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The Social Costs of Adolescent Problem Behavior

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This chapter examines the costs to society of having young people with multiple problem behaviors. Most people recognize intuitively that young people who break into homes, drink and drive, or abuse drugs are doing harm to themselves and others, but public discussions about these problems seldom take into account empirical analysis of the cost of those harms.

Why consider costs? One reason is that costs provide a single compact measure that summarizes such diverse outcomes as dropouts from high school, rapes, broken legs, and drug overdoses. Legislators, media, and the public can readily grasp costs. Costs communicate problem size clearly and illuminate policy relevance. For example, a minor's consumption of one can of beer results in an average of \$1.15 in medical and work loss costs (Levy, Miller, & Cox, 1999). Yet, that beer costs only \$.75, including \$.35 of gross profit (Miller Brewing Company, 2000). Can \$1.15 of social harm for a \$.35 profit possibly be worth it?

Another reason for assessing annual costs is to compare the importance of different problems in a fair way. For example, the interpersonal violence attributable to underage drinking costs almost 20 times what associated suicides cost (Levy et al., 1999). As Weimer and Vining (1989) point out, however, cost differentials alone do not tell us what in-

tervention investments make the most sense. Because resources are always scarce, the priorities for investment may be the interventions that will yield the greatest problem reduction for the funds available, even if they address only narrow parts of the overall problem.

Consistent with the youth problems examined in the previous chapter, this chapter considers the costs of a series of problems or harms related to high-risk behavior by youth. We were able to find or derive costs for the following problems:

1. Violent crime—events where a youth deliberately killed or injured someone or attempted to injure someone, including all child abuse and neglect by youth.
2. Property crime related to violence or substance abuse—burglary, larceny/theft, and motor vehicle theft committed by violent youth or substance-abusing youth.
3. Binge drinking—drinking five or more drinks of alcohol on one occasion. Binge drinking substantially impairs motor skills and judgment. It increases the risk of injury and death while driving and injury from non-motor vehicle trauma, such as drowning and fires.
4. Heroin and/or cocaine abuse—youth using these addictive drugs at least three times in the past year, which puts a youth at great risk of developing a need to maintain their regular administration well into adulthood.
5. High-risk sex—youth having heterosexual or male homosexual intercourse without protection. High-risk sex poses risks of infection, including HIV and sexually transmitted diseases, and unwanted pregnancy.
6. Smoking—smoking tobacco products, which are highly addictive, at least three times in the past month. This level of tobacco use poses a severe risk of dependency, resulting in premature death.
7. High school dropout—youth leaving high school before graduation and thus not completing the requirements of a high school diploma. Dropout often results from high-risk sex, substance abuse, or delinquency. As such, it may be an additional outcome of these problems. Because it is not specific to any one problem, however, we chose to cost this problem separately rather than trying to allocate its incidence among those problem behaviors.
8. Suicide acts—often link to other high-risk youth behavior or stem from victimization of other youth by risk takers. Although we explore the link to substance abuse, we largely cost suicide

acts separately. Many, but not all, probably result from high-risk youth behavior.

COST CONCEPTS

It is possible to evaluate the cost of an event from a number of different perspectives. As recommended by the U.S. Panel on Cost-Effectiveness in Health and Medicine (Gold, Siegel, Russell, & Weinstein, 1996), we estimated costs from society's perspective, also called social costs. That perspective enumerates all costs associated with social problems: costs to victims, families, government, insurers, and taxpayers.

This contrasts with methods in which costs to government, to insurers, or to employers are computed separately. When evaluating minimum-drinking-age laws, driver blood alcohol limits, and other laws that interfere with personal freedom, economists often focus only on external costs—the costs to people other than the person whose behavior is constrained. The rationale is that high external costs justify public intervention. However, this chapter does not differentiate external or government costs from internal costs. Thus, in our data, government would not recoup all the cost savings that resulted from reducing youth behavioral problems; others would reap much of the savings.

The societal cost perspective poses conundrums when applied to problem behaviors. Some economists argue that money stolen is not a societal cost. Rather, it is a transfer of income from the rightful owner to the thief. Applying this same logic, a smaller group of economists would claim a date rape gave sexual pleasure to the rapist, a benefit that is lost if the rape is prevented. This obviously goes against most people's understanding of the basic social contract. Our method of costing adopts William Trumbull's (1990) approach. We do not count gains criminals and sinners get illegally as societal benefits, nor do we view prevention of those gains as a loss. In proscribing these actions, legislatures implicitly state that the gains are ill gotten and do not benefit society.

Costs can be prevalence or incidence based. Prevalence-based costs measure all problem-related expenses during one year, regardless of when the problem occurred. For example, the prevalence-based cost of lung cancer in 1996 measures the total health care spending on lung cancer and its sequelae during 1996, including spending on patients diagnosed years earlier. Prevalence-based costs are computed by summing all costs incurred during the year. They are used to understand health care spending, evaluate cost controls, and describe the cumulative burden that society currently bears because of past problem behaviors. We esti-

mate the prevalence-based costs that youth problem behaviors caused during 1998.

Incidence-based costs sum the lifetime costs expected to result from problems that began during a single year. For example, the incidence-based cost of lung cancer in 1996 estimates present and future medical spending associated with all lung cancers diagnosed in 1996. Incidence-based costs are computed by multiplying the number of new victims times lifetime cost per victim. They measure the savings that prevention can yield. We provide incidence-based estimates of costs per youth involved by problem behavior (e.g., the cost of a teen's criminal career).

Investments earn interest. In incidence-based costing, therefore, it is necessary to discount future costs to present value. This demonstrates the amount needed to invest today to pay future costs as they arise. The Panel on Cost-Effectiveness in Health and Medicine (Gold et al., 1996) recommends that all cost-savings analyses include an estimate at a 3% discount rate to accommodate cross-study comparisons. We used that recommendation.

Cost Categories and Measurement Methods

Our costing efforts largely update or extend existing estimates. We separated societal burden of youth problem behavior into four cost categories.

Medical costs include emergency transport, medical, hospital, rehabilitation, mental health, pharmaceutical, ancillary, and related treatment costs, as well as funeral/coroner expenses for fatalities and administrative costs of processing medical payments to providers.

Other resource costs include police, fire, legal/court, prison/probation, foster care, and child protective services, plus the costs of property damage or loss. A difficult question here is whether to include intervention costs (e.g., the spending on security guards and alarm systems, police patrol and ambulance stations, or the National Highway Traffic Safety Administration) in problem costs. A reasonable guideline is to include these costs only when evaluating a problem or intervention impact that is so large that eliminating it would substantially reduce the need for these prevention services. For example, eliminating alcohol-attributable violence would reduce total violence by perhaps 15%, with an even smaller effect on violence by strangers (Harwood, Fountain, & Fountain, 1999; Harwood, Fountain, & Livermore, 1999; Miller, Fisher, & Cohen, 2001). That might marginally reduce security spending but it would not greatly reduce it. Therefore, this chapter excludes intervention costs.

Because they are paid out of pocket, travel-delay costs for uninjured

travelers delayed by road crashes and the injuries they cause and employer productivity losses caused by temporary or permanent worker absence (e.g., the cost of hiring and training replacement workers) are included as resource costs. One could argue for counting these costs as work losses instead.

Work loss costs include victims' wage losses, the replacement cost of lost household work, fringe benefits, and the administrative costs of processing compensation for lost earnings through litigation, insurance, or public welfare programs such as food stamps and Supplemental Security Income. Victim work loss has two components: short-term losses during acute recovery and lifetime losses due to death or permanent work-related disability. Children under age 15 will not lose work in the short term. When injured children are impaired sufficiently that they would not have been able to work if they had been employed, someone else generally will lose work while serving as a caregiver. We assume work loss by family and friends equals the loss that normally occurs when an adult suffers a comparable injury. For other age groups, the value of lost work depends on the work that someone of the victim's age and sex normally would do and the amount such an individual would earn. We can estimate household workdays lost from the days of paid work lost (Miller, 1993). These days are valued at the wages paid for comparable tasks (e.g., cooking, cleaning, and childcare).

Quality of life includes the value of pain, suffering, and quality-of-life loss to victims and their families. While measuring medical and other resource costs and work losses in monetary terms is obviously possible to do, placing a monetary value on pain, suffering, and lost quality of life is challenging and controversial. For this reason, we first quantify this portion of burden with a nonmonetary measure, quality-adjusted life years (QALYs). A QALY is a health outcome measure that assigns a value of 1 to a year of perfect health and 0 to death (Gold et al., 1996). The duration and severity of the health problem determine the QALY loss. The fraction of perfect health lost for each year that a victim is recovering from a health problem or living with a residual disability is estimated and then summed over years. When people die, economists assume a loss of a full QALY per life-year, a conventional assumption that ignores preexisting conditions and the general decline in health as people age. As Gold et al. (1996) recommend, like costs, we discount future QALY losses to present value at a 3% discount rate.

The most practical way to assess health-related quality of life losses from a community viewpoint involves a two-step process. In the first step, one creates a set of scales for rating health states (i.e., physical and emotional health status). The public then answers polls to determine how society values the different health states relative to optimal health

and to death. A good measure allows people to rate some fates as worse than death.

In the second step, either patient survey/observation or expert physician judgment is used to estimate the temporal pattern of health status changes over time that result from a medical problem. The rating scale then is used to estimate lost utility (an economist's measure of the relative value people place on different goods). The result is an estimate of the QALYs lost to the medical problem.

How do we put a monetary figure on QALYs? For death, pain, suffering, and lost quality of life are best valued in dollars using an approach economists call willingness to pay. This approach derives the value of pain and suffering by asking people what they are willing to pay for or by studying what people actually pay for small changes in their chance of death or injury. The value of reducing the risk of death, aggregated over many people, yields the value of a statistical life. For example, suppose a study estimated that the average person spends \$300 on optional auto safety features that reduce the chance of dying prematurely by 1 in 10,000. Dividing \$300 by the 1 in 10,000 probability yields a \$3 million value per statistical life. That value has two components: (1) the value of the foregone future work and (2) the value of the pain, suffering, grief, lost companionship, and lost quality of life. The value of lost future work is known. Subtracting it leaves the value of the intangibles (Arthur, 1981; Miller, Calhoun, & Arthur, 1989). Importantly, when this subtraction-based method is used to value lost quality of life, the total cost of an injury or illness becomes insensitive to the work-loss estimate and is determined by the risk reduction value.

The values for lost quality of life in this book use the estimated mean value of statistical life across 67 studies that Miller (1990, 2000) rated as technically sound. The estimated mean value of statistical life in the United States is \$3.25 million in 1999 after-tax dollars. This value is conservative. Individual value estimates vary widely around it, with a standard deviation of \$.7 million if only studies that Miller (1990) considered sound are included. Miller (1990) modified many published values to remove inappropriate biases. Without these somewhat arbitrary adjustments, Viscusi (1993) recommends a value of \$3–5 million. Fisher, Chestnut, and Violette (1989) recommend a \$1–8 million range, and a meta-analysis (Miller, 2000) suggests a \$3.3–4.5 million range, with a best estimate of \$3.7 million. Although these uncertainties seem quite large, they are no larger on a percentage basis than the uncertainty ranges around many intervention effectiveness estimates.

Depending on the nonfatal outcome considered, in order of preference, we used one of three methods to place a dollar value on pain, suffering, and lost quality of life:

1. Monetization of estimated QALY loss.
2. Analysis of jury awards for noneconomic damages.
3. Multiplication of work losses by the average ratio of QALYs to work loss across all nonfatal injuries to get a low-cost order-of-magnitude estimate.

Working from a general equilibrium model of the economy, Miller et al. (1989) show that the value of a statistical life times the percentage utility loss associated with a nonfatal outcome equals the willingness to pay to avoid that outcome. QALY systems measure the desired utility loss if calibrated so that optimal health has a value of 1, death has a value of 0, and fates worse than death are allowed.

We can estimate the value of reducing risk by one QALY readily from the value of statistical life by:

1. Assuming the value per QALY does not vary with age or sex.
2. Subtracting lifetime work loss from the value of statistical life to avoid double-counting.
3. Dividing the remainder by the expected years of healthy lifespan saved per life saved (discounted to present value). Multiplying the discounted years of expected healthy life lost for someone in a specific age group times the QALY value and dividing by the mean discounted all-victim lifespan yields a value of a statistical life tailored by age and sex.

With a \$3.25 million value of statistical life, a QALY of healthy life expectancy is worth \$135,000 (at a 3% discount rate in 1999 U.S. dollars). Although validation of this QALY value has been limited, some investigations support QALY use as a reasonable estimate. Miller et al. (1989) used it to accurately predict values of asthma risk reduction obtained in a subsequent survey. For assaults (Miller, Cohen, & Wiersema, 1996), consumer product injuries (Lawrence, Miller, Jensen, Fisher, & Zamula, 2000), and drunk driving (Smith, 1998), the pain and suffering component of jury verdicts can be predicted well from QALY losses (r^2 0.5 in log-linear regressions), with juries valuing QALYs consistent with a value of statistical life of \$1.9–4.4 million. Thus, QALY costs measure real and tangible losses. The theoretical framework for the jury verdict method comes from Cohen (1988), Viscusi (1988), and Rodgers (1993). The basic notion is that pain and suffering to a survivor can be approximated by the difference between the amount of compensatory damages awarded by a jury minus the actual out-of-pocket charges associated with the injury. Miller et al. (1996) estimated pain and suffering for physical assaults from log-linear jury verdict regressions, then compared

the results with QALY estimates by diagnosis group (from Miller, Pindus, Douglass, & Rossman, 1995). Some individual estimates varied significantly, but the incidence weighted mean estimates from the two methods varied by only 5%. Thus, it is reasonable to mix medically based QALY estimates and ones estimated from U.S. jury verdicts.

In the hopes of avoiding controversy, we present both QALYs expressed as years lost and monetized QALYs. The strongest argument for monetizing QALYs is to permit comparisons between health sector investments and investments in other sectors. Valuing quality of life may be unfamiliar or disquieting. Given the wide range for the value of a statistical life and the slim validation of the implied QALY value, it also is difficult and controversial. Nevertheless, the ease of dealing with a single measure of costs, plus the ability to compare between health and other sectors make it a valuable supplement to economic cost and QALY loss estimates.

COSTING METHODS BY PROBLEM BEHAVIORS

We relied on prior studies whenever possible in estimating the costs of youth problem behavior. We found studies of the costs of heroin and cocaine abuse (Cohen, 1998), criminal careers (Cohen, 1998; Miller et al., 1996; Miller et al., 2001), high school dropout (Cohen, 1998), and underage drinking (Levy et al., 1999). We also found fragmentary studies of high-risk sexual behavior (notably Trussell, Koenig, Stewart, & Darroch, 1997; Wang et al., 2000) and smoking (Adams & Melvin, 1998; Cromwell, Bartosch, Fiore, Hasselblad, & Baker, 1997; Manning, Keeler, Newhouse, Sloss, & Wasserman, 1991). Every study probed only one of the annual costs of high-risk behavior or lifetime costs resulting from youthful risk taking. Considerable reanalysis was required to arrive at comparable, contemporaneous cost estimates for the various behaviors.

This section details the methods used. All costs are in 1999 dollars. It describes how we estimated the costs of a high-risk youth and the annual costs of youth problem behavior. We costed seven behaviors: high-risk sex, binge/heavy drinking, regular drug use, violence, smoking, high school dropout, and medically treated or fatal suicide acts. Dropping out and suicide acts, although not behavioral problems focused on in this book, tie closely with the focus behaviors and youth who practice them or are victims of them. We chose to cost them separately rather than trying to apportion dropout and suicide costs among the target behaviors.

For each behavior costed, we estimated the number of adolescents with this behavioral problem in a recent year, the lifetime of costs result-

ing from their misbehavior during that year (essentially a prevalence-based estimate of the costs of problem behavior), and the likely temporal course and incidence-based cost of a career of misbehavior. Where possible, we used published cost estimates. Typically, we adjusted these estimates to make them comparable to the costs for other behaviors. The most frequent adjustments were to change the discount rate (used to convert future costs to present value) to 3% and to estimate work-related and QALY costs.

Underage Drinking

Levy, Miller, Cox, and Spicer (2001) estimate costs attributable to underage drinking (meaning that they involved alcohol and would not have arisen if the adolescents involved were not drinking). We replaced their alcohol-related crime and suicide costs with the crime and suicide costs used in this book.

From 1998 National Household Survey on Drug Abuse (NHSDA) data, we calculated that 91% of all alcohol consumed by adolescents ages 12–20 was consumed by the 4,817,000 adolescents who reported binge drinking (five or more drinks in one day) during the past 30 days. We consider those adolescents high-risk drinkers and assume they are responsible for all costs attributable to underage drinking. From NHSDA, we estimated the average temporal course of binge drinking before the 21st birthday, which allowed us to compute the cost per high-risk adolescent drinker. Unlike the career costs for youth smokers or heroin/cocaine abusers, our career costs for underage drinkers stop at the 21st birthday. If these youth would experience more drinking problems as adults than those who did not start drinking underage, our career costs are underestimates. Several studies suggest that delayed initiation could have averted some adult drinking problems (e.g., Hingson, Heeren, Jamanka, & Howland, 2000).

Heroin/Cocaine Abuse

We started from Cohen's (1998) estimated lifetime costs for a heavy adolescent user of cocaine (including crack) or heroin, but excluded the money spent on the drugs consumed. Cohen shared his costing spreadsheets with us, which facilitated converting his cost model to a 3% discount rate. We recomputed the crime costs.

The number of youth using heroin or cocaine at least three times in the past year (roughly Cohen's definition of a heavy user) came from the 1998 NHSDA. We used Cohen's cost model and the NHSDA incidence estimate to compute the costs of adolescent heroin/cocaine abuse in

1998, exclusive of crime costs. With data from the 1997–1998 waves of the NHSDA, we updated Cohen's estimate of the career heroin/cocaine usage of people who started using heroin or cocaine before age 21, then used this information to compute the costs per career of heroin/cocaine use initiated before age 21.

The rate of hospital-admitted youth suicide acts involving heroin/cocaine and the cost per act came from pooled 1997 hospital discharge data from 19 states that coded injury causes. The pooled data cover 52% of U.S. youth. Miller, Romano, and Spicer (2000) describe the costing methods. The incidence estimate is conservative because some injury discharges lacked required cause codes or their intent was coded as unknown.

We did not cost drug abuse by youth who did not abuse heroin/cocaine. A portion of the abuse costs for those youth is included in the costs of criminal careers, high school dropouts, and suicide acts, as well as in the alcohol abuse costs, which largely capture the costs of youth who abuse both alcohol and other drugs except heroin/cocaine.

High-Risk Sex

For the cost analysis, the limited information available for costing forced us to define high-risk sexual behavior as unprotected sex. Costs of female heterosexual, male heterosexual, and male homosexual sex were estimated separately and then summed. Little is known about the incidence of sexually transmitted diseases with lesbian sex, although it appears to be modest (Roberts, Sorensen, Patsdaughter, & Grindel, 2000). Therefore, we omitted the associated costs.

Female Heterosexual

Trussell et al. (1997) provided the annual risk of sexually transmitted diseases (STDs), including HIV/AIDS, herpes simplex, human papillomavirus, syphilis, gonorrhea, chlamydia, trichomoniasis, and pelvic inflammatory disease, and of pregnancy from unprotected sex by female adolescents. The percentage of live births to mothers ages 10–19 that were unintended and unwanted or mistimed (unintended hereafter) came from a 1995 national survey (summarized in Wang et al., 2000), and the number of births and abortions from U.S. Vital Statistics (U.S. Census Bureau, 1998). We assumed that the percentage of pregnancies that were unintended was equal for births and miscarriages to 10- to 19-year-old females and that all abortions in this age range resulted from unintended pregnancy. Further, we assumed that all 833,000 unintended pregnancies of adolescent mothers in 1996 (85.55% of the total) resulted from unprotected or other high-risk sex. Dividing the total by the

annual 29.7% pregnancy risk associated with unprotected adolescent sex (Trussell et al., 1997) yields an estimate that 2,805,000 female adolescents had unsafe sex in 1996. Trussell's risk data let us compute the resulting STD cases.

Trussell et al. (1997) gives the medical costs per adolescent STD case and live birth. We used its cost estimates from 1993 Medstat data. Medstat pools health care claims data on more than 3 million people who get health insurance through their own or a family member's employer. Wang et al. (2000) gives 1993 Medstat costs for pregnancies that are not carried to term and for prenatal care. These costs were multiplied times the 1996 outcome distribution for pregnancies to women under 21 (U.S. Census Bureau, 1998), yielding medical costs per unintended pregnancy.

Work loss equals the sum of wages and fringe benefits lost. When illness causes work loss, household work losses also are included. We restricted work loss due to live birth an average of 2 years earlier than desired to wage-related losses of \$10,535 per live birth (from Maynard, 1996, inflated to 1999 dollars and roughly adjusted to a 3% discount rate). For HIV, we found data on QALY loss to age 65 (essentially healthy years equivalent [HYE] loss) from Holtgrave and Pinkerton (1997), but not lifetime work loss under recent treatment regimens. We assumed the same percentage of lifetime wage and household work and QALYs were lost (both computed at a 3% discount rate). We conservatively assumed other STDs of adolescents resulted in just 2 days of lost wage work (often by a parent, not the teen) and no lost household work. Finally, we assumed that the ratio of QALY losses to work losses for HIV applied to the other conditions, which allowed us to estimate QALY losses for those conditions.

The unit costs were multiplied by the incidence of STDs and unintended pregnancies to obtain annual costs. Dividing by the number of adolescent females practicing unsafe sex yielded an annual cost per high-risk adolescent female. To compute lifetime cost per high-risk adolescent female (or male), we assumed that unsafe sex practices started at age 16 and lasted until adolescence ended at age 20 (and possibly beyond, but practices after age 20 are not relevant in costing this adolescent risk).

Male Heterosexual

Faulkner and Cranston (1998) report that 1.18 times as many adolescent males as females in high school are heterosexually active in Massachusetts. We assume that ratio applies to all adolescents. We assume unprotected sex and STD rates and costs do not vary by sex (except that males do not suffer pelvic inflammatory disease). Our assumption

implies that 3,306,000 male adolescents practice high-risk sex and allows us to compute male heterosexual STD costs from female costs.

Male Homosexual

From Faulkner and Cranston (1998), we estimate that the ratio of homosexually active males to heterosexually active females is 0.0805. From Pinkerton, Holtgrave, DiFranceisco, Stevenson, and Kelly (1998) and Trussell et al. (1997), we estimate that HIV risk is 5.84 times higher for male homosexual than heterosexual adolescents. We assume that ratio applies to other male STDs and that the cost per STD case does not vary by type of partner. That allows us to compute male homosexual STD costs from female STD costs.

Youth Violence

The costs per youth crime came from Miller et al. (1996) and Miller, Fisher, and Cohen (2001). Adjudication and sanctioning costs came from Cohen (1998). We converted the costs to a 3% discount rate. We used 1998 crime incidence by perpetrator age from the Bureau of Justice Statistics (U.S. Government Printing Office, 2000). We adjusted for underreporting of sexual assault and added violence against victims under age 12 with factors from Miller et al. (1996). Child abuse and neglect data came from Miller et al. (1996) and Miller, Levy, Cohen, and Cox (2001). The percentage of motor vehicle thefts by youth came from the 1996–1998 waves of the NHSDA, with three waves required to get an adequate sample size. We used Cohen's (1998) ratios of robberies to property crimes by substance abuse involvement, but adjusted the motor vehicle theft count downward to match the youth-involved total. Our cost estimate omits the many burglaries and larcenies/thefts committed by nonviolent youth who were not using drugs or alcohol. For comparison purposes, we also computed the total cost of violence in the United States in 1998.

For violent crime analyzed by type, we used data from the 1997 *Survey of Inmates in Federal and State Prisons* (U.S. Department of Justice, 1999) and the 1986 *Survey of Youth in Detention* (the only national survey of this population; U.S. Department of Justice, 1994). Using these data, we estimated the percentage of youth using heroin/cocaine, other drugs only, alcohol only, or both alcohol and other drugs at the time of their crime and the percentage of crimes committed to get money to buy drugs while not drugged or drinking. Cohen (1998) provided factors used to estimate property crime involving substance abuse from similar data about robberies. The estimates apportion crimes between violent perpetration and substance abuse without double counting.

We used Cohen's estimate of duration and intensity to cost a violent crime career that started in adolescence. We computed the number of violent crime careers by dividing the annual number of violent youth crimes not involving heroin/cocaine or alcohol (excluding child abuse and neglect) by the annual number of violent crimes per youth predator from Cohen (1998).

Youth Smoking

We computed four components of youth smoking cost:

1. Costs of adolescent girls smoking during pregnancy and until their children reach age 6.
2. The excess medical costs over a smoker's lifetime less the cost savings resulting from early death.
3. The work loss and QALY loss over a lifetime of smoking.
4. The costs of secondhand smoke exposure.

Because the addictiveness of smoking causes this behavior to persist for many years, we believe it is fair to attribute lifetime smoking costs to youth smoking.

NHSDA data suggested how to define a smoker. They showed that binge drinking rates of adolescent daily smokers matched binge drinking rates of adolescents who smoked on at least three occasions in the past 30 days but were much higher than rates for adolescents who had smoked only once or twice in the past 30 days. Given this clear break, we defined a smoker as someone who smoked on at least 3 days in the past 30; 6,234,000 adolescents ages 12–20 smoked in 1998 by this definition.

Adams and Melvin (1998) provided differential risk and medical cost data for delivery complications stemming from smoking during pregnancy. Smoking increases the risk of ectopic pregnancy, placenta previa, abruptio previa, and preterm premature rupture of membrane but reduces preeclampsia risk. The medical cost data were obtained from 1993 Medstat. For pregnancies that miscarried due to smoking, we used data from Wang et al. (2000) to estimate the number and cost savings from pregnancies that otherwise would have been aborted. The remaining miscarriages resulted in loss of a lifetime of work and QALY losses (computed with a standard age-earnings model and a 3% discount rate). The number of adolescent females who smoked during pregnancy came from 1998 Vital Statistics (CDC, 2002).

Stoddard and Gray (1997) indicated that children under age 6 living with smokers experience \$140 more in medical costs of respiratory illnesses annually (in 1999 dollars). We estimated parental work loss and quality of life loss to these respiratory problems from the medical costs

using Tolley, Kenkel, and Fabian's (1994) estimates of respiratory illness costs per case by cost category. We applied the respiratory illness costs only to children whose mothers smoked during pregnancy.

Added lifetime medical cost for a smoker came from Manning et al. (1991). QALY loss per smoker came from Cromwell et al. (1997), with wage losses assumed proportional. We computed the costs of secondhand smoking from smoking's lifetime costs for all smokers and the ratio of 0.37 annual smoking-related cardiovascular deaths of secondhand smokers per cardiovascular death due to primary smoking from Glantz and Parmley (2001) and He et al. (1999).

High School Dropout

The cost per high school dropout came from Cohen (1998), adjusted to a 3% discount rate. Cohen's estimate ignores the health behavior impact that results from being poorly educated. The number of high school dropouts in 1999 came from the National Center for Education Statistics (U.S. Department of Education, 1999).

Youth Suicide Acts

Costs per medically treated or fatal youth suicide act and the number of nonfatal acts that were medically treated but not hospitalized were computed with the methods described in Miller et al. (2000). The number of suicide deaths came from 1998 Vital Statistics (CDC, 2002). Hospitalized incidents, their substance abuse involvement, and their costs were computed from pooled, cause-coded 1997 hospital discharge censuses from 19 states. These 19 states house 52% of U.S. youth. We assumed their youth suicide act rate matched the U.S. rate. If instead we estimated incidence with the methods in Miller, Romano, and Spicer, the estimate would be within 5% of the estimate we used. We adjusted estimates of nonfatal incidence in 1997 to 1998 in proportion to the relative numbers of youth suicide deaths by year. From the 1999 Youth Risk Behavior Survey (YRBS; Kahn et al., 2000) we estimated that a youth who attempts suicide averages two suicidal acts, with 0.7% fatal and 28% of nonfatal acts requiring medical treatment.

COSTS IMPOSED BY MULTIPROBLEM YOUTH

To estimate the extent of the costs of these problems that could be attributed to multiproblem youth, we multiplied the total cost for each problem by the percentage of youth who we estimate have multiple problems.

As the previous chapter explained, those percentages were averages from four surveys (with some surveys not covering all ages). We used the 1999 NHSDA (USDHHS, 2000a), the 1999 YRBS (Kahn et al., 2000), the 1999 *Monitoring the Future* survey (Johnston, O'Malley, & Bachman, 2000c), and the 1996 Health Behaviors of School Children survey (World Health Organization, 2001). There was one exception: we used only YRBS data to assess high-risk sex behavior, because the other surveys collected minimal data about sexual risk taking. Because NHSDA personal interviews, some of them not conducted in private, detected lower rates of substance abuse than written surveys, we view the four-survey averages as conservative. We also computed costs using multiproblem rates with averages from just the other three surveys, obtaining a range.

Cost of All Youth Problem Behavior in 1998

Table 3.1 presents the prevalence-based costs of all youth problem behaviors in 1998—not just the costs attributable to multiproblem youth. As noted previously, these costs include continuing effects of conditions that started in 1998, such as a lifetime disability caused by an assault in 1998. They do not include the lifetime health consequences or criminal careers that result from someone establishing an addiction in 1998.

Problem behaviors cost \$435.4 billion in 1998. This total included \$16.6 billion in medical spending, \$35.9 billion in other resource costs, \$121.1 billion in work losses, and suffering and quality-of-life losses val-

TABLE 3.1. Social Costs by Cost Category and QALY Losses from High-Risk Youthful Behavior, Total and per Youth Ages 12–20, United States, 1998

Cost category	Total cost	Cost per American youth ^a
Medical	16,637,000,000	470
Other resources	35,899,000,000	1,020
Work	121,052,000,000	3,430
Quality of life	261,799,000,000	7,430
Total	\$435,387,000,000	\$12,350
QALYs lost	1,939,000	0.05

Note. Costs are prevalence-based (in 1999 dollars, with future consequences discounted to present value at a 3% discount rate). Averages computed from 1999 NHSDA Youth Risk Behavior Survey, 1999 *Monitoring the Future* survey, and 1996 *Health Behaviors of School Children* survey.

^aAveraged across youth with problems and youth with no problems.

ued at \$261.8 billion (all computed at a 3% discount rate). Some of these prevalence-based losses—although resulting from deaths, injuries, and illnesses in 1998—were deferred to later years, but they all resulted from problems active in 1998. For example, the person paralyzed by a gunshot wound fired by a drugged youth in 1998 faces a lifetime of suffering and work loss.

The cost per U.S. youth may be more understandable. In 1998, these youth problems cost an average of \$12,300 per youth ages 12–20 (and much more per problem youth, as explored later). This is averaged across all U.S. youth in this age range, not just across youth with problems. These problems consumed \$1,500 in resources per youth, led to \$3,400 in future work losses, and imposed \$7,400 in quality of life losses. In just 1 year, the average youth lost 20 days of HYE due to these problems.

These losses included 1.94 million years of healthy life. To put that loss in perspective, consider that when a youth reaches age 21, with our 3% discount rate, in present value terms, a healthy lifespan of 23.1 years awaits. The health losses were thus the equivalent of 84,000 young lives.

Estimating total costs to society for all youth across the number of cost categories that must be considered *and* across all these individual problems is complex. Apportioning these costs among problem behaviors is difficult because they are interlocked. For example, youth committed 70% of their crimes while drinking or under the influence of drugs. Similarly, most high school dropouts and suicide acts involved risk-taking teens or the consequences of their risk taking. Table 3.2 classifies the costs by problem behavior but lumps all crime costs and all suicide costs. During 1998, violent youth committed crimes that cost \$165.8 billion. Crime was the largest cost of youth risk taking. Next came high school dropout at \$142 billion and high-risk sexual behavior at \$48 billion. Not counting associated crime and suicide costs, substance abuse cost \$64 billion. Counting them raises substance abuse costs to \$168 billion. This figure largely excludes costs of abusing illicit drugs other than heroin and cocaine.

Tables 3.3–3.7 provide alternate, more detailed views of the prevalence-based costs of intertwined youth crime and substance abuse problems and details of the costs of high-risk adolescent sexual behavior. We did not apportion the costs of high school dropout among the other risks and segmented only the suicide risks linked to alcohol and drugs. Remember that our figures involving antisocial behavior include only a portion of crime by youth: violent crimes plus property crimes committed by violent or substance-abusing youth. Thus, our figures underestimate the total cost of all youth crimes.

In the short term, youth smoking causes minimal costs, almost all

TABLE 3.2. Total Social Costs and QALY Losses from High-Risk Youthful Behavior by Risk Category, United States, 1998, Excluding Costs of Adult Behavior Initiated before Age 21

Risk category	Medical	Other resource	Work loss	Quality of life	Total cost	QALYs lost
Violence and related property crime	5.7 B	30.8 B	12.7 B	116.7 B	165.8 B	864,000
Binge drinking ^a	3.2 B	5.0 B	5.1 B	28.7 B	42 B	213,000
Cocaine and/or heroin abuse ^a	644 M	148 M	5.4 B	15.5 B	21.7 B	115,000
High-risk sex	6.8 B		8.1 B	33.3 B	48.1 B	246,000
Smoking	99 M		81 M	239 M	419 M	2,000
High school dropout			87.1 B	54.5 B	141.6 B	404,000
Suicide acts	221 M	11 M	2.6 B	12.9 B	15.7 B	95,000
Total	\$16.6 B	\$35.9 B	\$121.1 B	\$261.8 B	\$435.4 B	1,939,000

Note. Costs are prevalence-based (in 1999 dollars). B, billions; M, million.

^aExcludes costs of crime and suicide acts related to substance abuse.

TABLE 3.3. Social Costs of Youth Violent Crimes and Property Crimes Committed by Violent Offenders, by Drug and Alcohol Involvement and Cost Category, United States, 1998

Substances involved	Medical	Other resource	Work loss	Quality of life	Total cost	QALYs lost
Heroin or cocaine	1.3 B	8.7 B	3 B	26.6 B	39.6 B	197,000
Alcohol and other drugs	1.3 B	2.4 B	972 M	8.3 B	13 B	62,000
Alcohol only	933 M	4.7 B	2.2 B	19.1 B	26.9 B	141,000
Other drugs only	352 M	5.6 B	2.9 B	28.4 B	37.2 B	210,000
None	1.8 B	9.4 B	3.6 B	34.3 B	49.1 B	254,000
Total	\$5.7 B	\$30.8 B	\$12.7 B	\$116.7 B	\$165.8 B	864,000

Note. Costs are prevalence-based (in 1999 dollars). B, billion; M, million.

TABLE 3.4. Social Costs of Youth Violent Offenses and Property Crimes Committed by Violent Offenders, by Type of Crime and Cost Category, United States, 1998

Crime	Number of cases	Medical	Other resource	Work loss	Quality of life	Total cost	QALYs lost
Rape	587,000	2 B	1.9 B	1.5 B	57.6 B	\$63 B	427,000
Murder	6,114	137 M	1.0 B	6.9 B	14.8 B	\$22.8 B	109,000
Assault	3,463,000	2.3 B	17 B	3.7 B	30.5 B	\$53.5 B	226,000
Robbery	336,000	185 M	2.8 B	335 M	2.3 B	\$5.6 B	17,000
Child abuse and neglect	422,000	968 M	552 M	365 M	11.2 B	\$13.1 B	83,000
Burglary	375,000	2 M	1.4 B	6 M	130 M	\$1.5 B	1,000
Larceny	1,643,000	12 M	3.1 B	15 M	0	\$3.1 B	0
Motor vehicle theft	432,000	3 M	3.1 B	23 M	136 M	\$3.2 B	1,000
Total	7,264,114	\$5.6 B	\$30.9 B	\$12.8 B	\$116.7 B	\$166 B	864,000

Note. Costs are prevalence-based (in 1999 dollars). B, billion; M, million.

TABLE 3.5. Social Costs of Binge Drinking by Problem and Cost Category, Ages 12-20, United States, 1998

Problem	Medical	Other resource	Work loss	Quality of life	Total cost	QALYs lost
Impaired driving	1.2 B	2.1 B	3.3 B	13.5 B	\$20.1 B	100,000
Violence	2.2 B	8.5 B	5 B	47.4 B	\$63.1 B	351,000
Property crimes	4 M	1.8 B	11 M	65 M	\$1.9 B	500
Burns	2 M	0	63 M	130 M	\$195 M	1,000
Drowning	3 M	0	159 M	278 M	\$440 M	2,000
Suicide	20 M	1 M	233 M	1.2 B	\$1.4 B	9,000
Fetal alcohol syndrome	373 M	0	140 M	244 M	\$757 M	2,000
Alcohol poisoning	10 M	0	17 M	325 M	\$352 M	2,000
Abuse treatment	1.1 B	0	0	0	\$1.1 B	0
Total	\$4.9B	\$12.4 B	\$8.9 B	\$63.1 B	\$89.3 B	467,500

Note. Costs are prevalence-based (in 1999 dollars). B, billion; M, million.

TABLE 3.6. Costs of Cocaine and Heroin Abuse by Problem and Cost Category, Ages 12-20, United States, 1998

Problem	Medical	Other resource	Work loss	Quality of life	Total cost	QALYs lost
Drug treatment	378 M	0	0	0	\$378 M	0
Medical care	350 M	0	679 M	1.3 B	\$2.3 B	10,000
Risk of death ^a	23 M	22 M	4.8 B	15.4 B	\$20.2 B	114,000
Violence	1.2 B	5.6 B	2.9 B	25.2 B	\$35 B	187,000
Property crimes	7 M	3 B	17 M	106 M	\$3.1 B	1,000
Drug possession	21 M	54 M	34 M	257 M	\$366 M	2,000
Nonfatal suicide acts	11 M	0	9 M	293 M	\$314 M	2,000
Total	\$1.99 B	\$8.7 B	\$8.4 B	\$42.6 B	\$61.7 B	316,000

Note. Costs are prevalence-based (in 1999 dollars). B, billion; M, million.

^aIncludes suicide deaths.

TABLE 3.7. Social Costs of High-Risk Sex by Problem and Cost Category, Ages 12–20, United States, 1998

Problem	Medical	Work loss	Quality of life	Total cost	QALYs lost
HIV/AIDS	680 M	2.2 B	8.9 B	\$11.7 B	65,000
Pelvic inflammatory disease	219 M	20 M	85 M	\$324 M	1,000
Other sexually transmitted diseases	478 M	835 M	3.4 B	\$4.7 B	25,000
Unintended pregnancy	5.4 B	5.1 B	20.9 B	31.4 B	155,000
Total	\$6.8 B	\$8.2 B	\$33.3 B	\$48.2 B	246,000

Note. Costs are prevalence-based (in 1999 dollars). B, billion; M, million.

related to pregnancy or children's respiratory illness. Tobacco, however, is highly addictive. The youth who smoked in 1998 will cause \$2.6 trillion in associated incidence-based costs over their lifetimes (Table 3.8), with 27% of that cost due to secondhand smoke. The \$37 billion in anticipated medical costs of smoking far exceeds the combined medical costs of all other youthful risk taking in 1998. This estimate of the medical cost includes the offsetting Medicare cost savings from lifespan truncation. The 14.1 million healthy life years that these 6.3 million young smokers and their victims will lose equates to more than 610,000 lives.

Cost of a Single Lifetime Career of Each Problem

As noted earlier, the costs of many youth problems are not limited to the time of adolescence but continue into adulthood. Therefore, we are interested in the costs of the career of a youth who engages in a particular

TABLE 3.8. Lifetime Cost of Smoking for All Smokers Ages 12–20, United States, 1998

Cost category	Total cost
Medical	\$37 B
Work	\$658 B
Quality of life	\$1,900 B
Total	\$2,595 B
QALYs lost	\$14,078,000

Note. Costs are incidence-based (in 1999 dollars discounted to present value at a 3% discount rate). B, billion.

problem behavior. Violence, cocaine or heroin abuse, and smoking are problem behaviors that typically continue and thus incur costs into adulthood. As shown in Table 3.9, the incidence-based costs are highest for youth criminals who are violent when not drinking or using drugs and for those addicted to cocaine or heroin. The costs of binge drinking shown here include all costs of alcohol-involved crime. In reality, some of those crimes would occur even if the perpetrators were sober. They are costs of a high-risk behavior complex that involves drinking and committing violent acts. Because of pregnancy and its complications, girls face higher costs than boys do when practicing risky sex or smoking. The costs per smoker would be much higher if they were not so far in the future.

Of course, as documented previously, most youth who engage in one of these problems engage in other problems. The last row of table 3.9 gives the cost for each youth who engages in *all* of the problems under consideration, including dropping out of high school and attempting suicide.

Total Costs of Multiproblem Youth

Table 3.10 shows the total prevalence-based costs of youth who had *two or more* of the focal problems in 1998, including costs due to two related nonfocal problems: dropping out of high school or attempting suicide. The costs are broken down by cost category. We estimate that multiproblem youth accounted for 77–80% of the total cost of youth behavior problems. Thus, they cost society \$335–350 billion in 1998. The costs include \$12–13 billion in medical costs, \$24–26 billion in other resource costs, \$102–103 billion in work loss costs, and \$196–207 billion in quality of life costs. About 1.5 million years of healthy life—the equivalent of 63,000–66,500 young lives—were lost.

The social costs imposed by multiproblem youth are so large that one needs a yardstick to comprehend them. In 1999 dollars, the \$340 billion cost of high-risk youth behavior during 1998 is:

- Slightly less than the \$394 billion cost of all violence in the United States in 1998.
- Slightly less than the annual cost of U.S. highway crashes (\$418 billion; Miller, Lestina, & Spicer, 1998).
- About three times the total alcohol sales in 1999 (\$113 billion; Miller Brewing Company, 2000).
- More than one-third of total spending on medical care for adults and children combined in 1999 (\$943 billion; U.S. Office of Management & Budget, 2000).

TABLE 3.9. Number of Problem Youth Ages 12-20 and Cost of One Youth's High-Risk Career by Type of Risk, United States, 1998

Risk category	Number of youth	Medical	Other resource	Work loss	Quality of life	Total cost	QALYs lost
Violent criminal	300,000	20,900	511,000	141,100	424,600	\$1,097,600	3.14
Binge drinker ^a	4,817,000	3,700	9,600	6,900	48,600	\$68,800	0.36
Cocaine/heroin abuser ^a	674,000	28,300	128,100	122,900	614,500	\$893,800	4.55
High-risk sex partner	6,337,000	4,900	0	5,600	23,500	\$34,000	0.17
Female	2,805,000	9,800	0	9,600	40,700	\$60,100	0.30
Male	3,532,000	1,000	0	2,500	9,800	\$13,300	0.07
Smoker	6,286,000	5,800	0	104,700	302,400	\$412,900	2.24
High school dropout	519,000	0	0	167,800	105,100	\$272,900	0.78
Suicide attempter ^b	99,000	2,800	100	26,800	143,300	\$173,000	0.96
Youth with all problems	Unknown	55,000	632,200	486,500	1,333,400	\$2,507,100	9.88

Note. Costs are incidence-based (in 1999 dollars).

^aIncludes costs of crime and suicide acts related to substance abuse of \$51,100 per binge drinker and \$221,700 per drug abuser.

^bExcludes those whose suicide acts were not medically treated and recognized as suicide acts by the medical provider or not coded as suicide in Vital Statistics mortality data.

TABLE 3.10. Ranged Estimates of Costs of Multiproblem Youth by Cost Category, United States, 1998

Cost category	% Multiple from four data sets	% Multiple from three data sets
Medical	12,319,000,000	12,884,000,000
Other resource	23,782,000,000	26,480,000,000
Work loss	101,999,000,000	103,287,000,000
Quality of life	196,446,000,000	207,200,000,000
Total cost	\$334,546,000,000	\$349,851,000,000
QALYs lost	1,455,000	1,535,000
Life-equivalents	63,000	66,500

Note. Multiproblem youth are defined as having two or more of the following problems: violent criminal, smoker, risky sexual behavior, cocaine/heroin abuser. Costs include costs of those behaviors plus costs of related suicide attempts and school dropout. The first column averages data from YRBS, *Monitoring the Future*, Healthy Behavior of Children, and NHSDA databases. The second column excludes NHSDA data. See text for details. Costs are prevalence-based (in 1999 dollars).

Added to these costs are those associated with extending the consequences of youth behaviors into adulthood, including violent criminal careers, binge drinking, cocaine/heroin abuse, high-risk sexual behavior, smoking, and high school dropout (see Table 3.9). In total, these represent social costs of \$2.5 million over the career of each youth who had all of the problems.

SUMMARY AND CONCLUSIONS

In this chapter, we estimated cost to society of young people with multiple problem behaviors. As in any effort to estimate total societal costs and adjust for a wide variety of economic considerations, there are caveats. For example, we lack perfect estimates for any of the problems and lack any cost estimate for some problems associated with this youth subpopulation (e.g., vandalism, eating disorders, and fires started by cigarettes or by young children of adolescent parents). However, we believe that our analysis provides reasonable and somewhat conservative dollar estimates of the damage wrought by these multiproblem youth.

This chapter first estimates the costs to society for the series of problems most likely to involve youth. Looking across all U.S. youth, the average cost of problems per youth during 1998 was about \$12,300. This estimate includes costs for underage drinking, heroin/cocaine abuse, high-risk sex, violence, smoking, school dropout, and suicide. Using these estimates, the health losses for 1998 were equivalent to 84,000 young lives.

These costs were specific to adolescence, but social costs for problems that begin in adolescence extend throughout adulthood. This means that these estimates will increase over time as careers of high-risk behavior continue. Table 3.9 gives estimates for a career of high-risk behavior. Violence yields the highest total to society of over \$1 million per youthful career. As we will see in the next three chapters, many effective prevention and treatment programs cost only a fraction of this per youth to provide. Even if we look only at dollars, not at wasted or harmed lives, the potential for savings is enormous.

Applying the costs for individual problems to the population of youth who are involved in multiple problem behaviors gives a total cost to society of \$335–350 billion for misbehavior in 1998. This represents 77–80% of the costs of the youth behavioral problems analyzed individually. This means that interrupting the life course of multiple problem youth is likely to have tremendous payoff for society. This payoff also translates into improved lives for these youth and the victims and family members they harm by their problems.

While this chapter provides reliable estimates of costs associated with youth problems and the costs associated with combinations of these problems, we make no claims that these are the final or only estimates possible. The implication of these estimates is that 1.5 million years of healthy life were lost, the equivalent of 63,000–66,500 young lives. In sum, the total cost to society for youth problems, the substantial amount of this cost accounted for by youth who engage in multiproblem behavior, and the great burden these problems represent show the import of multiproblem youth.

From a public policy perspective, these cost estimates provide strong support for the importance of investing in reducing these problems. Investing can lower both the costs associated with problem behaviors during adolescence and the longer-term costs when these behaviors persist into adulthood.