8	
Female	4.3	7.4	$234,884,250
<15	3.6	9.8	
15-44	3.7	6.8	
45-64	8.6	8.6	
65+	11.0	12.3	
TOTAL			$336,461,250

SOURCE: National Hospital Discharge Survey, 1991.

Chart 12: Babies Exposed to Substances Stay Longer

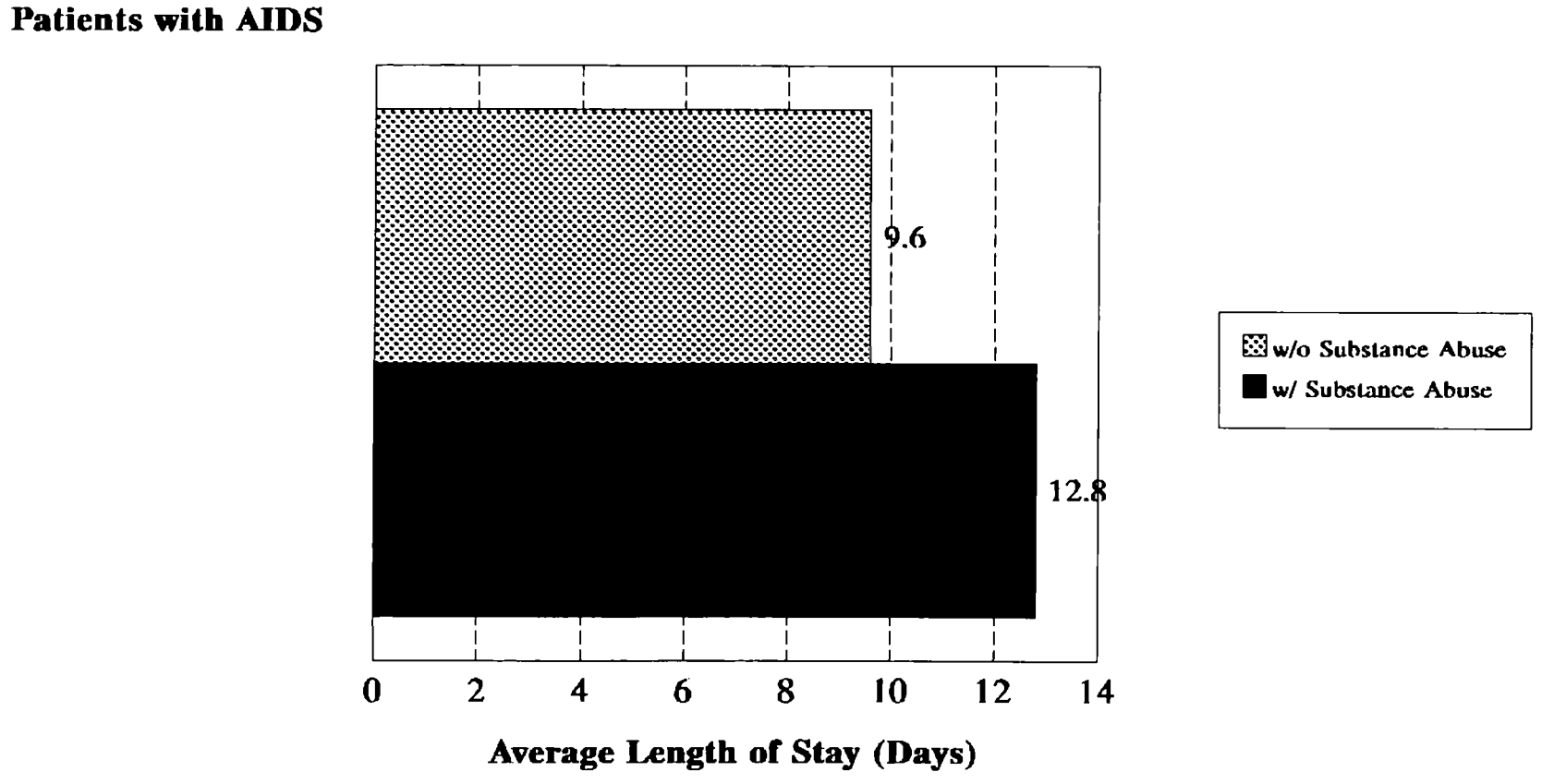
Average Length of Stay for Babies with and without Exposure to Substance Abuse



SOURCE: National Hospital Discharge Survey, 1991.

Chart 13: AIDS Patients with Secondary Diagnosis of Substance Abuse Stay Longer

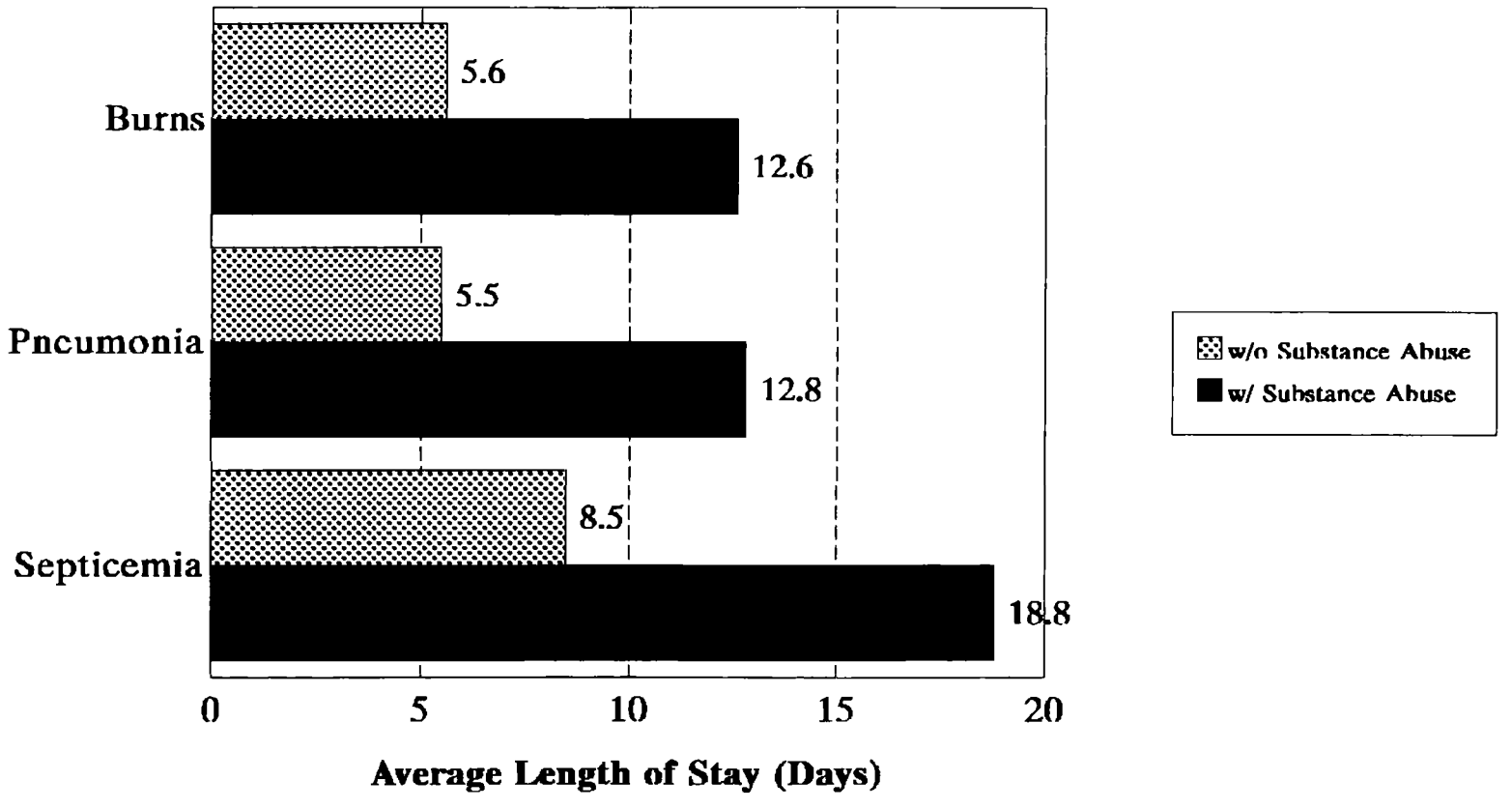
Average Length of Stay for Medicaid AIDS Patients with and without Substance Abuse



SOURCE: National Hospital Discharge Survey, 1991

Chart 14: Medicaid Patients with Secondary Diagnosis of Substance Abuse Stay Longer

Average Length of Stay for Medicaid Patients with and without Substance Abuse



SOURCE: National Hospital Discharge Survey, 1991.

Chart 15

This chart details the percentage of individuals in both the Medicaid and general populations who use each respective substance. The prevalence of drinking and drug use are projected from national figures from the National Health Interview Survey data adjusting for a larger female to male ratio in the Medicaid population (females have a lower drinking rate) and for a lower socio-economic status (those in lower socio-economic status have higher drinking prevalence). The figures do not account for overlapping use of drugs.

Medicaid-specific smoking prevalence rates by age and sex were obtained from the National Medical Expenditure Survey. The significantly higher percentages for smoking among the Medicaid population are of concern, particularly since these figures are most pronounced for women during their reproductive years.

The numbers on alcohol and drug use are self-reported. Since individuals tend to be reluctant to admit to alcohol abuse or illegal drug use, consumption rates for heavy alcohol use or drug use are likely to be significantly understated for the whole population, not just for Medicaid.

Chart 15: Consumption Rates for Medicaid and General Population

Substance	User category	Consumption Rate	
		Medicaid	General
Cigarettes	Current Smokers	42.7%	29.6%
	Former Smokers	14.3%	23.3%
Alcohol	Heavy Drinkers	10.4%	8%
Illicit Drugs	Drug Users	6.8%	5%

SOURCES: National Medical Expenditures Survey, 1987; National Health Interview Survey, 1991.

Chart 16

Chart 16 details how many pregnant women in the Medicaid population continue to smoke. These figures reflect an assumption that the 15% of Medicaid women stop smoking when they realize they are pregnant (the percentage that applies to women in lower socio-economic categories) as contrasted with a 21% decrease in smoking for women of higher socio-economic status.

The higher female to male ratio in the Medicaid population than in the general U.S. population, combined with a higher rate of cigarette smoking for Medicaid women during their reproductive years, contribute to the high Medicaid costs for birth complications and disorders.

Chart 16: Prevalence of Smoking in Pregnant Women

Medicaid and General Population, 1987

	Medicaid	General
Smoking Status:		
Current	43.7	23.4
Former	15.6	21.2
Never	40.8	55.4

Source: National Medical Expenditure Survey, 1987; Health, United States, 1991
National Health Interview Survey, 1990

Chart 17

In an era of competition, prospective payment and cost-consciousness, patients with comorbid substance abuse problems are less attractive to most hospitals. Since they are likely to use more resources, they may be less profitable to the institution than a patient without such complications. Patients perceived as socially and financially undesirable can place a hospital at a competitive disadvantage.

This problem can be seen most dramatically with respect to Medicaid where some form of prospective payment is used as the basis for reimbursement. For example, as Chart 17 indicates, patients with a secondary diagnosis of alcohol or drug use have an average case mix index that is 41% higher than for those patients without a secondary diagnosis. The case mix index is a measure of resource consumption for patients for a given group of diagnoses and often serves as the basis for payment. However, these patients stay on average 68% longer in the hospital than patients without a substance abuse problem. Thus, they may be more expensive than level of reimbursement would reflect. As a result, those hospitals that have a larger share of patients with substance abuse as a comorbid condition may be at serious financial disadvantage. This, in turn, makes such patients less attractive, and limits their access to hospital care.

Chart 17: Substance Abusers May Be Unprofitable Patients to Hospitals

	Case Mix	Length of Stay
Patients with a Secondary Dx of Substance Abuse	1.03	8.4
Patients without Substance Abuse	0.73	5.0
% Difference	41%	68%

SOURCE: National Hospital Discharge Survey, 1991.

IV. POLICY IMPLICATIONS

At least one in five dollars that Medicaid spends on hospital care is related to substance abuse. This finding of the CASA study, combined with its identification of over 70 medical conditions attributable in whole or in part to substance abuse, has profound implications for substance abuse prevention and treatment under the Medicaid program. Moreover, given the pervasiveness of smoking, and alcohol and drug abuse through all segments of American society, the implications go beyond Medicaid to the entire health care system in this country.

Investing in Research

We need to increase our support for research that will tell us what works in prevention and treatment, for whom, and at what cost. Through the Federal Agency for Health Care Policy and Research and the National Institutes of Health, we are currently investing a considerable amount of money in evaluating and identifying more cost-effective treatment approaches for a variety of medical problems. Given the tremendous cost of substance abuse and its impact on such a wide range of medical problems, greater investment in evaluating substance abuse treatment may yield even greater benefits in reducing morbidity and costs.

In addition, with respect to basic research into the causes of diseases, the Federal government invests almost $10 billion studying diseases such as AIDS, cancer and cardiovascular diseases. Yet, it spends only 5% of that amount on research into what causes substance addiction and abuse, a major risk factor for these and many other ailments.

Finally, while a considerable body of epidemiologic research already exists identifying the

relationship between various substances and morbidity, there are still many gaps in our knowledge base. The interaction of smoking with a wide range of diseases has been well established; yet, the research is much less thorough with respect to alcohol, and is even more sketchy for legal and illegal drugs. It is important that we get a better understanding of the risks presented to us by these substances separately and synergistically.

Guaranteeing Treatment

We need to ensure that appropriate substance abuse treatment and continuing care is available to all who need it and is covered in all public and private insurance programs. This includes coverage for treatment of all substance abuse, including cigarettes.[7] Currently, the Medicaid program has no explicit substance abuse treatment benefit and no mandate that the states provide such services. Limitations on the kinds of facilities and counselors who can be reimbursed further restricts access.[8]

Treatment in general appears to suffer from misplaced priorities. In a short-sighted effort to cut costs, and due to skepticism about treatment effectiveness, the Administration, Congress, and private payers have been cutting back on the kinds of treatment that they cover. The reduction in private coverage shifts more of the cost back to the public sector, including Medicaid.

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[7] *For Medicaid, the number of women in the reproductive years who smoke, combined with high rate of birth complications, argues strongly for smoking cessation programs.*

[8] *Medicaid is an underused resource with respect to substance abuse. For a more complete discussion of what is possible under the Medicaid program, CASA has recently (April, 1993) prepared a study entitled "Maximizing the Use of Medicaid Under the ACCESS Demonstration Program, An Opportunity for Change."*

A distinguished working group of 19 experts in drug abuse research and treatment convened by CASA in collaboration with The Brown University Center of Alcohol and Addiction studies, concluded in March of this year, that "the inclusion of a substance abuse treatment benefit is a vital part of true health system reform." In response to this concern, the group designed a low-cost comprehensive benefit package.[9]

Increasing Access

In addition to expanding the services covered under existing programs, we need to ensure that no one who needs help is excluded by virtue of being ineligible for coverage. Currently, low-income male IV drug users between the ages of 21 and 64 are ineligible to participate in the Medicaid program.

Finally, we need to target prevention and treatment efforts to high-cost, vulnerable individuals. Services must be made more accessible to attract at-risk but hard-to-reach individuals in inner city schools, shelters, community health centers, etc. Pregnant women are a particularly important group to reach. Substance abuse-related complications of newborns account for a staggering 32.3% of all Medicaid hospital days. Yet many treatment centers will not treat pregnant women because of concerns about legal liability. The GAO estimated that only about 11% of the pregnant women in need of drug treatment actually receive care.

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[9]*This document, available through CASA, was entitled "Recommendations on Substance Abuse Coverage and Health Care Reform." The paper was issued in March of this year.*

V. PREVIOUS RESEARCH

Alcohol and Other Drug Cost Studies

At present the most comprehensive studies on the economic costs of alcohol and other drug use are those commissioned by the Alcohol, Drug Abuse and Mental Health Administration in the 1980s. Cruze (1981) and Harwood (1984) studied the combined cost impact of alcohol and drug abuse and mental illness to society. Both studies, conducted by the Research Triangle Institute (RTI), estimated the total economic impact of alcohol and drug abuse and mental illness (ADM) disorders, including the direct costs of diagnoses and treatment of patients suffering from these illnesses, indirect costs associated with loss of earnings due to reduced or lost productivity, premature death, and other related costs.

In their estimates of treatment and costs, the RTI studies refined previous estimates by "identifying specific diseases and illnesses that are related to alcohol, drug abuse, and mental illness (ADM) and allocating costs based on the proportions of the illnesses or diseases that are attributable to ADM." However, these attributable proportions were almost solely alcohol-related: no drug-related illnesses were included. In some cases, furthermore, estimates ranged from 0.2% to 70%. Nevertheless, this work did provide a analysis of the alcohol literature and established a clear link between epidemiologic research and cost analysis.

In 1988, Rice, et al updated Harwood's cost analysis. Like Harwood, Rice attempted to estimate the total societal costs of alcohol, drug abuse, and mental illness (direct health care costs only accounted for 24% of these total costs). For estimating direct health care costs, however, Rice did not use the attributable percentages employed by Harwood. Instead, she

created a methodology for addressing issues of comorbidity. Using the National Hospital Discharge Survey (NHDS), Rice first estimated the cost of alcohol, drug, or mental illness-related as a primary diagnoses following Harwood's model. Then, recognizing that secondary diagnoses of substance abuse complicates the treatment of other diseases and thus adds to hospital costs, Rice also calculated the additional days of care reported for all primary diagnoses that had a secondary ADM diagnosis. Rice acknowledges at the outset that her estimates are low, restricted by the information reported on the medical records. In fact, many studies have documented that underreporting of secondary diagnoses is common, especially for conditions such as substance abuse that do not require direct treatment but contribute to longer stays and are considered embarrassing by the patient.

Costs of Smoking

Quantifying the costs of smoking has been a major public health issue since the 1960's. Annually, the Surgeon General issues a report on smoking and health which summarizes all current epidemiologic evidence on the relationship between smoking and disease and death. The most noteworthy of these was *Reducing Health Consequences of Smoking: 25 Years of Progress*, issued in 1989, which reported smoking attributable fractions (SAFs) for ten selected causes of death using data collected in a four year, fifty state study conducted by the National Cancer Society. These SAFs represent the proportion of deaths for a given disease that could have been avoided if cigarette smoking were eliminated.

Many economic cost studies have relied on these estimates to calculate the number of smoking-attributable deaths for specific regions and the number of years of potential life lost as a result of smoking. Some have also employed these mortality statistics to estimate hospital utilization

and costs. However, mortality SAFs, which measure smokers' risk of dying of a disease, are different than morbidity SAFs, or smokers' risk of contracting a disease. Thus, mortality SAFs cannot be used reliably for estimating morbidity or hospital costs.

Recognizing the shortcomings of using mortality SAFs in estimating health care costs, Rice (1986) developed a different methodology for identifying smokers' attributable risk of using health services using NHIS data. For people who had neoplastic, circulatory, and respiratory diseases, Rice analyzed the use of hospital days and physician visits by smokers compared to non-smokers by age and sex. From these ratios, Rice was able to calculate morbidity attributable risks which she then applied to hospital and outpatient expenditures for these diseases to estimate annual smoking-related health care costs. While not as disease-specific as the mortality-based studies, Rice's methodology set a standard for estimating annual health care costs associated with smoking.

In addition to these point-in-time estimates, others have studied the lifetime costs of smoking. For example, Manning concludes that the cumulative impact of excess medical care required by smokers at all ages far outweighs shorter life expectancy. Hodgson using survey data from the National Medical Expenditures Survey (NMES) and the National Health Interview Survey (NHIS), breaks down the differences in smokers and non-smokers expenditures by payer, revealing that over the long term, payers that cover the younger age groups (i.e. private insurers and Medicaid) bear a greater burden of smokers' costs than does, for example, Medicare. These studies have current relevance in countering the arguments that measures designed to reduce smoking (e.g., increased cigarette tax) will, in fact, increase health care costs.

Other studies have estimated the costs of specific diseases (Harwood, 1985), of specific sub-populations (Phibbs, 1991; Rivo, 1990), of distinct hospital departments (Hauswald, 1989), and of state health expenditures (Rice, 1991; Spiegel, 1990) associated with one or more substance. Most of these studies employed some version of the Rice or Harwood methodology. CASA's study also starts with Rice and Harwood's previous work, incorporating both the concept of disease-specific attributable risks to substance abuse and the marginal affects of substance abuse as a secondary diagnosis.

APPENDIX

Diseases/Conditions Attributable to Substance Abuse in Epidemiologic Research

Disease Category	*Substance*	*Attributable Risks*
Abortion	Smoking	15%
AIDS - adults	I.V. Drug Use	32%
AIDS - <13 yrs.	I.V. Drug Use	55%
Anal Cancer	Smoking	46%
Angina Pectoris	Smoking	16%
Asthma	Smoking and Passive Smoke	27%
Bladder Cancer-males	Smoking	53%
Bladder Cancer-female	Smoking	43%
Brain Tumor	Smoking	20%
Brain Tumor	Alcohol	27%
Breast Cancer	Alcohol	13%
Burns	Alcohol and Drugs	25%
Cardiomyopathy	Alcohol	40%

Cataracts - Female	Smoking	6%
Cervical Cancer	Smoking	21%
Cheek and Gum Cancer	Smokeless Tobacco	87%
Cirrhosis	Alcohol	74%
Colorectal Cancer	Alcohol	17%
Congenital Defects	Smoking	21%
Congenital Syphillis	Cocaine	9%
COPD - Male	Smoking	84%
COPD - Female	Smoking	79%
Coronary Artery Disease	Smoking	74%
Coronary Heart Disease	Smoking	52%
Crohn's Disease	Smoking	59%
Dementia	Alcohol and Drugs	11%
Diabetes - Female	Smoking	8%
Duodenal Ulcers	Alcohol	5%
Duodenal Ulcers	Smoking	52%
Ectopic Pregnancy	Smoking	74%
Endocarditis	IV Drugs	75%

Epilepsy	Alcohol	30%
Esophageal Cancer	Alcohol and Smoking	80%
Head and Neck Cancer	Alcohol and Smoking	50%
Hepatitis A	IV Drugs	6%
Hepatitis B	IV Drugs	12%
Hepatitis C	IV Drugs	36%
Hypertension	Alcohol	11%
Influenza	Smoking	45%
Kidney Cancer	Smoking	33%
Laryngeal Cancer - Female	Alcohol and Smoking	80%
Laryngeal Cancer - Male	Alcohol and Smoking	94%
Leukemia	Smoking	30%
Liver Cancer	Alcohol	29%
Low Back Pain	Smoking	10%
Low Birth Weight	Smoking	42%
Lower Respiratory Illness (Acute Bronchitis & Pneumonia)	Passive Smoke	24%
Lung Cancer - Males	Smoking	88%
Lung Cancer - Females	Smoking	74%

Myocardial Infarction - Female	Smoking	76%
Myocardial Infarction - Male	Smoking	33%
Oral Cavity Cancer	Alcohol and Smokeless Tobacco	85%
Other Respir. Diseases - Male	Smoking	37%
Other Respir. Diseases - Female	Smoking	35%
Pancreatitis, Chronic	Alcohol	72%
Pancreatitis, Acute	Alcohol	47%
Pancreatic Cancer - Male	Smoking	41%
Pancreatic Cancer - Female	Smoking	19%
Pelvic Inflammatory Disease	Smoking	33%
Peptic Ulcers - Female	Smoking	29%
Peripheral Vascular Disease (PVD)	Smoking	75%
Perinatal Death	Smoking	17%
Periodontitis	Smoking	40%
Pharyngeal Cancer	Alcohol and Smoking	80%
Pneumonia-Female	Smoking	35%
Pneumonia-Male	Smoking	36%
Pregnancy - Bleeding	Smoking	19%
Pregnancy - Premature Rupture	Smoking	32%
Pregnancy - Spontan. Abortion	Smoking and Cocaine	41%
Pregnancy - Abrupt. Placentae	Smoking	42%

Pregnancy - Placenta Previa	Smoking	43%
Preterm Delivery	Smoking	25%
Renal Cancer - Male	Smoking	39%
Renal Cancer - Female	Smoking	32%
Renal Pelvis Cancer	Smoking	60%
Rheumatoid Arthritis	Smoking	17%
Seizures	Alcohol	41%
Stomach Cancer - Male	Smoking	39%
Stomach Cancer - Female	Smoking	33%
Stomach Ulcers	Alcohol	13%
Stomach Ulcers - Male	Smoking	34%
Stroke	Smoking and Cocaine	65%
Trauma	Alcohol and Drugs	40%
Tubal Pregnancy	Smoking	36%
Ureter Cancer	Smoking	71%

Databases

CASA Substance Abuse Epidemiologic Database, 1993. Based on a Medline search of studies establishing an epidemiologic link between the abuse of a substance and a medical disorder or disease. Included with each citation are the relative risks and the reported or calculated population attributable risk.

Health Care Financing Administration - Office of the Actuary - Medicaid Hospital Inpatient Data, F.Y. 1987-1982. A time series of actual Medicaid hospital expenditures.

National Association of Psychiatric Hospitals Annual Survey, 1992. A database of the clinical and administrative operations of 261 private psychiatric hospitals in the U.S. Trends in psychiatric discharges by principal diagnoses included alcohol related disorders and substance related disorders. Admissions are also broken down by payer.

National Health Interview Survey (NHIS), 1991. The 1991 National Center for Health Statistics survey on health status, acute and chronic conditions, and medical care use of the general U. S. population. Data is collected through personal household interviews of about 50,000 households involving 125,000 persons.

National Hospital Discharge Survey (NHDS), 1991. The 1991 survey of approximately 500 short-stay hospitals in the United States. Administered by the National Center for Health Statistics. Data is collected through a random sample of discharges and the associated medical records of some 200,000 cases. Data includes admissions, diagnoses, and procedures.

National Household Survey for Drug Abuse: Population Estimates, 1991. Approximately 32,600 households at 125 sampling units in the United States were interviewed in order to estimate the extent of drug abuse in the United States. The data was collected by the National Institute on Drug Abuse, US DHHS.

National Medical Expenditure Survey, 1987. 38,500 persons were interviewed in the Household Survey of the 1987 National Expenditure Survey (NMES). Along with many areas of health care utilization, population characteristics such as demographic and family relationships, income, disability, employment, health insurance status, and utilization data were collected. For our study, we used NMES data on the prevalence and levels of smoking.

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