Societal Costs of Cigarette Fires

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U.S. Consumer Product

Safety Commission

National Public Services

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Fire Safe Cigarette Act of 1990

Under the Cigarette Safety Act of 1984 (P.L. 98-567), the Technical Study Group on Cigarette and Little Cigar Fire Safety (TSG) found that it is technically feasible and may be commercially feasible to develop a cigarette that will have a significantly reduced propensity to ignite furniture and mattresses. Furthermore, they found that the overall impact of such a cigarette on other aspects of the United States society and economy may be minimal.

Recognizing that cigarette-ignited fires continue to be the leading cause of fire deaths in the United States, the Fire Safe Cigarette Act of 1990 (P.L. 101-352) was passed by the 101st Congress and signed into law on August 10, 1990. The Act deemed it appropriate for the U.S. Consumer Product Safety Commission to complete the research recommended by the TSG and provide, by August 10, 1993, an assessment of the practicality of a cigarette fire safety performance standard.

Three particular tasks were assigned to the National Institute of Standards and Technology's Building and Fire Research Laboratory:

- develop a standard test method to determine cigarette ignition propensity,
- compile performance data for cigarettes using the standard test method, and
- conduct laboratory studies on and computer modeling of ignition physics to develop valid, user-friendly predictive capability.

Three tasks were assigned to the Consumer Product Safety Commission:

- design and implement a study to collect baseline and follow-up data about the characteristics of cigarettes, products ignited, and smokers involved in fires,
- develop information on societal costs of cigarette-ignited fires, and
- in consultation with the Secretary of Health and Human Services, develop information on changes in the toxicity of smoke and resultant health effects from cigarette prototypes.

The Act also established a Technical Advisory Group to advise and work with the two agencies.

This report is one of six describing the research performed and the results obtained. Copies of these reports may be obtained from the **U.S. Consumer Product Safety Commission, Washington, DC 20207.**

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SOCIETAL COSTS OF CIGARETTE-IGNITED FIRES

Introduction

The Fire Safe Cigarette Act of 1990 ("the Act") prescribes a number of tasks for the Consumer Product Safety Commission (CPSC). Section 2(b)(2) of the Act directs the Commission to "develop information on the societal costs of cigarette-ignited fires." This report provides a summary of the estimated costs of deaths, injuries and property damage resulting from structural fires started with smoking materials. These are the costs most likely to be significantly affected by action to reduce the ignition propensity of commercial cigarettes. As noted in the discussion below, there are other costs associated with fires and fire safety, but those costs are less directly related to cigarette-ignited fires.

A substantial amount of information regarding the cost of injuries was developed for this task. Greatly improved estimates of costs associated with fatal and non-fatal burn, anoxia and other injuries were developed by the National Public Services Research Institute (NPSRI) in a new, CPSC-sponsored fire injury study (Miller, et al, "Estimating the Costs to Society of Smoking Fire Injuries," June 1993; copy attached). This study estimated medical costs, transport costs, productivity losses, lost quality of life (including what is commonly referred to as "pain and suffering"), and legal and health insurance administrative costs for fire-related injuries. These estimates, presented in summary below, are reasonably applicable to injuries resulting from cigarette-ignited fires. Estimates for the numbers of

fatalities and non-fatal injuries and for property damage are from CPSC's Directorate for Epidemiology, the U.S. Fire Administration, and the National Fire Protection Association.

Estimated Societal Costs

The total direct cost of cigarette-ignited fire deaths, injuries and property damage in 1990 was approximately $4 billion (in 1992 dollars). This comprises over 1,150 fatal injuries and over 6,000 treated civilian and firefighter injuries in accidental, residential and non-residential, cigarette-ignited structural fires (99 percent of total estimated injury costs -- and virtually all fatalities -- involve civilian casualties, including non-smoker victims) as well as about $0.5 billion in property damage. Fatal injuries account for about $2.5 billion of this total; hospitalized, non-fatal injuries -- chiefly thermal burns and anoxia -- account for over $1.0 billion. Estimated total annual costs for all injuries are shown in Table 1.

The NPSRI report presents detailed breakdowns of injury cost components on a per-case average basis. These components are estimated for burns and anoxia (the major injury categories) as shown in Table 2. There is some controversy over the method of estimating the value of lost quality of life and pain and suffering; the estimates are, however, based on the conservative (i.e., low) end of the observed range of estimates for such costs.

Table 1

Societal Costs of Cigarette-Ignited Fire-Related Injuries

(millions of 1992 dollars)

Cost Component	Estimated Cost	Percent
Medical & Transport	73	2.1
Productivity Loss	852	24.3
Pain & Suffering	2,532	72.2
Legal & Admin	51	1.4
TOTAL	3,585	100.0

Source: Miller, et al, National Public Services Research Institute (NPSRI)

Table 2

Estimated Average Per-Case Cost Components

for Burn and Anoxia Injuries from Cigarette-Ignited Fires

(thousands of 1992 dollars)

Cost Component	Burns			Anoxia		
	Fatal	Non-Fatal (Hosp.)	ER Only	Fatal	Non-Fatal (Hosp.)	ER Only
Medical & Transport	12	51	1	11	5	1
Productivity	680	43	3	680	16	3
Pain & Suff.	1,380	785	11	1,380	110	10
Legal & Ins./Admin	23	19	<1	23	3	<1
TOTAL	2,095	898	15	2,094	134	13

Source: NPSRI. Estimates are based on breakdowns for civilian injuries

The aggregate cost estimates in Table 1 cover all fatal and non-fatal injuries associated with cigarette-ignited fires. It should be noted, however, that more than 20 percent of the fatalities are from fires in which the material reportedly ignited was something other than upholstered furniture or mattresses/bedding (e.g., paper, trash, etc.). Thus, the estimated cost of those fires involving soft furnishings -- the products generally regarded as being directly relevant to the scope of the test method development effort undertaken pursuant to the Act -- is somewhat lower than the $4 billion figure noted above. On the other hand, lower ignition propensity cigarettes may be less likely to ignite materials other than soft furnishings. On balance, the Table 1 loss estimates for all cigarette-ignited fires probably yields a reasonable approximation of the relevant hazard baseline.

It should be noted, however, that cigarette-ignited fire losses are declining over time. Between 1980 and 1990, fatalities decreased by roughly 40 percent (non-fatal injuries may also have decreased, although by much less). Hazard data for 1990 are the latest available containing the appropriate injury breakdowns; these are used in the Table 1 estimates. A preliminary review of 1991 data indicates a 25 percent decrease from 1990 in the number of cigarette-ignited fire deaths. Thus, the estimated total direct cost of cigarette-ignited fires (exclusive of property damage and projected increases in injury treatment costs) may be expected to decrease accordingly.

Conference on Fire-related Injuries

A CPSC/NPSRI-sponsored national conference of leading burn care experts was held on April 15, 1993 to discuss trends in treatments, costs and outcomes of fire-related injuries. The conferees noted the substantial reduction in the mortality rates for hospitalized burn patients over the past two decades led to an increase in the proportion of resources devoted to extremely severe burn cases, i.e., those in which a majority of body surface area is burned, often accompanied by inhalation injury. This emphasis on badly injured victims may tend to increase total costs, especially since treatments being developed for the most severe burn and anoxia cases are likely to be very expensive. Further, cigarette-ignited fire injuries treated at burn centers tend to have higher morbidity and mortality rates than other burn center admissions. Thus, costs can be expected to continue to be very high for fire-related injuries. On the other hand, functional and cosmetic outcomes for less severe burns improved dramatically in recent years, and increasing outpatient management of burn injuries (in lieu of hospitalization) may tend to curb potential cost increases.

Other Costs

Excluded from the $4 billion overall cost estimate are certain other, widely-spread societal costs fractionally associated with cigarette-ignited fires, such as:

--residential and business interruptions;

--product liability insurance premiums and administration;

--professional and volunteer fire services; and

--fire safety in structures, products and maintenance practices.

Previous estimates for such indirect costs range up to $115 billion per year (e.g., Meade, "A first Pass at Computing the Cost of Fire Safety in a Modern Society," March 1991). A portion of these costs may arguably be allocated to cigarette-ignited fires: for example, among residential structural fires, roughly 7 percent are reportedly cigarette-related. This suggests the actual annual national cost of cigarette fires might be as much as $8 billion more than is accounted for by deaths, injuries and direct property damage, for a total of up to about $12 billion. It also implies this figure could be significantly reduced, were there fewer cigarette-ignited fires.

There is substantial uncertainty, however, as to whether the costs of the major components -- fire services and building code and other fire safety requirements -- are rightly attributable to cigarette-ignited fires, or would lessen significantly with decreases in the number of such fires. Most, if not virtually all, of these other costs would be imposed even in the absence of specific subsets of the U.S. fire problem, even the relatively large subset of

accidental, cigarette-ignited structural fires. To the extent the societal cost estimates are viewed as a baseline for estimating potential societal benefits of lower ignition propensity cigarettes, the most reasonable -- albeit potentially conservative -- measure of societal costs is the aggregate cost of deaths, injuries and property damage. Comparisons incorporating some additional components may be valid for certain policy purposes; however, given the necessary speculation involved in estimating potential reductions in such costs, that exercise is not undertaken in this report.

Potential Benefits of Lower Ignition Propensity Cigarettes

The Act does not call for an analysis of the economic benefits -- or costs -- of any specific set of performance or other requirements for cigarette fire safety. The level of societal costs of cigarette-ignited fires, however, provides an upper limit for any estimation of potential benefits.

While the $4 billion societal cost estimate above may be conservative in some respects, not all cigarette-ignited fires would be addressable by widespread use of lower ignition propensity cigarettes. Therefore, the overall estimate of the cost of cigarette-ignited fire losses may overstate the likely level of benefits of mandatory or other action to reduce cigarette ignition propensity.

The range of potential benefits would depend on the nature, technical and commercial feasibility, and projected effectiveness of any possible action. The 1987 Technical Study Group (TSG) final report, "Toward a Less Fire-prone Cigarette," suggested various physical cigarette characteristic modifications may be technically and commercially feasible; however, no specific performance or other requirements were contemplated or analyzed. While some commercial cigarettes may have lower ignition propensities, industry representatives continue to maintain that cigarettes embodying ostensibly fire safety-enhancing combinations of physical characteristics would not be generally acceptable to smokers. Thus, uncertainty about the commercial feasibility of lower ignition propensity cigarettes remains. Similarly, the potential net benefits (i.e., net of economic costs) are totally unknown, and may be especially sensitive to any possible adverse health effects of altering the chemical composition of cigarette smoke.

Notwithstanding this uncertainty, the societal cost estimates presented in this report support the belief that substantial fire safety benefits could accompany even modest reductions in cigarette ignition propensity. Any future analysis of the economic efficiency of lower ignition propensity cigarettes would involve estimating the likely benefits (and costs) to the public of a reasoned set of alternatives aimed at improved cigarette fire safety.

Attachment

Appendix A

Estimating the Costs to Society of Cigarette Fire Injuries
Final Report

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1. INTRODUCTION

The National Public Services Research Institute, the Urban Institute, the Burn Foundation, and consultants Mark Cohen and Valerie Nelkin are pleased to submit the final report on their study of the costs to society of cigarette fire injury. This study started on March 1, 1993. For each task, this report summarizes the methodology and findings. For convenience, this report refers to the study team collectively as NPSRI.

This report's purpose is to provide unit costs to use for cigarette fire injuries in costing the potential benefits of the fire-safe cigarette. In some cases, burn cost data that were analytic byproducts which appear useful for analysts of other burn issues also are reported. The Consumer Product Safety Commission (CPSC) prescribed six project tasks.

Task 1 estimates medical costs. This task was undertaken in stages. First, costs for broader categories of burns were estimated. Then the broad estimates were used to estimate costs specific to cigarette fire burns. Further analysis prescribed by CPSC broke the costs down by age, sex, and diagnostic details. The cigarette fire burn incidence data available for this study did not differentiate cases admitted to hospital from ones treated in the emergency room and released. Therefore, although the detailed costs enhance understanding of burn injury treatment variations, more aggregated costs are more appropriate for costing the average cigarette fire burn.

Nonhospitalized medical costs (using payments including co-pay as a surrogate) were built from 1987 National Medical Expenditure Survey (NMES) and third party payer data.

Hospitalized costs were built from Workers' Compensation payments data that the Urban Institute previously supplied to CPSC and from NMES data. Then 1984-1990 National Hospital Discharge Survey (NHDS) data on length of stay were used to break the costs down by body part burned and degree of burn.

To assess how burn and anoxia costs vary between cigarette fires and other burn incidents, this study uses two types of data: 1990 hospital discharge data from California, where causes now are coded for more than 90 percent of injuries; and data from burn centers where more detailed causes are recorded. The burn center data come from the Burn Foundation in Philadelphia. They represent serious cases, ones triaged to burn centers. The data cover all burn centers serving Delaware, New Jersey, and the eastern half of Pennsylvania. They include about

40 percent of area burn hospitalizations. Variations by age, sex, and diagnostic details also were analyzed using regressions on California and NHDS burn data.

Fatal injury medical costs for medically treated cases were computed from the burn center data and NHDS data.

Task 2 assesses recent trends in burn injury treatment and hospitalization, as well as their effects on costs and outcomes. This task has three components:

- A review of the medical literature by the Burn Foundation.
- Interviews with burn experts. This work was done by Burn Foundation staff who those experts view as colleagues.
- A conference that assembled experts to discuss these issues.

Task 3 provides in-depth investigational case studies of individual burn and anoxia injuries, with emphasis on injuries in cigarette fires. The case studies are appended. They include focused assessments of physical functioning, psychological impacts and lost quality of life, as well as assessments of out-of-pocket costs; lost work, housework, and schooling for the injured and family and friends; and long-term treatment, costs, and consequences.

Task 4 analyzes jury verdicts to value pain and suffering resulting from burn and anoxia injuries. To accomplish this task, NPSRI purchased data on 397 nonfatal burn verdicts and 209 settlements from Jury Verdict Research, Inc. These data were analyzed using regression analysis by Dr. Mark Cohen, who has used this approach extensively, including on past projects undertaken jointly with NPSRI's team. The estimates were compared with the estimates in CPSC's Injury Cost Model (ICM), which come from a sample that included about 40 burn injuries.

Task 5 models litigation costs. This task combines published data on costs per case by stage, data from Task 4 on litigation frequency, and estimated economic costs of burn injury from Task 1 and the ICM.

Task 6 estimates emergency transport costs. This task drew primarily on burn center data to estimate probabilities of helicopter transport, ambulance transport, and double transport (for transfers). The costs of ambulance transport by hospitalization status came from NMES. The cost for helicopter transport came from an industry survey.

2. BURN AND ANOXIA INJURY MEDICAL COSTS

This task uses several data files, including the National Medical Expenditure Survey (NMES), Civilian Health and Medical Program of the Uniformed Services (CHAMPUS), National Hospital Discharge Survey (NHDS), National Health Interview Survey (NHIS), California hospital discharge survey (HDS), National Council on Compensation Insurance Detailed Claims Information (DCI), Burn Foundation patient record, and National Nursing Home Survey files. Methodologically, the NHDS analysis closely parallels the California HDS analysis.

This section first describes the data bases analyzed. It discusses costs, in turn, for nonhospitalized injuries, hospitalized injuries, and fatalities. Each subsection compares costs and utilization statistics between data sets and recommends average costs per case.

Injury Definitions and Data Base Summaries

Injury data are not collected uniformly. Almost every national data collection agency codes injury descriptions differently. This section discusses sample size, coding, and data quality issues.

NMES, the National and California Hospital Discharge Surveys, CHAMPUS, and NHIS code injuries using the Ninth Edition of the **International Classification of Diseases** (ICD-9). The ICD is designed for the classification of morbidity and mortality information for statistical purposes, for the indexing of hospital records by disease and operations, and for data storage and retrieval. It is not limited to injury-related morbidity or mortality. ICD nature of injury (N) codes have a 3-digit major category. The **Clinical Modification**, ICD-9-CM, provides for greater coding detail (up to six digits). This project used data for ICD N-codes 799.0 (anoxia), 940-949 (burns), 986 (toxic effects of carbon monoxide), and 987 (toxic effects of other fumes and gases). When present in incidents caused by flame/fire, ICDs 428.1, 506, 514.0 (acute pulmonary edema and chemical fume codes), 799.0, 986, 987 (anoxia codes), 947.1 (burn of trachea, larynx, or lungs), or 947.2 (burn of esophagus) are labelled as **inhalation injuries or anoxia.**

The **National Medical Expenditure Survey** (NMES) is a telephone survey of approximately 35,000 individuals in 14,000 households. It provides information on health expenditures, use of health services, insurance coverage, and sources of payment for the civilian population during the period from January 1 to December 31, 1987. NMES uses 5-digit ICD-9-CM codes.

The major NMES expenditure groups currently on public use tapes include prescriptions, ancillary and transportation, outpatient department visits, emergency room visits, and hospital admissions. These groups are on separate files and each visit is a separate event. The files were merged to construct payments for each injury episode. There are 397 hospital admissions for injury and 6,799 non-hospitalized cases. These counts include 10 burn hospitalizations and 167 other medically attended burns.

Civilian Health and Medical Program of the Uniformed Services (CHAMPUS) data cover hospital and medical utilization and charges for roughly 2,000,000 military dependents and retirees. The CHAMPUS annual reports are the only national source known to NPSRI that records payments for outpatient visits, inpatient medical fees, and hospital services by ICD-9 code. CHAMPUS also provides the only national data on outpatient utilization by ICD-9 code. The data include few males aged 18-45 and few people over age 65. CHAMPUS produces annual hard copy summary reports which provide average payment (including co-pay) and utilization data per claimant for inpatient and outpatient care by 3-digit ICD code. One problem with CHAMPUS data is that beneficiaries may continue to receive some of their care from military facilities. Such care is not recorded in the CHAMPUS system. Also, longitudinal tracking of individual claims is not possible with the available CHAMPUS data; the summary reports track patients for only a calendar year.

A limitation of the CHAMPUS outpatient data is that they mix data on those not requiring hospital care with data on care after hospital discharge. Using the data as costs for medically treated injuries not requiring hospital care implicitly assumes that the payments per case are similar for this care and for post-discharge care.

This project used both inpatient and outpatient injury data for calendar years 1986-1991, including 2,167 burn hospital discharges and 25,521 non-hospitalized cases. Each year's data cover claims processed onto the data base over a 16-month period, that is during the year or by the following April 30. The Office of the Civilian Health and Medical Program of the Uniformed Services estimates that 92% of all claims for care during a calendar year are processed by the reporting cutoff date.

National Hospital Discharge Survey (NHDS) data are a nationally representative annual sample of roughly 200,000 hospital discharges. This file excludes discharges from Veteran's Administration hospitals and other government-run facilities. It includes 33 of the 148 U.S.

hospitals in the American Burn Association's 1991 Burn Center Directory (Dennison, 1993). NHDS data are recorded using 5-digit ICD-9-CM codes in six diagnosis fields (i.e., up to six diagnoses are recorded). Code choices are influenced by reimbursement rates in these systems. NHDS records length of stay but not charges. NPSRI extracted NHDS burn cases and suspected anoxia cases for 1984-1991, more than 7,000 cases in all.

The **National Health Interview Survey (NHIS)** is a continuing nationwide household interview survey of a probability sample of the civilian noninstitutionalized population of the United States. It captures about 20,000 injured people annually. Information about the numbers and types of injuries, and the treatment received is self-reported. Because of the small sample size, the number of hospitalized injuries reported in the NHIS is minimal. However, NHIS is valuable as a source of data on minor injuries which are not reported elsewhere, including injuries which received no medical treatment. The injuries are coded in 3-digit ICD-9, but coding is based on the injury descriptions provided by the interview respondents. This study used previously tabulated NHIS data for the period 1984-1986.

The **National Nursing Home Survey** polled a nationally representative sample of 1079 skilled nursing facilities (SNFs) and intermediate care facilities (ICFs) in 1985-1986. It gathered data on 5,243 current residents and 6,023 discharges. The data included up to five 5-digit ICD-9-CM hospital discharge diagnoses, length of stay, prior nursing home usage history, and discharge disposition (died, community hospital, other long-term care, home).

California Hospital Discharge Survey data provide a census of State hospital discharges. This study used data from the second half of 1990, when the state mandate that hospitals record the causes of burns and other traumatic injuries first took effect. More than 93 percent of eligible records were cause-coded. Each record includes 24 diagnosis fields for entry of 5-digit ICD-9-CM codes. The system also records length of stay, hospital charges, age, and sex. NPSRI extracted 614 hospitalized cases caused by fire and flames and 1515 other burn cases (for use in converting NHDS burn data to estimated flame burn data).

For this study, discharge records of people transferred to and from acute care hospitals were linked together to form integrated records wherever possible. In many cases, linked records matched imperfectly. Imperfect matches could occur, for example, because the receiving facility learned more about the patient demographically or diagnostically or due to coding errors. **All flame burn transfers lengths of stay in each facility exceeding one day were matched.** Some

other burn transfers proved unmatchable, possibly due to transfers out of state. In computing means, unmatched transfers from another facility (often transfers of non-admitted patients) were included. So were unmatched transfers to another facility with lengths of stay exceeding one day. Excluding unmatched transfers would lower the average length of stay for non-flame burns. Matching these cases would raise the average slightly.

The **Detailed Claims Information** (DCI) data base maintained by the National Council on Compensation Insurance (NCCI) provides longitudinal data on a nationally representative sample of injuries to workers. The sample is restricted to injuries that resulted in Workers' Compensation claims for lost workdays. State laws vary on the number of days of work loss required before an injured worker can claim, with the range from two to seven days. Minor injuries and injuries to nonworkers -- children and the elderly -- are excluded. Advantages of the DCI are detailed payment data from a system with no co-pay or deductibles, a large sample size, and linkage of payments over the injury episode, even if treatment continues for years. The DCI file used contains data on over 13,237 burn injuries for the period 1979-1988, including 3,530 with hospitalization. This study primarily used DCI in-patient data.

The DCI codes the person's most severe injury using the **American National Standards Institute's ANSI Z-16.2** coding system. ANSI defines a two-column coding system akin to National Electronic Injury Surveillance System (NEISS) codes. An injury is coded as a two-digit body part (e.g., elbow) and a two digit nature of specific injury (e.g., burn). These codes are designed for coding from workers' compensation insurance records that lack the diagnostic detail required for coding the ICD-9 categories used by health insurers and hospitals.

In addition to the injury descriptions, DCI data include length of hospital stay if hospitalized, medical costs, hospital costs, nonmedical rehabilitation costs, time lost from work, and disability. Data are reported six months after the injury, and annually thereafter until the case is closed. A case remains open until disability payments are scheduled and all medical charges are paid. If complications arise, the case is reopened and the new medical payments are reported. When medical costs of serious injuries become predictable, the medical loss reserve (an underwriting estimate of remaining payments) is entered into the data base. If actual payments vary significantly from estimates, the insurer is supposed to revise the loss reserve estimate.

DCI data are extracted from claims forms by insurance company clerks who select the injury codes without training or quality control by NCCI. Nevertheless, because the DCI is

funded by the insurers, who use it to analyze rate-making and loss control issues, incentives exist to report accurately.

The **Burn Foundation data** cover 1987-1990 discharges from the five Burn Centers that serve Delaware, New Jersey, and Eastern Pennsylvania. The data include type and location of burn, burn size, inhalation involvement, injury causes, charges, length of stay, and patient disposition.

Some flame injuries associated with cigarettes were coded as fire-cause unknown in the Burn Foundation files. These files describe cause information known at the time of admission. Philadelphia fire marshal's records were examined to learn the final cause for all city fires recorded as cause unknown. Checking led to recoding of cause to cigarette fire for 25 cases and to other fire for 85 cases. This rate suggests that another 25 cigarette flame burns in other jurisdictions are coded as flame burns with unknown cause in the file.

Incidence

Estimates of nonfatal burn incidence derive from many sources. NHIS estimates an average of 1.5 million new nonfatal burn injuries annually for 1984-1986 (Miller et al., 1993) and 1.75 million for 1985-1987 (National Safety Council, 1992). Of these, 92 percent led to in-person contact with a doctor. The other 120,000 cases involved telephone contacts with physicians or at least one half day of restricted activity. According to 1984-1986 NHDS data, 66,323 people (4.46 percent of the injured) were hospitalized with primary diagnoses of burn -- ICDs 940-949 (Miller et al., 1993). Overall, from 1984-1990, NHDS indicates that an average of 63,350 people were hospitalized with primary burn diagnoses and 13,150 with secondary burn diagnoses but non-burn primary diagnoses.

For live hospital discharges whose primary ICD code was not a burn but whose injuries resulted from fires, California hospital discharge data show that survivors with secondary burn diagnoses only are 11.7 percent of the primary burn diagnosis count (i.e., for every 100 discharges with primary burn diagnoses, 11.7 discharges have only secondary burn diagnoses), cases with anoxia only are 12.3 percent (excluding ICD 947), and cases with no burn or inhalation injuries are 12.0 percent. Many discharges with only secondary burn diagnoses had primary diagnoses of drugs/alcohol/mental illness, toxic fumes/anomia, pneumonia, or coma. (For all burns, survivors with secondary diagnoses only are 32 percent -- 520/1609 -- of the primary count. Survivors with

secondary burn diagnoses only include 48 of 89 burn plus inhalation cases and 1568 of 2040 burn only cases.) Hand checking of California secondary burn diagnosis-only cases with only one burn diagnosis revealed that very few cases appeared to be miscoded as burns.

Hospitalized burn incidence is falling. Figure 1 (at the end of this chapter) shows the trend in NHDS cases with primary discharge diagnoses of burn (meaning burns used the largest amount of hospital resources). Figure 2 (and the Appendix) shows the trend in primary and primary plus secondary burn discharges by year over a shorter time period. The NHDS primary diagnosis totals for 1989-1991 averaged 55,000, with 52,000 cases in 1991. Cases with secondary burn diagnoses only average 20.8 percent of the primary burn count.

Conversely, total burn injuries may be rising. The NHIS count for 1988 was 2.2 million, including treatment for injuries that originated in prior years. This count is not comparable to the new injury count of 1.5 - 1.75 million above, but seems to have grown. Trending NHIS data, however, is treacherous due to the large error in single-year estimates.

NEISS consumer product injury counts for 1991-1992 and workplace injury counts for 1983-1985 suggest an average of 330,000 emergency room (ER) visits per year result from burns. Assuming hospitalized injury causes are representative, this count excludes perhaps 120,000 intentionally inflicted burns and burns associated with transport vehicles (cars, trucks, boats, trains, and airplanes) and natural events (most forest fires and open-air lightning strikes), as well as some unknown number of burns in public places. Table 1 (which appears at the end of this chapter) breaks these cases (and the hospitalized cases) down by cause. Half the injuries result from thermal (flame or hot object) burns. Both the California hospital discharge data and the National Fire Incident Reporting System (NFIRS) count of fire hospitalizations confirm this split. Indeed, the NEISS and California distributions of hospitalized burn injuries by cause are extremely similar. The NEISS hospitalized count of 4,649 workers burned annually, however, is well below the DCI average of 15,872 (adjusted for the percentage of workers covered by Workers' Compensation). The DCI counts burn injuries not treated in emergency rooms.

NMES also can be used to estimate cases by treatment modality. It suggests 763,500 burn cases treated in doctors offices only and 537,000 treated in emergency rooms. NMES reports burns treated in emergency rooms involve an average of 1.22 visits per ER case, while hospitalized burns average 0.1 ER visits after discharge. That suggests 661,000 ER visits

annually for burns in 1984-1986. Thus, NMES/NHIS estimates are higher than the NEISS data. The NMES/NHIS estimates have wide uncertainty, however, due to small burn sample sizes.

Nonhospitalized Injury

The 1987 National Medical Expenditure Survey (NMES) provides recent, nationally representative data on medical expenditures. Its sample size is too small to distinguish reliably the amount paid for a burned arm from the amount for a burned face. Nevertheless, it provides the most reliable estimate of average nonhospitalized medical costs (using payments including co-pay as a surrogate) per burn injury. CHAMPUS data are less representative, in part because CHAMPUS is the largest private third party payer. Especially since 1990, CHAMPUS has used its leverage to negotiate favorable prices. CHAMPUS data contain enough cases, however, to show how costs vary among nonhospitalized burn injuries.

DCI data, while covering only temporarily or permanently disabling nonhospitalized injury, can be used to infer costs more than six months after injury (on average, 5.67 percent of total costs for nonhospitalized burns). By assuming the percentage of incidents and payments in DCI parallel all medically treated nonhospitalized injuries, DCI data can be used to estimate payments by body part from more aggregated 3-digit ICD diagnoses.

NMES includes 167 non-hospitalized burn cases. However, because NMES records visits during a calendar year, people hospitalized in 1986 report only their outpatient follow-up visits in 1987. Twelve NMES burn cases were initially seen in the outpatient department of the hospital, which is not normally a primary point of entry for acute treatment. These cases apparently were follow-up treatment for injuries in earlier years, not new burn cases. Table 2 compares payments and treatment intensity per nonhospitalized burn case with and without these cases. The payments were inflated to November 1992 dollars using the Medical Care component of the Consumer Price Index. Excluding the 12 outpatient cases, payments average $61 per physician's office visit, $299 per emergency room visit, and $282 per outpatient department visit. Overall, the average is $166.

Table 3 provides a more comprehensive NMES cost picture. Predictably, burns initially treated in emergency rooms involve much more follow-up and far greater cost than those initially treated in physicians' offices. The average payments per emergency room visit, including follow-up care, are $540. Consistent with prior findings from the 1980 National Medical Care Utilization

and Expenditure Survey (Miller et al., 1993), nonhospitalized burn injuries generated no home health services or ancillary payments.

Overall, medically treated nonhospitalized burns average $346 in lifetime medical payments. The average burn treated in the emergency room costs $698. Cases treated in physicians' offices average much less, only $98.

Because more detailed data do not exist, this report assumes flame burn injuries and other burn injuries treated only in emergency rooms generate equal medical payments. In reality, flame burns probably are more costly to treat than scald burns.

Comparison with CHAMPUS Data

CHAMPUS gives average outpatient visits per case and payments per visit. Visits per case are comparable to NMES. They average 2.1 for 1986-1988 CHAMPUS, 1.9 for 1989-1991 CHAMPUS, and 2.0 for NMES when outpatient visits for hospitalized and outpatient department cases are included.

NMES nonhospitalized payments per visit average $166, much higher than the CHAMPUS outpatient visit average of $111 in 1986-1988 or $120 in 1989-1991 (all in November 1992 dollars). With follow-up visits for inpatients included, the contrast would be even larger. NMES is nationally representative, CHAMPUS is not. Therefore, the NMES average payments per visit were used as an overall mean.

Breakdown by Body Region. Table 4 provides estimated visits and payments per nonhospitalized case by three-digit ICD code. To prepare this table, the NMES mean payments per visit were multiplied times CHAMPUS visits per case by ICD code and the ratio of CHAMPUS payments per visit by ICD code to average CHAMPUS payments per visit. The costs include NMES prescription payments per visit. Payments beyond the first six months were computed using DCI payment patterns. The average payments across all cases in Table 4 are slightly higher than in Table 3 because the computation uses CHAMPUS rather than NMES visit rates and patterns.

Among nonhospitalized burn injuries, face and lower limb injuries cost the most per case. For facial burns this is due to high costs per visit, while for lower limb burns, it is due to greater follow-up requirements. The payments estimates for ICD 948, percentage of body burned, are much higher than for other burn diagnoses. Since this ICD records severity in 10 percent increments, it usually is used to code serious burns. The ICD 948 cases probably are

predominantly cases involving outpatient follow-up to inpatient care rather than injuries treated only on an outpatient basis. CHAMPUS does not distinguish the two groups.

Anoxia Injury Only. NMES captures almost no anoxia only cases. The best available anoxia medical payments estimate is $617 (in November 1992 dollars). This cost, from Miller et al. (1993), is for nonhospitalized carbon monoxide poisoning. It uses CHAMPUS payments per visit and visits during the acute injury phase, and the DCI percentage of payments within six months of injury.

Other Injury. For other injuries, the recommended payments per case are $515. This amount equals the $444 NMES average costs divided by the DCI percentage of costs in the first six months from Miller et al. (1993). For nonfatal firefighter injury, the $1,093 average injury cost from Miller et al. (1993) is recommended.

Hospitalized Injury

Burn costs for hospitalized cases are estimated by multiplying short-term length of stay times payments per day. The acute care payments then are divided by the percentage of medical payments resulting from follow-up care. Nursing home costs are then added. This section also derives multipliers to convert burn injury payments to payments for cigarette fire burns and analyzes variations in length of stay (and presumably cost per case) by victim demographics and diagnosis.

Length of Stay. As Figure 3 shows, hospital lengths of stay for burns are similar in all the data sets examined. The mean lengths of stay are:

- 10.1 days for NMES weighted data (and 12.7 days unweighted).
- 10.55 days in NHDS for all burn cases and 10.3 days for cases with primary ICDs of burn injury ; average length of stay was stable from 1984-1990.
- 9.7 days in the California HDS for all burn cases and 9.4 days for cases with primary ICDs of burn injury.
- 10.7 days for 1986-1988, 9.6 for 1989, and 8.9 for 1990 and 1991 in CHAMPUS (recall that CHAMPUS moved aggressively to control costs in 1989-90)
- 12.2 days in DCI, including rehospitalization in the first six months after injury.

NMES captures only ten hospitalized burn injuries. The mean length of stay for these injuries is 10.1 days. Two of the injuries have lengths of stay of 1 day, one of 2 days, one of 3

days, three between 10 and 15 days, two between 20 and 25 days, and one of 37 days. In contrast, the mean length of stay for cigarette fire burn injury or flame plus anoxia injury treated at Burn Centers exceeds 34 days, as found in the Burn Foundation data. Clearly, the NMES data are not representative of all hospitalized burn injuries. The survey sample is too small to capture extremely serious injuries representatively.

This study uses 1984-90 average lengths of stay from NHDS. Table 5 shows mean lengths of stay by three-digit ICD code. Stays are especially long for survivors of burns to the trunk or multiple body regions. Flame burns of the hand and wrist involve markedly longer stays than burns from other causes. The regressions probe these variations further, controlling for other factors.

Payments per Day. Table 6 compares NMES, DCI, and CHAMPUS data on reimbursed charges plus short-term post-discharge payments per day of inpatient care (on average, for the first six months). It uses the CPI medical care inflator and an inflator based on the change in hospital cost/day (from the American Hospital Association's (AHA's) annual Hospital Statistics). The latter inflator may be preferable because it incorporates changes in the goods and services used during a hospital stay. Thus, it adds new technologies like magnetic resonance imaging (MRI) and improved burn wound coverage. The Table 6 comparisons use 1989 dollars because more recent AHA data on cost/hospital day were not readily available. Figure 4 inflates the estimates to November 1992 dollars.

The Table 6 estimates also are comparable to the daily cost for burn care inferred from Burn Foundation and California data. The inference involved several adjustments. First, the Burn Foundation burn center costs were multiplied times the ratio of daily charges for burns in the California HDS data to daily charges in the Burn Foundation data. Next, they were multiplied times the ratio of daily hospital costs in California and the U.S., from Bureau of the Census (1992). Finally, the product was multiplied times 1.21, the ratio of hospital plus professional services payments to hospital payments in the CHAMPUS data.

The NMES payments/day are in the same range as the other data. Because NMES has only 10 burn hospitalizations, this study uses DCI payments per day ($1,288 in November 1992 dollars, based on the AHA inflator through 1990 and the CPI inflator thereafter because the AHA inflator was not yet available). Although the CPI inflator seems to give closer agreement on burn costs, the AHA inflator gives better agreement across all injuries and is used here. Multiplying

the payments/day times length of stay yields payments/case. The NHDS lengths of stay are used, after adjusting them to six-month lengths of stay. The adjustment procedure to get six-month stays applies an 8-percent burn readmission rate during the first six months and a six-day average readmission stay from Rice et al. (1989). By comparison, Prasad et al. (1991) find 12.4 percent of their burn patients were readmitted over a multi-year time period after injury. Percentage of payments beyond six months (83.7 percent on average) came from the DCI.

Tailoring to Flame Burns. This section refines the cost estimates to reflect just flame injury. It also examines whether cigarette fire injury without accelerants (e.g., gasoline) causatively involved differs from other flame injury. The analysis uses California HDS, NHDS, and Burn Foundation data.

Burn Foundation data were used to differentiate nonfatal burns in cigarette fires without accelerants from other nonfatal flame and nonflame burns. As Table 7 shows, these burns have distinctly longer lengths of stay than other flame burns, especially for cases without anoxia. They also have substantially longer lengths of stay than nonflame burns. The differences between flame and cigarette burn lengths of stay in cases with anoxia may be insignificant. Assuming the unknown survival cases all survived and the unknown if anoxia cases did not involve anoxia, and considering the number of cigarette and other flame burn cases, suggests cigarette burn only cases have 1.22 times the average length of stay for flame burns. They have 1.26 times the average ignoring the unknowns. The comparable ratios for burn plus anoxia are 1.10 and 1.08. Given the relatively small numbers of cases including some with extremely long stays, NPSRI conservatively assumed the difference in length of stay for the cases with anoxia was insignificant. For burn only cases (a larger sample), this study assumes cigarette fire lengths of stay are 1.22 times the average flame burn length of stay.

Table 8 shows costs per day by nature of burn injury for discharges from Burn Foundation burn centers. Costs were computed by multiplying charges times the facility-wide Medicare cost to charge ratio for the year of discharge.

Table 8 also compares length of stay and charge data between Burn Foundation burn centers and all California hospitals (with transfer stays of more than one day included). Predictably, the burn centers treat considerably more severe burns (measured by length of hospital stay). Their charges per day for flame burns are comparable to average California charges per day. For other burns, their charges per day are higher.

Both data sets show flame burns with anoxia have longer lengths of stay or higher charges per day than other flame burn injuries. These differences persist in the regressions, which control for burn nature and severity. NHDS data, shown in Figure 5, also indicate anoxia cases have longer lengths of stay. For flame burns, this study uses the mean NHDS lengths of stay with and without anoxia. For burns without anoxia, the length of stay is multiplied times 1.0625, the ratio of length of stay for flame burn only versus all burn only in the California data. This study also applies the California ratios of burn charges per day to adjust DCI data to reflect flame burns. The computations are described further below.

Nursing Home Costs. National Nursing Home Survey data include 11 burn cases. These cases include 8 current residents, one person who transferred back to a hospital after an 18-day nursing home stay, one person who died after a 1301-day stay, and one person who transferred to an Intermediate Care Facility from a surveyed Skilled Nursing Facility after a 690-day stay. The weighted average length of stay for burn survivors was 606 days for current residents and 463.5 days for the three "discharges." Two of the current residents also had prior stays of unknown duration at other nursing homes. Overall, nursing home stays for burn victims probably average about two years.

Bureau of the Census (1991) reports an annual cost of $68,785 for custodial care in a public mental retardation facility (inflated to November 1992 dollars using the CPI-All Items). Miller et al. (1989) suggest using this cost as a surrogate for ICF cost. It also estimates the average cost of a year in a Skilled Nursing Facility (SNF) is at least double the cost in an Intermediate Care Facility (ICF).

The probability of nursing home admission following hospital discharge was computed from California discharge destinations. Table 9 shows the probabilities by cause of burn (as defined below in the discussion of demographic variation). Flame burns (excluding vehicle-related burns) have a 2.93 percent probability of nursing home admission. All flame burn transfers to nursing homes were to SNFs, as were 92 percent of other burn transfers.

The average nursing home cost per hospitalized flame burn is $7,911. This figure is comparable to the cost for scald burns, but lower than the cost for burns with unknown causes. It is the product of the probability of admission directly after hospital discharge times the cost per year times a two-year stay. Second year costs were converted to present value using a 4-percent discount rate.

Medical Cost per Hospitalized Cigarette Fire Burn Survivor. From above, the length of stay for flame burn only cases equals 10.25 (from NHDS) * 10.2/9.6 (the California ratio of flame burn only to all burn only lengths of stay) = 10.9 days. For cigarette fire burns without accelerants, the average length of stay is 1.22 times as long, or 13.3 days. The payments per day equal 1288 (from DCI) * 3779/2298 (the California ratio of charges per day for flame burn only to all burn cases) = $2118. For burn plus anoxia cases, the length of stay averages 20.15 days (from NHDS). The payments per day equal 1288 (from DCI) * 3523/2298 (the California ratio of charges per day for flame burn plus anoxia to all burn cases) = $1975. The initial hospitalization and associated outpatient treatment accounts for 80.6 percent of the total medical payments for a hospitalized burn according to Miller et al. (1993). Thus, the medical payments per case average $34,899 for flame burn only and $49,317 for flame burn plus anoxia.

Incidence data are required to compute average medical payments for all cigarette flame burns. Weighted National Fire Incident Reporting System (NFIRS) data for 1990 provide them. With unknowns allocated proportionally to knowns, NFIRS suggests 626 hospitalized civilian burn plus anoxia survivors in residential and non-residential structural fires attributable to cigarettes without accelerants. The estimate for hospitalized burn only survivors is 385. Some additional burn victims may have been classified by the fire service into non-burn injury categories. Applying the California ratio of .095 nonprimary nonanoxia burn admissions for every primary fire burn (or burn plus anoxia) admission implies another 96 hospitalized burn only cases (which are included in the average lengths of stay above). Total hospitalized survivors number 1107.

To test the reasonableness of the inferred nonprimary injury count, the death count was multiplied times the ratio of hospitalized fire burn survivors in NEISS to residential flame burn deaths from NFIRS. The ratio is 1.17, based on 4818 nonfatal hospitalizations and 4115 deaths. NFIRS suggests 942 cigarette fire burn deaths. These data suggest 1102 hospitalized survivors.

Weighting the medical payments with these counts yields **average estimated medical payments per hospitalized survivor of burns in a cigarette fire without accelerants** computed as [626 * 2118 * 10.9 *1.22 + 481 * 1975 * 20.15]/[(626 + 481) * .806]. The average is $43,005. Adding nursing home costs yields total medical payments of **$50,963 per case.** By comparison, the average medical payments for all hospitalized burns are $26,700, including $16,851 (10.55 days * $1288/.806) in hospital, physician, and ancillary care payments and $9,849 in nursing home costs.

The California flame data suggest 0.101 (47/465) nonburn injury survivors for every burn survivor. That suggests 112 hospital admissions. The average length of stay for nonburn injuries in California fires is 4.6 days. Applying the average injury payments per day and percentage of payments incurred during acute care from Miller et al. (1993) yields average medical payments of $13,267 for these cases (in November 1992 dollars).

The California flame burn data suggest .110 (51/465) anoxia survivors per burn survivor. That suggests 121 hospital admissions for anoxia only. The average length of stay for the California cases is 3.0 days. (Confirming this figure, for ICDs 947, 986, and 987 in 1984-1986 NHDS data -- a crude approximation of flame anoxia cases -- it is 3.2 days.) The estimated medical payments per day for these injuries equal $1,425, the $1,288 DCI average payment per day for burns times the ratio of anoxia to burn charges per patient day from Table 8. For asphyxiation, 94.9 percent of medical payments occur within six months of injury (Rossman, Miller, and Douglass, 1991). These figures yield medical payments of $4,764 per hospitalized anoxia survivor (1288 * 3/.949).

Variation with Demographics and Diagnosis. This section examines how length of stay varies with survivor and injury characteristics. Table 10 shows the mean length of hospital stay by age and sex among nonfatal California flame burn survivors discharged during the last half of 1990. A non-parametric signs test showed that the lengths of stay did not differ significantly by sex at even the 90 percent confidence level. Lengths of stay appear to be longer for burn survivors over age 60.

Regression analyses on the California and NHDS data further probed variations in length of stay by age, sex, and burn characteristics. NPSRI structured three age variables for the elderly:

- AGEGT59 equal to 0 if over 60 and 1 otherwise
- OLD55STEP, coded as 1 for 55-59, 2 for 60-64, ..., up to 7 for 85 and over
- OLD60STEP, coded as 1 for 60-64, 2 for 65-69, ..., up to 6 for 85 and over.

Similarly, both yes-no age variables and stepped age variables were tested for AGELT15 (under age 15) and ADULT (age 15 to 55 or 60). The age break at 60 and yes-no rather than stepped age variables worked best in the model. This section reports only those results.

Other variables in the regression included:

- SEX, equal to 0 for female, 1 for male
- FACE, equal to 1 if the face was burned, 0 otherwise

- TRUNK, equal to 1 if the trunk was burned, 0 otherwise
- HAND, equal to 1 if a hand was burned, 0 otherwise
- UPLIMB, equal to 1 if an upper limb was burned, 0 otherwise
- LOWLIMB, equal to 1 if a lower limb or foot was burned, 0 otherwise
- MULTREG, equal to 1 if two or more body regions were burned, 0 otherwise
- %BODY, equal to 1 for 0-10% burned, 2 for 11-20% burned, etc.
- DEG1, equal to 1 for erythema (1st degree) and 0 otherwise
- DEG2, equal to 1 for blister/epidermis (2nd degree) and 0 otherwise
- DEG3, equal to 1 for full skin loss (3rd degree), and 0 otherwise
- DEG4, equal to 1 for deep necrosis/amputation and 0 otherwise; this severity occurred so rarely in the California data that DEG3 and DEG4 cases were analyzed together
- INHALE, equal to 1 for burns with inhalation injury, 0 otherwise

Table 11 summarizes the significant coefficients from linear and log-linear regressions. Log-linear regression probably is more appropriate because lengths of stay cannot be negative. Also, the logarithmic transformation reduces the influence of long lengths of stay. Because stays are Weibull-distributed, long stays are more common than is ideal for regression techniques designed for normal distributions. Many cases were missing percentage of body burned, so regressions were run with and without this variable. The log-linear regressions have five fewer cases than the linear regressions because five discharges had 0-day lengths of stay.

The regressions confirm that length of stay for flame burns does not vary by sex. People over age 60 have 42 to 56 percent longer stays for similar injuries (from the log-linear coefficients), averaging 3.9 to 5.2 extra days (from the linear coefficients). Lengths of stay are shorter for children than non-elderly adults. This finding is marginally significant statistically. Children's stays are on average 2.5 to 3 days shorter (29 to 36 percent).

Flame burns of multiple body regions raise length of stay by 51 to 55 percent, or 3.7 to 6.1 days. Survivors with facial burns may be admitted with less severe injuries in order to prevent complications of swelling that could block the airway. Their average length of stay is lower by 38 to 44 percent, 2.5 days. The log-linear regressions suggest that lower limb injuries may have 19 to 26 percent longer lengths of stay. This finding may reflect the greater difficulty in ambulating these patients. Complication by inhalation adds 38 to 47 percent, or 7.8 to 8.4

days, to the average length of a flame burn stay. A one-level increase in burn depth raises length of stay by 57 to 68 percent or 3.9 to 8.6 days. Finally, each 10-percent increase in the percentage of body burned is associated with a 20 percent or 3.7 day increase in length of stay.

Variations in length of stay by demographic and diagnostic factors are similar in the NHDS burn and California flame burn data. As Table 12 shows, the effects of age are consistent in direction but smaller. Males also have slightly shorter lengths of stay than females.

Extending the California flame burn regressions to other causes also made little difference in the estimated influence of the demographic and injury variables with one exception: inhalation injury cases do not have significantly different lengths of stay than other fire cases and cases with unknown causes. Table 13 shows these results. The Appendix defines the cause variables. The definitions parallel the NEISS injury classes. As Table 14 shows, electric and chemical burns involve substantially shorter stays than flame burns, while scald burns cause slightly shorter stays. Flame burn lengths of stay do not differ significantly by nature of fire. Intentionality also affects length of stay minimally.

Fatal Injury

The California HDS data include 31 flame burn fatalities. These deaths have mean **charges** per day of $8,763 (inflated to November 1992 dollars). By comparison, mean charges per day for 114 flame burn fatalities in the Burn Foundation data were $8,992. The mean daily charges in the data sets are similar. The Burn Foundation data were used because they could be adjusted to costs using Medicare cost to charge ratios. (The ratios by year and facility are appended.) The average **cost** per hospital day for fatalities is $4,991. Applying the 1989-91 CHAMPUS ratio of $.21 in professional fees per dollar of hospital payments for burn injury, total medical costs per day average $6,039 for flame burn deaths.

The mean length of stay for 31 fatal flame burns is 7.3 days in the California HDS data. For all 78 fatal burns, it is 10.0 days. It is much longer in the other data sets: 19.5 days for all 84 burn deaths in NHDS data; and 27.7 days for 22 deaths from cigarette flame burns without accelerants, 21.9 days for all 190 flame burn deaths, and 23.0 days for all 242 burn deaths in Burn Foundation data. In the Burn Foundation data, the difference between the mean stay for cigarette burn and all flame burn fatalities results may be a sample size effect in data with some extremely long stays. Excluding the case with the longest stay from cigarette burns and from

other flame burns yields mean of 19.4 days and 19.0 days respectively. The pooled standard deviation for these two groups exceeds 40. As with nonfatal burns with anoxia, NPSRI conservatively concludes, lengths of stay for burns in cigarette fires without accelerants do not differ significantly from lengths of stay for other flame burns.

The discrepant lengths of fatal stay between the HDS data sets is worrisome. This is a fatality issue; nonfatal lengths of stay in these data sets are comparable. This report uses the NHDS estimate, which is nationally representative. Multiplying lengths of stay times costs per day yields medical costs per burn fatality averaging $117,763. Multiplying times the California length of stay ratio for flame burn deaths to all burn deaths yields an estimated $85,967 in medical payments per flame burn fatality.

For 1982, Burn Foundation analysis of hospital discharge data and state fire death statistics suggests that about a third of Pennsylvania fire deaths and a quarter of New Jersey fire deaths were admitted to hospitals. These rates imply medical costs across all flame burn deaths average about $25,000. NFIRS data indicate only 13 percent of cigarette fire deaths are transported to hospitals. This rate implies medical payments average $11,076 per death.

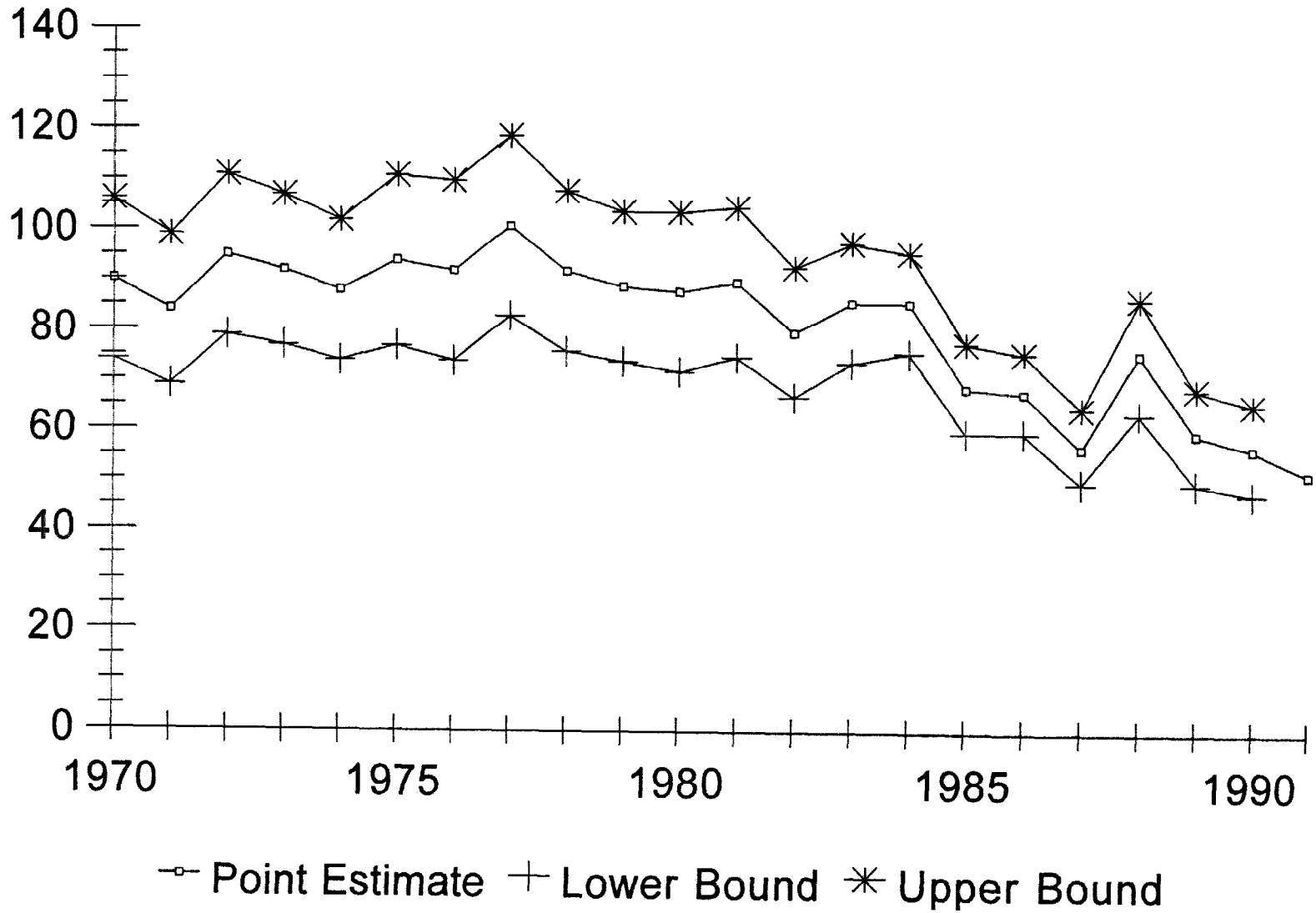
As Tables 7 and 8 show, burn center deaths involving inhalation injury involve shorter than average stays. Deaths from flame burns only typically are preceded by very long stays. Overall, however, flame burn deaths appear to have shorter lengths of stay than other burn deaths.

Deaths in hospital from inhalation injury only are too rare to analyze in depth. The lengths of stay for seven Burn Foundation cases and one California case combined average 14.9 days. NFIRS reports that only 12 percent of the 242 anoxia deaths in cigarette fires are transported to hospitals. Only the California case had charge data. Applying the cost per day for burn deaths to these cases yields a medical cost per anoxia death of $10,860.

For other injuries, the recommended fatality cost is $14,677. This cost is the average medical payments across 3334 deaths covered by Workers' Compensation in 1985 (NCCI, 1989).

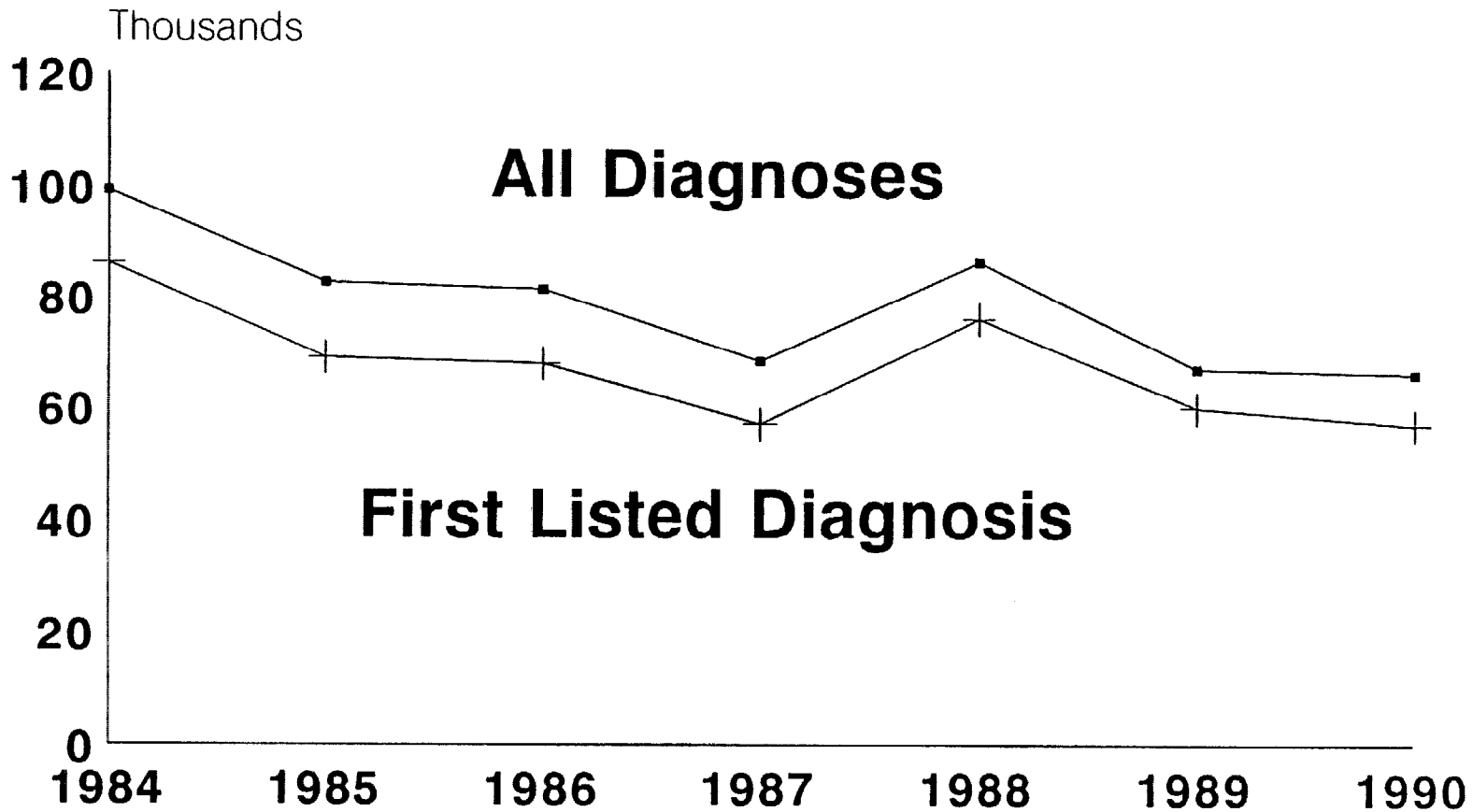
Figure 1. U.S. Burn Hospitalizations, 1970-1990:

Point Estimates and 95% Confidence Intervals (In Thousands).



Source: NHDS Data. Compiled by Peter Brigham, The Burn Foundation.

Figure 2. Trend in Live Burn Discharges For Primary Diagnosis and All Diagnoses in 1984-90 NHDS Data



Source: National Public Services Research Institute, 1993

Table 1. Annual Hospitalized and Emergency Room-Treated Burns by Cause

	Hospitalized				
	Nonwork	Work	Total	%OfBurns	CA%ofBurns
Thermal	11677	2115	13792	51.9%	48.3%
Scald	8460	984	9444	35.5%	38.6%
Electric	582	579	1161	4.4%	4.9%
Chemical	936	680	1616	6.1%	7.2%
Radiation	27	140	167	0.6%	1.0%
Unknown	263	151	414	1.6%	--
TOTAL	21945	4649	26594	100.0%	100.0%

	Emergency Room Only				
	Nonwork	Work	Total	%OfBurns	%Hosp
Thermal	151470	800	152270	50.3%	8.3%
Scald	69440	798	70238	23.2%	11.9%
Electric	5762	3777	9539	3.1%	10.8%
Chemical	40358	623	40981	13.5%	3.8%
Radiation	13471	10771	24242	8.0%	0.7%
Unknown	2623	3098	5721	1.9%	6.7%
TOTAL	283124	19866	302990	100.0%	8.1%

Thermal = Flame or Hot Object

Note: Excludes burn injuries, primarily from flames, involving motorized transport vehicles, most injuries in nature (e.g., in forest fires or lightning strikes) and public places, and most intentional injuries.

Source: National Public Services Research Institute, compiled from 1991-1992 National Electronic Injury Surveillance System (NEISS) data, NEISS workplace injury counts for 1983-1986 from Miller et al. (1993), and California Hospital Discharge Survey data for the last half of 1990.

Table 2. Costs Per Nonhospitalized Burn Injury, With and Without Burns Initially Treated in the Outpatient Department

	Without	With
Cases	155	167
Payments/Visit	$166	$291
Visits/Case	1.85	2.0
Payments/Case	$305	$553
Payments/Hospital Outpatient Visit	$282	$724

Note: The values without cases originating in the outpatient department are best estimates of nonhospitalized case costs. Excludes ancillary and prescription costs. Visits cover utilization in Calendar Year 1987. On average, that period covers six months after injury.

Source: National Public Services Research Institute, tabulated from 1987 NMES data, inflated to 11/92 dollars.

Table 3. Medical and Ancillary Payments and Utilization for Nonhospitalized Cases, By Level of Treatment

	Emergency Room	Physician Office	All Non-Hospitalized
Cases	64	91	155
Visits/Case	2.84	1.18	1.86
ER Visits/Case	1.22	0	.50
% with Outpatient Visits	14%	0.0%	6%
Outpatient Visits/ Case	.83	0	.35
Physician and Ancillary Medical Visits/Case	.79	1.18	1.00
Provider Payments/ Case	$647	$72	$309
% with Prescriptions	36%	43%	40%
Prescription Payments/Case	$12	$21	$17
Total Paid/Case	$659	$93	$326
Total Paid/Visit	$232	$79	$175
Total Paid/ER Visit	$540	--	--
DCI % Paid in 1st 6 Mos	94.3%	94.3%	94.3%
Lifetime Payments/Case	$698	$98	$346

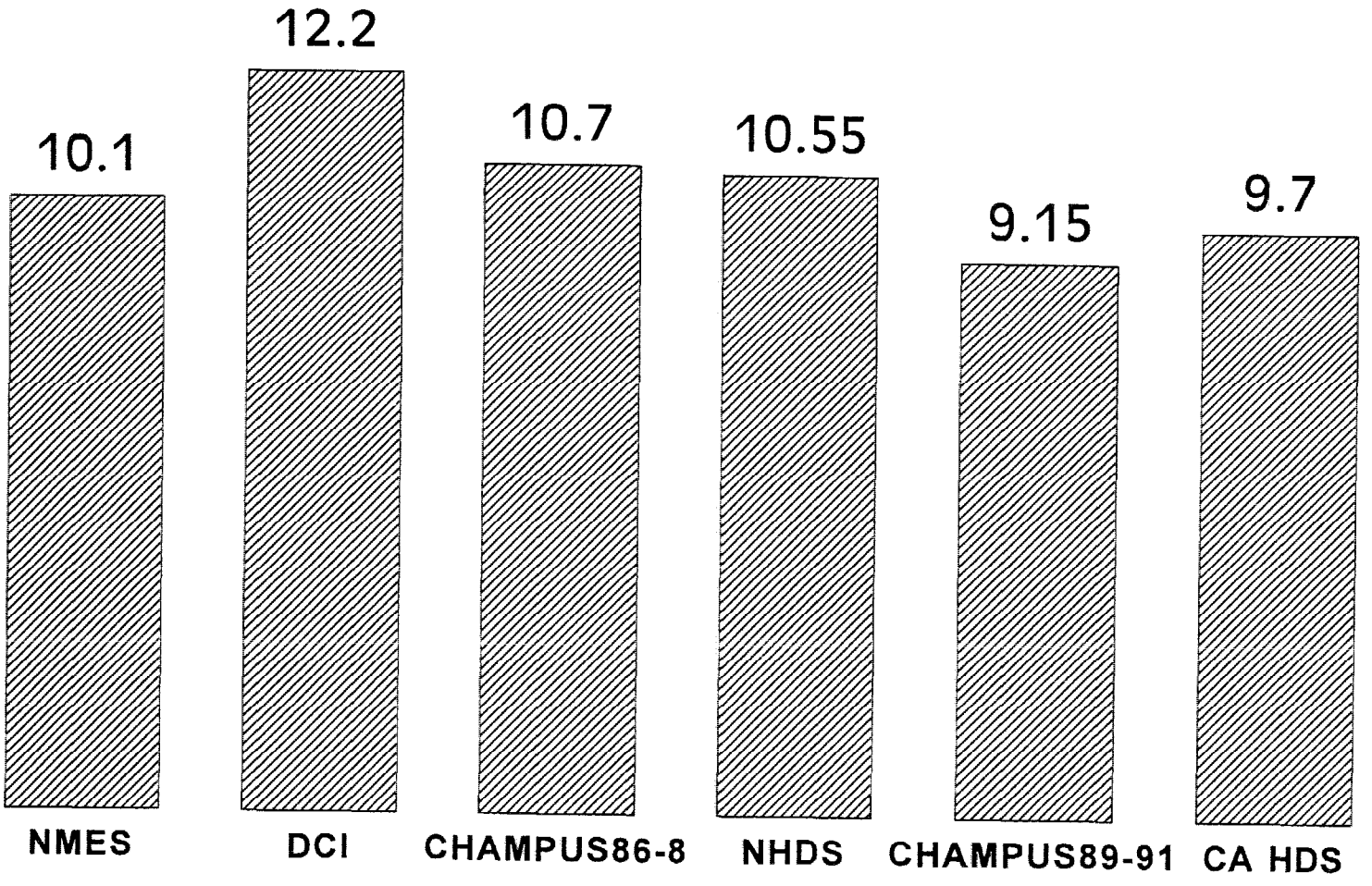
Source: National Public Services Research Institute, tabulated from 1987 NMES data, inflated to 11/92 dollars.

Table 4. Nonhospitalized Medical Payments and Visits by Body Region Injured

ICD		CHAMPUS Cases	Visits/ Case	$/Visit	Lifetime $/Case
940	Eye	348	1.5	106	246
941	Face	402	1.6	160	394
942	Trunk	415	2.1	110	359
943	Upper Limb	597	1.7	121	329
944	Wrist/Hand	1215	1.9	103	311
945	Lower Limb	814	2.4	103	385
946	Multiple	292	1.6	141	341
947	Internal	98	1.5	111	259
948	% of Body	96	1.7	428	1070
949	Unspecified	916	1.8	125	353
All		5193	1.9	120	353

Source: National Public Services Research Institute, based on NMES costs per visit and prescription costs inflated to 11/92 dollars, CHAMPUS visits per case and pattern of payments per visit by ICD, and DCI percentage of payments in the first six months.

Figure 3. Hospitalized Burns: Length of Acute Care Stay by Data Set



Source: National Public Services Research Institute, 1993

Table 5. Case Counts and Length of Stay (LOS) for Burn Injuries by Primary Body Region Burned, from National Hospital Discharge Survey Data and California Flame Burn Data

		NHDS All Causes		
ICD Code	Weighted Cases/Yr	Unwgtd Cases	%	LOS
940 Eye	1132	39	1.6%	2.50
941 Face	5489	305	7.6%	5.30
942 Trunk	6054	308	8.4%	10.15
943 Upper Limb	4925	222	6.8%	7.90
944 Wrist/Hand	7825	418	10.8%	6.15
945 Lower Limb	16828	723	23.3%	10.95
946 Multiple	28216	1104	39.1%	12.85
947 Internal	12310	100	2.4%	8.05
			100.0%	
948.0 LT 10% of Body	1322	726	54.0%	8.55
948.1 10-19% of Body	8458	371	27.6%	13.60
948.2 20-29% of Body	3861	145	10.8%	19.35
948.3 30-39% of Body	1037	50	3.7%	32.20
948.4 40-49% of Body	789	31	2.3%	39.55
948.5 50-59% of Body	155	9	.7%	61.40
948.6 60-69% of Body	65	2	.1%	52.85
948.7 70-79% of Body	175	7	.5%	21.05
948.8 80-89% of Body	42	2	.1%	1.60
948.9 90-99% of Body	31	1	.1%	3.00
			100.0%	

	California All Causes			California Flame Burn		
	Cases	%	LOS	Cases	%	LOS
940 Eye	13	0.6%	4.30	2	.4%	7.50
941 Face	287	14.3%	8.10	87	19.4%	8.75
942 Trunk	288	14.4%	11.30	59	13.2%	13.55
943 Upper Limb	192	9.6%	9.10	42	9.4%	8.90
944 Wrist/Hand	254	12.7%	5.95	56	12.5%	8.05
945 Lower Limb	545	27.2%	9.45	98	21.9%	8.05
946 Multiple	410	20.5%	12.40	103	23.0%	13.20
947 Internal	15	0.7%	4.15	1	0.2%	25.0

Source: National Public Services Research Institute, 1993. Computed from 1984-1990 NHDS data and California HDS data from the second half of 1990.

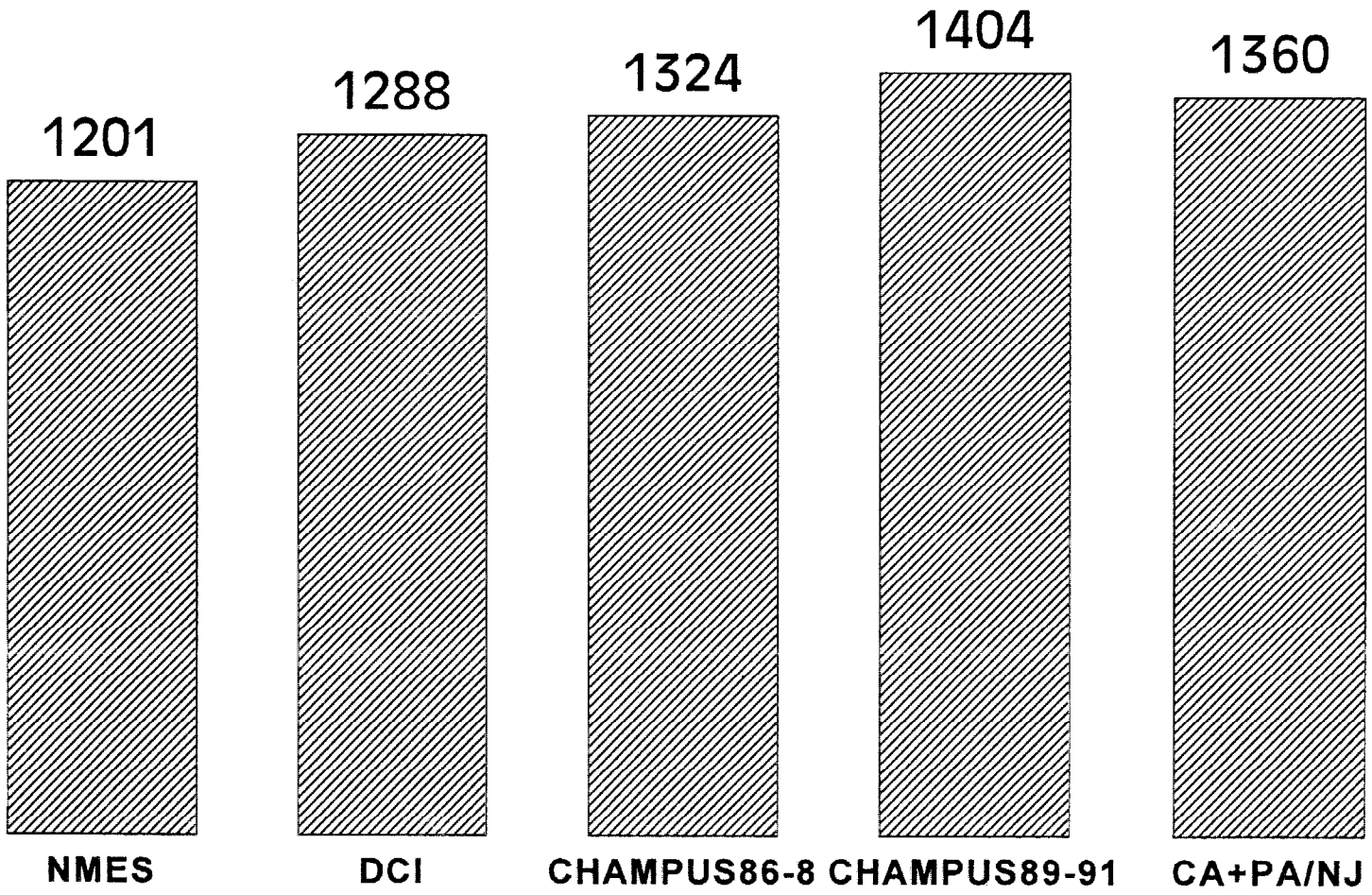
Table 6. Payments per Day of Hospital Stay for Burn Injury, by Data Source and Inflator Series (in 1989 dollars)

	CPI Medical	AHA Cost/Day
NMES 1987	$914	$933
DCI 1979-87	$897	$1001
CHAMPUS 1989-91	$1029	N/A*
CHAMPUS 1986-88	$1065	$1091
CA + Burn Foundation	$925	$935

N/A* = American Hospital Association average cost/hospital day is not yet available for 1991.

Source: National Public Services Research Institute, 1993.

Figure 4. Hospitalized Burns: Payments/Day (in 11/92 $)



Source: National Public Services Research Institute, 1993.

Table 7. Length of Stay (LOS) in Burn Foundation Data for 1987-1990, by Discharge Status, Cause of Burn, and Presence of Inhalation Injury/Anoxia

	Live		Dead		Unknown	
	Cases	LOS	Cases	LOS	Cases	LOS
Cigarette without Accelerant						
Burn Only	30	27.2	4	92.3		
Burn Plus Anoxia	22	52.7	16	14.3		
Burn & Unknown If Anoxia	8	24.4	2	5.5		
Any Flame Burn	60	36.2	22	27.7		
Anoxia Only	2	17.0	6	17.3		
Total	62	35.6	28	25.5		
Other Flame						
Burn Only	786	21.3	40	33.1	120	16.1
Burn Plus Anoxia	311	45.6	99	19.0	33	59.0
Burn & Unknown If Anoxia	101	30.1	29	4.6		
Any Flame Burn	1198	28.4	168	19.9	153	25.4
Anoxia Only	28	27.3	1	1.0	3	16.0
Total	1226	28.4	169	19.7	156	25.2
Other Burn	1729	15.9	41	29.0	N/A	N/A
All Flame Burn	1258	28.8	190	20.8	153	25.4
All Anoxia	30	26.6	7	15.0	3	16.0
All Burn	2987	21.3	231	22.2	153	25.4

N/A = Not applicable. Anoxia is largely confined to flame burn injury.

Source: The Burn Foundation, tabulation of data from the five burn centers serving Delaware, New Jersey, and the eastern half of Pennsylvania, 1993.

Table 8. Utilization, Charges, and Costs in 1987-1990 Burn Foundation and 1990 California Hospital Discharge Data, by Nature of Burn Injury

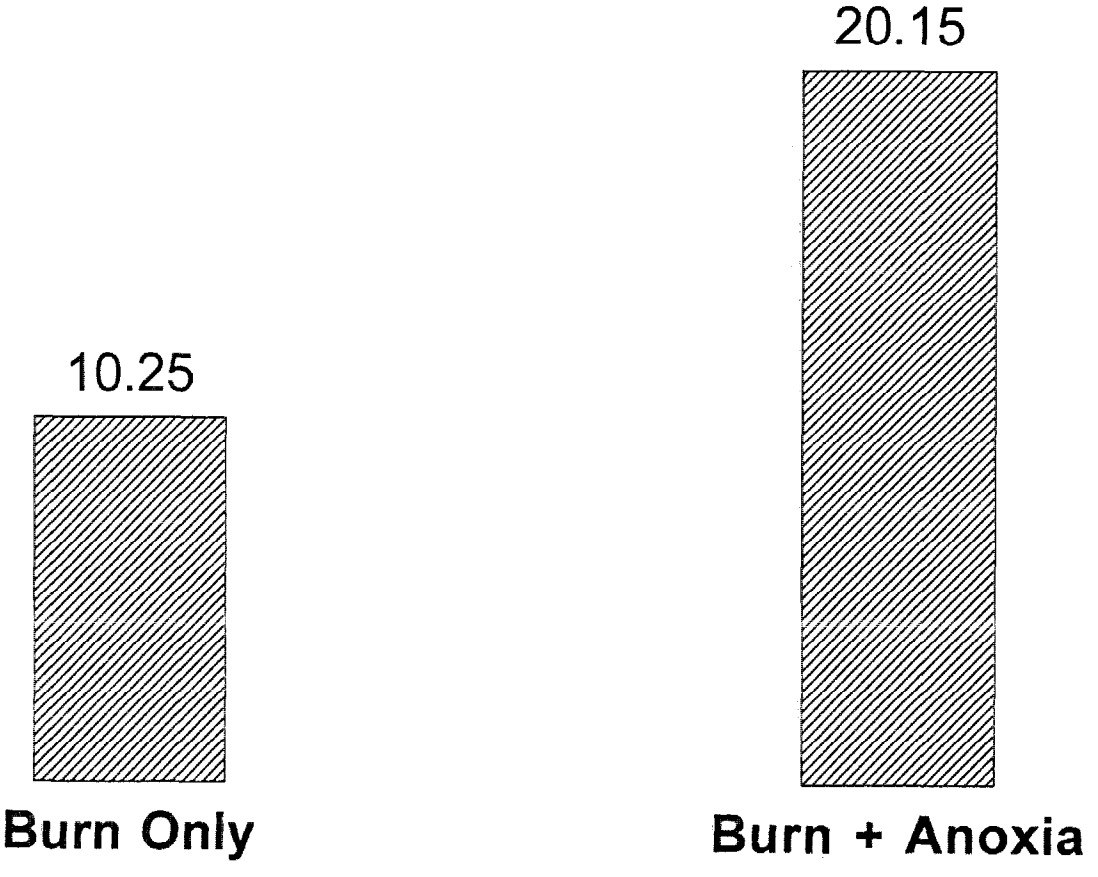
All Flame Burns (Burn Foundation)	Cases	Cost/Day
Live Discharge	1245	$1,831
Survival Unknown	59	1,735
Non-survivor	138	4,991

LIVE DISCHARGES	Flame Burn Only	FlameBurn + Anoxia	Anoxia Only	Burn Only	All Burns
Cases					
California HDS	424	41	51	2040	2129
with charges known	410	40	48	1942	2029
Burn Foundation	816	330	30	2545	2875
with charges known	333	149	10	1707	1856
Length of Stay					
California HDS	10.2	17.4	3.0	9.6	9.7
Burn Foundation	21.6	45.5	26.6	17.7	20.9
Charges/Day					
California HDS avg across patients	2956	5186	2208	2226	2331
avg across days	3779	3523	2543	2573	2298
Burn Foundation avg across patients	2927	3572	2495	2819	2916
Charges/Case					
California HDS	30416	92444	6711	24979	26940
Burn Foundation	61873	132297	22193	43636	55063
Costs/Day					
Burn Foundation	1709	2118	1391	1639	1701
Costs/Case					
Burn Foundation	35614	76440	12483	25119	31734

Note: Charges were converted to costs using Medicare cost-to-charge ratios by facility and year. Data were converted to November 1992 dollars using the Consumer Price Index - Medical Care. California flame burn plus anoxia category excludes 48 vehicle fire and intentional fire injury cases. Including those cases, the average length of stay is 13.0 days and the average charge per case is $70,710. All Burns includes burn plus anoxia cases, but not anoxia only cases. In California, recall some burn plus anoxia cases fall outside the restrictive definition of "flame" burn used with this data set, which exludes incidents like fires in vehicles.

Source: National Public Services Research Institute, Burn Foundation, tabulation of data from California HDS and from four of the five burn centers serving Delaware, New Jersey, and the eastern half of Pennsylvania, 1993.

Figure 5. Length of Stay for Burns in NHDS, by Presence of Inhalation Injury



Source: National Public Services Research Institute, 1993

Table 9. Number of Hospitalized California Burn Survivors, Probability of Nursing Home Transfer, and Average Nursing Home Cost/Case by Cause of Injury

Cause	Cases	P(Nursing Home Admit)	Nursing Home Cost
Flame	614	2.9%	$ 7911
Electric	83	1.2%	3120
Chemical	128	0.0%	0
Scald	650	2.9%	7570
Radiation	16	6.2%	16186
Moving Motor Vehicle	92	2.2%	5630
Other Vehicle/Machine	57	0.0%	0
Hot Object/Heat	237	4.5%	11712
Not Elsewhere Classified	38	10.5%	27260
Unknown	252	11.8%	25691
TOTAL	2129	3.8%	9849

Source: National Public Services Research Institute, 1993. Case counts from California hospital discharge data for the second half of 1990.

Table 10. Length of Stay (LOS) by Age Group and Sex for Live Hospital Discharges Attributed to Flame Burns in California during July-December 1990

Age	FEMALE		MALE		ALL
Group	Cases	LOS	Cases	LOS	LOS
1-4	11	4.4	28	5.0	4.8
5-14	8	18.8	26	8.8	11.1
15-24	8	7.4	48	8.0	7.9
25-34	16	7.1	69	10.7	10.0
35-44	13	8.0	69	12.7	12.0
45-54	10	9.5	36	8.0	8.3
55-59	4	16.0	13	11.3	12.4
60-69	7	10.0	16	16.1	14.3
70-79	6	15.0	12	19.4	18.0
>=80	4	3.2	10	19.2	14.6
All Ages	87	9.3	307	10.4	10.4

Excludes patients who were transferred between acute care hospitals.

Source: National Public Services Research Institute, 1993, tabulated from California Hospital Discharge Survey public use file.

Table 11. Regressions Explaining Variation in Length of Stay for Live Hospital Discharges Attributed to Flame Burns in California during July-December 1990

Dependent Variable	LOS	LOS	Ln(LOS)	Ln(LOS)
CONSTANT	11.40 (8.21)	10.56 (5.52)	1.71 (15.06)	1.7 (11.53)
AGEGT59	3.89 (2.14)	5.20 (2.18)	0.46 (2.79)	0.56 (3.05)
AGELT15	-2.48 (1.55)	-2.95 (1.44)	-0.36 (2.74)	-0.29 (1.80)
MULTREG	6.12 (4.66)	3.69 (2.06)	0.55 (5.16)	0.51 (3.73)
FACE	-2.49 (1.77)	-2.51 (1.43)	-0.38 (3.26)	-0.44 (3.28)
LOWLIMB	0.66 (0.50)	2.63 (1.58)	0.19 (1.75)	0.26 (2.04)
TRUNK	0.82 (0.57)	-1.09 (0.62)	0.18 (1.57)	0.04 (0.28)
INHALE	8.36 (3.83)	7.84 (2.74)	0.47 (2.64)	0.38 (1.71)
DEG1	-12.24 (3.59)	-15.29 (2.71)	-1.16 (4.16)	-1.31 (3.03)
DEG2	-8.31 (6.62)	-8.55 (5.42)	-0.57 (5.58)	-0.68 (5.56)
%BODY	Excluded	3.70 (6.92)	Excluded	0.20 (4.83)
Degrees of freedom (error)	455	292	455	292
Adjusted r-squared	0.159	0.305	0.182	0.300
F-value	10.72	14.28	12.50	13.92

Ln = natural logarithm

Note: The absolute value of the Student's t statistic is shown in parentheses beside each coefficient.

Source: National Public Services Research Institute, 1993.

Table 12. Regressions Explaining Variation in Length of Stay for Live Hospital Discharges for Burns in 1984-1990 NHDS data.

Dependent Variable	LOS	LOS	Ln(LOS)	Ln(LOS)
CONSTANT	10.30 (15.15)	8.68 (8.63)	1.76 (35.23)	1.78 (24.00)
MALE	-0.96 (1.85)	-1.09 (1.57)	-0.10 (2.76)	-0.13 (2.57)
AGEGT59	3.83 (5.45)	5.67 (5.19)	0.34 (6.47)	0.25 (3.09)
AGELT15	-1.40 (2.57)	-0.62 (0.89)	-0.13 (3.11)	-0.09 (1.81)
MULTREG	3.68 (7.28)	1.90 (2.55)	0.28 (7.61)	0.29 (5.24)
FACE	-3.05 (3.87)	-2.26 (2.54)	-0.48 (8.28)	-0.52 (7.96)
UPLIMB	-1.75 (2.09)	-2.80 (1.85)	-0.06 (0.94)	-0.09 (0.76)
HAND	-3.24 (4.33)	-2.31 (2.71)	-0.29 (5.23)	-0.28 (4.52)
TRUNK	1.07 (1.32)	0.66 (0.47)	0.15 (2.60)	0.20 (1.91)
INHALE	10.20 (7.17)	11.62 (6.67)	0.49 (4.69)	0.47 (3.69)
DEG1	-5.01 (3.89)	-6.98 (4.00)	-0.46 (4.84)	-0.61 94.74)
DEG2	-3.38 (5.32)	-3.50 (4.09)	-0.23 (5.00)	-0.28 (4.44)
DEG3	4.04 (5.98)	3.52 (3.86)	0.39 (7.89)	0.30 (4.51)
DEG4	10.88 (5.70)	14.79 (6.68)	0.57 (4.03)	0.64 (3.91)
%BODY	Excluded	4.98 (16.48)	Excluded	0.24 (10.93)
Degrees of freedom (error)	3452	1808	3452	1808
Adjusted r-squared	0.111	0.288	0.143	0.275
F-value	34.23	53.68	45.38	50.33

Ln = natural logarithm

Note: The absolute value of the Student's t statistic is shown in parentheses beside each coefficient.

Source: National Public Services Research Institute, 1993.

Table 13. Regressions Explaining Variation in Length of Stay for Live Hospital Discharges Attributed to Flame Burns in California during July-December 1990

	Unintentional Injury w/Known Cause		All Burn Injury (expanded causes)	
	ALL REGRESSIONS ARE LOG-LINEAR			
CONSTANT	1.50 (15.89)	1.39 (9.77)	1.57 (19.14)	1.29 (9.93)
AGEGT59	0.36 (4.88)	0.42 (4.30)	0.30 (4.52)	0.44 (4.63)
AGELT15	-0.29 (5.22)	-0.16 (2.35)	-0.23 (4.44)	-0.12 (1.73)
MALE	-0.07 (1.38)	-0.07 (1.02)	-0.07 (1.55)	-0.03 (0.53)
MULTREG	0.41 (7.23)	0.31 (4.33)	0.41 (7.68)	0.37 (5.36)
FRAC	0.51 (2.57)	0.34 (1.51)	0.48 (4.05)	0.46 (2.69)
FACE	-0.20 (3.29)	-0.24 (3.17)	-0.18 (3.09)	-0.20 (2.69)
HAND	-0.17 (2.79)	-0.14 (1.91)	-0.20 (3.54)	-0.17 (2.36)
LOWLIMB	0.18 (3.48)	0.23 (3.52)	0.16 (3.26)	0.22 (3.59)
UPLIMB	-0.02 (0.24)	-0.07 (0.96)	-0.04 (0.75)	-0.07 (0.99)
TRUNK	0.12 (1.98)	-0.02 (0.24)	0.15 (2.68)	0.01 (0.13)
INHALE	0.24 (1.80)	0.10 (0.65)	0.27 (2.14)	0.17 (1.12)
ELEC	-0.38 (3.26)	-0.18 (1.19)	-0.49 (4.14)	-0.20 (1.21)
CHEM	-0.28 (2.64)	-0.12 (0.78)	-0.36 (3.41)	-0.17 (1.08)
SCALD	-0.05 (0.83)	-0.05 (0.64)	-0.07 (1.22)	-0.07 (1.02)
RADIAT	0.01 (0.02)	-1.03 (2.52)	-0.02 (0.09)	-0.94 (2.18)
HOTOBJ	-0.11 (1.31)	-0.20 (1.85)		
DEG1	-0.52 (3.76)	-0.68 (3.10)	-0.43 (3.87)	-0.34 (1.86)
DEG2	-0.13 (1.53)	-0.12 (0.93)	-0.17 (2.46)	-0.05 (0.38)
DEG3	0.43 (4.79)	0.49 (3.67)	0.36 (4.86)	0.53 (4.41)
ARSON			-0.06 (0.17)	-0.28 (0.76)
SUICIDE			0.37 (2.05)	0.28 (1.13)
INTENT			0.16 (1.00)	0.25 (1.33)
MV			-0.05 (0.44)	0.06 (0.39)
OTHMV			-0.05 (0.30)	-0.17 (0.82)
VEHMACH			0.31 (1.45)	0.33 (1.20)
NEC (hot obj, med mal)			-0.06 (0.78)	-0.18 (1.66)
UNK			0.19 (2.33)	0.11 (0.82)
%BODY	Excluded	0.25 (9.79)	Excluded	0.22 (10.08)
Degrees of freedom (error)	1593	964	2102	1168
Adjusted r-squared	0.19	0.28	0.16	0.25
F-value	20.49	19.84	16.84	15.81

Ln = natural logarithm

Note: For definitions of cause variables, see the appendix. The absolute value of the Student's t statistic is shown in parentheses beside each coefficient.

Source: National Public Services Research Institute, 1993.

Table 14. Number of Hospitalized California Burn Survivors and Mean Length of Stay by Cause of Injury

Cause	Cases	% of Cases	LOS
Flame	614	28.8%	11.4
-unintentional	568	26.7%	11.0
Electric	83	3.9%	7.3
-excluding lightning	78	3.7%	7.7
Chemical	128	6.0%	5.2
-unintentional	114	5.4%	4.8
Scald	650	30.5%	8.1
-unintentional	638	30.0%	8.1
Radiation	16	0.8%	8.4
Moving Motor Vehicle	92	4.3%	16.1
Other Motor Vehicle	34	1.6%	13.4
Other Vehicle/Machine	23	1.1%	15.0
Hot Object/Heat	199	9.4%	7.1
Not Elsewhere Classified	38	1.8%	11.5
Unknown	252	11.8%	11.6
TOTAL	2129	100.0%	9.7

Source: National Public Services Research Institute, 1993. Compiled from California hospital discharge data for the second half of 1990.

3. LITERATURE REVIEW OF BURN INCIDENCE AND TREATMENT

Before World War II, those who survived fires and other burn incidents with major injuries received virtually no care before reaching a hospital. If they reached the hospital alive, they would receive largely palliative care. If they escaped the constant threat of death from burn wound sepsis and its complications while their wounds remained open, they generally faced a cosmetically and functionally compromised future, and the unappealing choice of dealing with or hiding from a generally uncomprehending and unsympathetic populace.

Treatment of patients with severe fire and burn injuries has shown remarkable progress in the past 50 years, at a rate that has accelerated in the past 25 years (Alexander, 1985; Dimick et al, 1993). During the same period, death and injuries from fires and burns have declined to current levels of approximately 4500 civilian fire deaths (Karter, 1992) and 52,000 hospitalized primary ICD-code burn injuries per year (National Center for Health Statistics, 1993; Dimick et al, 1993). Counts of additional burn deaths and hospitalized fire injuries, while considerably lower, remain locked in unanalyzed data. Less severe injuries are more frequent. Total burn injuries, defined as contact with medical care and/or reduced activity for at least a day, were estimated at 1.75 million per year, or about .75 per year per 100 population (National Safety Council, 1992, tabulation of National Health Interview Survey, 1985-87).

According to the most recent annual tabulation by the National Fire Protection Association, about 1200 of the nation's 4500 annual fire deaths result from fires started by dropped cigarettes (Miller A, 1993). There is no national system in place which counts all fire and burn injuries by type and ignition source. The National Fire Incident Reporting System (NFIRS), estimates the incidence of fatal and nonfatal fire injuries attended by fire departments. Data from the National Electronic Injury Surveillance System (NEISS) of the U.S. Consumer Product Safety Commission (CPSC) cover many burn injury sources comprehensively. Scattered burn center reviews place dropped cigarette fire injuries at between 3% of admissions (Burn Foundation, unpublished data, 1993) and 6% (Cleon Goodwin, unpublished data, 1993). Projected against the national total of 23,000 specialized burn facility admissions per year (Dimick et al, 1993), these reports suggest that the number of such cigarette fire injuries receiving specialized burn treatment is between 700 and 1400. This does not include additional injuries related to smoking, such as the accidental ignition of an accelerant (gasoline, kerosene, etc.) or the

intentional ignition of combustibles by a cigarette, or the misuse of matches or cigarette lighters by children or compromised adults with ready access to smoking paraphernalia.

Overview of Recent Advances

Five landmark articles documenting major advances in burn treatment in recent decades have been cited by Cohen et al (1989). They include:

- a comprehensive approach to fluid and electrolyte needs (Baxter, 1974)
- prevention and control of infection (Heggers and Robson, 1986)
- early debridement and coverage (Janzekovic, 1970; Hunt et al, 1979)
- prevention of contractures with splints and early mobilization (Petros, 1986)
- prevention of hypertrophic scars and keloids with pressure garments (Larsen, 1971)

Additional important areas of recent advances and continuing concern are reflected in the topic headings in the report of the most recent NIH consensus conference on trauma and burn injury (Maddox et al, 1990). These include nutrition and metabolism, pulmonary injury, wound healing, and immunological consequences.

For those who survive a fire or burn injury incident to enter the medical care system, the standard for care is now a mature system extending from prehospital care and transportation through inpatient care and rehabilitation (American Burn Association, 1990; Bayley et al, 1989). Rehabilitation both during and after hospitalization is receiving increased attention (Cromes & Helm, 1992) although the overall societal approach to rehabilitation remains deficient (Salisbury, 1992).

Advances affecting the acute treatment of the most severely injured have particular relevance for the survivors of fire started by dropped cigarettes. Classed by ignition source, injuries caused by cigarettes have the longest hospital course, the most extensive respiratory and other complications, and the highest average hospitalization costs (Jones & Feller, 1988, Burn Foundation, 1990). Cigarette fires typically do not produce substantial quantities of CO and other toxic products while smoldering in a mattress or upholstered furniture before erupting into flame. Many National Institute of Standards and Technology (NIST) studies attest to this. However, those caught in the ensuing conflagrations suffer as a group the most severe mix of respiratory and burn injury of any fire injury scenario.

The literature on the treatment of fire and burn injury is growing by several hundred references each year. There are some 150 new references alone in the two major periodicals dedicated to burn injury, the Journal of Burn Care and Rehabilitation, inaugurated in 1981, and Burns, published in England since 1974. Dozens of articles addressing burn injury appear in other medical publications. Upwards of 250 papers and poster sessions, many remaining unpublished, are also presented each year at the annual meetings of the American Burn Association.

The recent literature documents continuing progress and further promise in advancing the frontier of survival and shortening the hospital stay through improved surgical and nursing technique in the areas of wound coverage and healing (Munster et al, 1992; Carrougher et al, 1991). There is increasing attention to diagnosing and treating inhalation injury, (Clark & Nieman, 1987) which remains the last major challenge to surviving the acute stage of injury (Sobel, 1992). There is also increasing attention to how burn care can most effectively be administered in an era of changing payment mechanisms and reduced burn center occupancy. (Jordan, 1991; Fortune, 1992; Rees, 1992; Silverstein, 1992; Brigham, 1993)

The following review assesses advances in more specific areas of burn care and research, with particular reference to literature published within the past five years, and with special attention to respiratory injury. The review is intended to serve as a guide to recent trends, to aid in determining what effect they have had and are likely to have on outcomes of care and medical costs.

Rescue and Transportation

Fire suppression and rescue techniques have become so refined that the prospect of surviving a conflagration has increased significantly (Chiles, 1992). Investigation of fire fatalities has improved the abilities of architects and builders to prevent fires from occurring and to enhance rescue and escape efforts if a fire breaks out. With advances in air transport and the nationwide spread of emergency medical systems (Dimick et al, 1993), care in the prehospital stage has substantially improved and transportation of the patient directly from the scene to a burn center has become standard practice (Chiles, 1992; Sharar et al, 1988). The widespread use of helicopters has even reached the point of stimulating recommendations for more precise criteria for their use (Baack et al, 1991). Both land and air transport have benefitted from the improvement in monitoring equipment, which is increasingly compact, user friendly and non-

invasive, making the monitoring of hemodynamic stability more accurate and precise and enabling corrective action during transit.

Acute Treatment

Burn mortality continues to be associated with advanced age and higher percent of total body surface area burned (Thompson et al, 1986). In addition, mortality remains greater (40%) in any burn combined with an inhalation injury (Herndon, 1986). Those who present to the burn center are frequently more complex due to increased age, advanced disease or complicated medical history. Substance abuse and intoxication also contribute both to the severity of burn injury and to ensuing complications (Kelly & Lynch, 1992; Haponik & Munster, 1990; Clark & Neiman, 1988).

Advanced technology has created an array of new techniques in debridement and skin replacement, such that wound size is reduced more quickly and with fewer complications (Burke, 1990). Better equipment and technique during surgery have improved the control of the patient's wound bed and facilitated healing. Complications associated with prolonged anesthesia have accordingly declined. The contribution of strengthened nutritional status and other supports to the patient's immunological defenses are increasingly well documented (Heimbach, 1990; Garrel, 1991).

Early wound excision and closure have reduced the complications of burn wound sepsis and shortened hospital stays without increasing mortality (Heimbach, 1988). Now that burn care has "come of age", refined skin grafting techniques have enabled surgeons to treat patients quickly and efficiently. Today, burn wounds are frequently excised and autografted on an outpatient basis. Healing time is spent at home, rather than in a high-priced hospital room. This reduces costs and potentially promotes early rehabilitation, if family and professional support is forthcoming.

These improvements have enabled the focus of grafting to expand at an earlier stage from wound coverage to cosmetic and functional restoration. In the most recent Presidential address to the American Burn Association, Warden (1993) communicated the need to establish early cosmesis and return to functional capacity as major goals of contemporary burn treatment.

Respiratory Care

Respiratory injury, and/or the ingestion of toxic gases, is the leading cause of death identified in data sources identifying fire victims (Harwood & Hall, 1989) and patients admitted to burn centers (Thompson, 1986; Tredget et al, 1990). Thompson reported mortality rates of 4% for patients without inhalation injury and 56% where such injury was present. Since inexperienced emergency room personnel may be distracted by the sensational external appearance of a large body surface wound, the emphasis in education is on securing an accurate history and performing a complete examination of the patient. These are crucial first steps in acquiring evidence of inhalation injury and implementing timely treatment (Herndon, 1986). Patients with smoke exposure but no thermal injury are also at risk for ominous complications if the emergency department practitioner does not implement appropriate treatment at the time of the initial examination (Haponik, 1990).

Jones and Feller (1988) reported that patients with a respiratory injury were hospitalized twice as long (46 days) as those without pulmonary involvement (18 days) based on average lengths of stay of patients documented in the National Burn Information Exchange from 1979 through 1986.

The patient who survives a thermal injury accompanied by a pulmonary injury faces a long recovery with multiple complications. Besides the physiologically damaging effects of smoke and heat, particles of smoke can cause toxic consequences that lead to delayed neurological problems (Sharar, 1990; Choi, 1983; Ellenhorn and Barceloux, 1988). Long-term pulmonary complications continue to involve all areas of the pulmonary tree causing restriction, stenosis or obstruction from the larynx and trachea to the bronchioles and parenchyma. Problems such as chronic obstructive pulmonary disease (COPD) can plague the survivor long after their initial hospitalization, complicating their rehabilitation and raising the costs to both patient and society (Colice, 1990).

Bronchoscopy examination is widely used and accepted for quick and effective determination of airway involvement and severity of injury (Herndon, 1986; Clark & Nieman, 1988; Haponik & Munster, 1990) yet it cannot predict the chance of respiratory failure (Shimozu, 1987). The xenon scan is a precise diagnostic tool for identifying a pulmonary injury, but is very expensive and not generally used if bronchoscopy is readily available (Herndon, 1986).

Increasing knowledge of the physical composition of smoke and its chemical properties has broadened the understanding of the causes of asphyxiation. Cyanide poisoning is now understood to be a major cause of death in addition to carbon monoxide (Jones 1987), accompanying the increased use of synthetic materials in building and decorating and the proliferation of plastics in home and industry (Decker and Garcia-Cantu, 1986). In 1991, Baud reported that plasma lactate concentration at the time of admission correlated more closely with blood cyanide intoxication than with blood carbon monoxide concentration.

The use of hyperbaric oxygenation in treating patients with thermal injury has become popular and at the same time controversial. Those who believe that hyperbaric treatment enhances removal of carboxyhemoglobin and promotes tissue oxygenation advocate its use with burn patients. Others feel the cost and clinical risk is too great to justify transporting a thermally injured patient back and forth from the treatment chamber (Ellenhorn and Barceloux, 1988). In the report of a comparative study of recipients and non-recipients of hyperbaric oxygen in burn treatment, investigators reported a 39% decrease in surgical procedures, a 34% reduction in hospitalization and a 34% reduction in patient costs in the cohort receiving such treatment (Cianci et al, 1990). The study did not resolve whether the risk of transporting a patient to and from a hyperbaric chamber was justified.

Recent research has focused on pathophysiological changes in the lung as a consequence of smoke and heat, singly or in combination (Thom, 1989; Demling et al, 1992; Hales et al, 1991; Isago et al, 1991; Kramer et al, 1989). Researchers continue to explore the effect of inhalation injury on microvasculature permeability at the cellular level. It is still difficult to predict the fluid requirements of patients with inhalation injury. More recent work suggests that such injury requires additional fluid administration in the early post-injury phase (Thom, 1989). Further research to identify such fluid requirements is crucial, since contemporary resuscitation formulas do not meet the needs of those experiencing respiratory compromise (Navar et al, 1985; Herndon, 1986; Clark & Nieman, 1988; Haponik & Munster, 1990).

Rehabilitation

The burn treatment community's growing consensus is that the frontier of survival in burn care has been pushed close to its extreme, with the exception of respiratory injury, and that attention must increasingly be devoted to burn rehabilitation. (Helm, 1992; Salisbury, 1992)

Controlling contracture and hypertrophic tissue formation, restoring psychological balance and regaining functional capacity are major clinical goals in the rehabilitation of the burn patient. Helm (1992) has identified the major components of rehabilitation services and listed ten broad educational, research and public policy goals related to burn rehabilitation. The psychosocial aspect of rehabilitation has long been and continues to be a major concern (Bowden et al, 1979; Blakeney, 1988). Current goals extend beyond getting the patient out of the hospital, to embrace the return of the patient to work or school through work hardening, or school reentry programs, provided directly by burn team members or through consultation with community agencies. Obtaining disability insurance for disabled burn patients has been a vexing problem (Salisbury, 1992). Miller et al (1993) estimate 15% of hospitalized burn patients and 1% of those treated in emergency departments experience permanent decreases in earning power.

Recent advances in scar control include the use of silicone and elastomer inserts and conformers in areas where it is difficult to maintain pressure over hypertrophic tissue (Cohen et al, 1989; Pegg, 1989; Ward, 1991). Splinting material, used to reduce contracture formation and allow better control of the treated area, is now available in a reusable fashion that can be customized as a patient's needs change with reduced edema and changing skin coverage. The newer material is easier to clean and has a longer shelf life, thus reducing costs (Roberts et al, 1991).

Conclusion

The past ten years have brought advances in burn care including the identification of toxic substances at the scene of the injury, improved transportation of patients, early respiratory treatment and support, aggressive wound coverage, and more comprehensive rehabilitation services.

Today, those who survive serious injury do so because of knowledge gained from the unfortunate incidents of the past, technological advance, improved health care education, the maturing functioning of multi-disciplinary burn teams and society's ever-expanding demand for quality care. These improvements have a two-way impact on costs, the net effect of which is not clear. As those who ultimately expire from their injuries without recovering survive for longer periods, treatment costs increase. As the caliber and speed of recovery increases for those who do survive, the total hospitalization costs may go down, although more resources are concentrated on

each day of care. Fire and burn deaths have decreased significantly in the past two decades. Now that well over 90% of burn center admissions survive to be discharged from the hospital, hopefully, the balance is shifting toward reducing costs. Better knowledge of this balance is needed to provide substance to the increasing ethical debate over the provision of extensive, intensive care to those who are massively burned (Kliever, 1989; Fratianne, 1992).

4. SUMMARY OF CONFERENCE ON TRENDS IN BURN TREATMENT AND THEIR IMPACT ON COSTS AND OUTCOMES, APRIL 15, 1993

This chapter reports on a conference held to discuss burn care trends and impacts. Various burn care professionals and other experts attended. Figure 6 identifies them. The conference, moderated by NPSRI, was held at the Urban Institute.

James Hoebel, Acting Associate Director for Health Sciences of the U.S. Consumer Product Safety Commission, placed the conference in the context of the legislative history of the fire-safe cigarette. Although CPSC does not have general regulatory jurisdiction over tobacco products, it does have a project-specific charge, mandated in the Fire-Safe Cigarette Act of 1990, to review the societal costs of fires started by cigarettes and the potential economic impact of a cigarette with a reduced propensity to start fires.

Ted Miller, PhD, of the National Public Services Research Institute, Principal Investigator, noted that the conference of burn experts was one of several tasks to be carried out as part of the NPSRI contract with CPSC, others including case studies of fire survivors, an analysis of jury verdict awards, and an extensive data review.

Severity and Nature of Patients with Burn and Anoxia Injuries, with Special Reference to Injuries in Cigarette Fires

A. Fire Data Perspective. (John Hall, PhD., National Fire Protection Association)

Dr. Hall reported that national civilian fire deaths had dropped in 1991 to 4465 after remaining at a plateau of about 5000 for several years, according to data collected annually from fire departments by NFPA. An increasing proportion of fire deaths is attributed to smoke inhalation rather than burns, although the relative importance of the two is frequently obscured by conflicting requirements in injury and death reports as to whether one or more causes can be listed.

About 1200 fire deaths in 1990 resulted from fires started by smoking materials. Most occurred in rooms other than where the fire originated. Of 30,000 fire injuries reported to fire departments 3100 were attributed to smoking. Of the latter, 2300 had burn and or smoke inhalation injuries, the remainder unknown or other injuries. About 1700 of the 2300 were transported to hospitals. There was discussion of the limitations of body part burned as an

indicator of burn severity, since burns to small areas such as the hand frequently result in long-term disability.

B. Burn Data Perspective (Peter Brigham, Burn Foundation)

Mr. Brigham reported that over the past 10 years burn center admissions had been increasing slightly while burn admissions to general hospitals (as reported in the annual sample study of the National Center for Health Statistics) had decreased sharply. The net result was that the nation's approximately 140 burn centers were now admitting about 40% of all hospitalized burns. Factors reducing overall burn admissions and shifting admissions to burn centers were identified, including changing financial incentives, the shift from inpatient to outpatient care, reduced incidence of serious burn injury and concerns about litigation.

Drawing from data collected between 1987 and 1990 at five burn centers coordinated by the Burn Foundation, Mr. Brigham noted that 85 admissions, or 2.5% of all admissions had been attributed to fires started by dropped cigarettes. Based on a projection of a subsequent review of Philadelphia Fire Marshal records on patients whose injury cause was recorded in the medical record only as "house fire", there were an additional 25 regional admissions resulting from smoking fires. The estimated total of 110 admissions from smoking fires results in an overall proportion of 3% of burn center admissions. Since the Burn Foundation hospitals account for about 5% of the nation's 23,000 burn center admissions, smoking fire injuries as the same proportion of national burn center admissions would be about 700 per year. While not a true sample, this figure does not contradict the NFPA report that 1700 people known to have suffered burn or respiratory injury in fires started by cigarettes were transported to hospitals.

Mr. Brigham reported some preliminary data. Average cost per day for known cigarette fire victims treated in Burn Foundation centers was $2465, based on adjustment of charges to each hospital's annual Medicare report cost-to-charge ratio and for inflation to November, 1992. Mr. Brigham stressed distinguishing costs from charges, which are increasingly inflated to capture revenues from sources which continue to pay a high proportion of charges. The average length of stay for this cohort was 33.5 days, resulting in hospital costs of $82,977. At $83,000 per admission, national burn center costs alone would be $60 million per year. This excludes physician charges, prehospital and referring hospital care, post-discharge care, and the costs of pain and suffering as reflected in jury awards. The mortality rate for this group of patients was 28%, well above the overall 7.2% mortality rate for these burn centers during 1987-1990.

C. A Federal Data Perspective (Ted Miller, PhD, National Public Services Research Institute).

Dr. Miller referred to data collected from the National Electronic Injury Surveillance System (NEISS), the National Health Interview Survey, the National Hospital Discharge Survey and the National Medical Expenditure Survey. Outpatient visits per hospitalized burn injury (2.2 in NMES data) seemed low to the burn experts. Miller also was encouraged to check the NEISS hospitalized burn distribution against the cause-coded California Hospital Discharge Survey distribution and against burn center data.

Trends in Burn Treatment

A. Transportation and Emergency Department Treatment (Alan Dimick, MD, University of Alabama)

Dr. Dimick described the six components of a properly functioning emergency medical system, as was now generally available throughout the country. He described the training to emergency care providers available in Advanced Burn Life Support courses offered around the country. He expressed concern that the improved survival rates resulting from well-managed and appropriate triage to burn centers may not prevail in the new world of managed care systems and HMO Preferred Provider Organizations. There could be an adverse impact both on patients and their families if the patient must be transferred to a participating hospital without a burn center, where there is no team approach to burn care.

B. A 40-year review of burn mortality. (Arthur D. Mason, MD, US Army Institute of Surgical Research)

Dr. Mason reviewed changes in burn mortality at his institution and nationally since the establishment of the burn center at the USAISR in 1947. The LA50 (the area of the body burned above which 50% of all patients do not survive) had increased nationally from 45% in the 1960's to about 75% overall and above 80% for young adults. Survival is continuing to improve except for patients with severe inhalation injuries. The emphasis in both research and treatment thus should be increasingly devoted to rehabilitation. In discussion it was noted that the mortality rate in most burn centers is now below 5%. Every burn center has its cluster of massively burned patients but most are below 25% body surface area. In the massively burned, long-term quality of life cannot be predicted from the size of the injury: much depends on personal motivation and

family support. While the literature is inconclusive, it appears that 80% of the massively burned resume independent existence, but less than 50% regain a healthy sense of self-worth. Thus if long-term care, especially of a mental health nature, is adequately reimbursed under proposed health care reforms, the costs may exceed those of acute care.

C. Inhalation Injury (William Clark, M.D., State University of New York at Syracuse)

Dr. Clark reviewed the development of an understanding of inhalation injury, citing knowledge gained from several major disasters and from animal studies. He described the deficiencies in defining and diagnosing inhalation injury, noting that the descriptive methodology is problematical, the clinical consequences not always obvious and the responses to exposure inconsistent in animal models.

Inhalation injury increases the likelihood of death by anywhere from 15% to 40%, in different institutional studies.

Dr. Clark's conclusion that it is not currently possible to quantify the severity of inhalation injury or its comparative importance to burn injury in mortality led to an extended discussion of such classifications. The restriction in death certificate E-coding to one cause (burn or inhalation injury) obscures the interaction between the two which frequently results in fatal pneumonia. Carboxyhemoglobin levels are not a good indicator since they have frequently dropped by the time a measurement is taken. More recent efforts to measure fractional accepted dose have not yet proven valid.

Dr. Warden noted that current treatment focuses on symptoms (e.g., improving ventilation) rather than the underlying disease. The future lies in addressing the inflammatory reaction (e.g., through monoclonal antibodies). Dr. Mason noted that inhalation injury is essentially a chemical burn of the trachea which cannot be reversed. Though its management can be improved, it has to slough and clean on its own.

D. Wound Management (Cleon Goodwin, MD, Cornell-New York Medical Center)

Dr. Goodwin cited trends including earlier excision and a move from mesh to sheet graft. Cultured epithelial autograft (CEA) is now frequently used in massive injury when there is little available donor skin (generally, 90% of body surface area burned). It has been somewhat prematurely commercialized, being used in patients with relatively small injuries. CEA is usually unsuccessful when applied over deep wounds without dermal support. Management of wounds

covered by CEA is so difficult that some patients cannot be referred to rehabilitation centers. CEA is expensive, currently $400 per 25 square centimeters.

A variety of protein-based items are currently being tested to provide dermal support in wound healing. A product expected on the market in 1988 is still not out. Ultimately, perhaps within five to ten years, morbidity will improve, but currently there is much scarring.

E. Infection/Immunology (Glenn Warden, MD, Shriners Burns Institute, Cincinnati, Ohio)

Dr. Warden described the strong interrelationship among nutrition, metabolism and immunology in treating the severely burned patient. He described the sequence of injury response involving first local and then systemic inflammation followed by shock and frequently a systemic infection. There is currently a focus on inflammatory mediators (cytokines and growth factors) in an effort to reduce their immunosuppressive effect while still controlling infection.

Future trends include the development of vaccines, Polymyxin B and antisera, including monoclonal antibodies (which can cost up to $1,000 a day) and immunoglobulins, such as growth factors and blockers. Their development is controlled by industry. Growth factors reduce the time needed between surgical procedures, at the possible expense of optimum long-term result. Further progress is needed against infection without compromising the immune response.

F. Rehabilitation (G. Fred Cromes, PhD, University of Texas Southwestern Medical Center, Dallas)

Dr. Cromes described the program at Parkland Hospital and the University of Texas Medical Center in Dallas. He cited the relationship between increased survival of large injuries and longer more complex rehabilitative care. Burn rehabilitation services have improved over the past decade such that most burn centers with 120 or more admissions per year have well organized services and strong patient followup. There is a need to study long-term outcomes, empirically evaluate rehabilitation treatment and provide more outpatient care directly or under the supervision of the burn center team. Length of time in rehabilitation correlates with size of injury in large burns but not in small injuries (e.g., serious hand burns).

Costs are increasing as a result of litigation and disability payments. Workers' Compensation insurers are seeking to avoid the responsibility of paying for injuries incurred through employee negligence. Medical insurance companies are declining claims for pressure garments and related visits, as "cosmetic" care. Patients generally suffer an "adjustment disorder" akin to post-traumatic stress.

Collection rates vary widely for both acute and rehabilitative care. Hospitals are generally covering between 60% and 80% of charges, while physicians' collection rates were cited as ranging from 13% to 60%.

The National Institute of Disability Rehabilitation Research (NIDRR) is currently reviewing applications for grants that will be made to three model burn rehabilitation centers. It is hoped that such federal funding will spread to additional centers throughout the country as has been the case for spinal cord injury.

G. Burn Unit Operational/Financial Issues (Marion Jordan, MD, Washington Hospital Center)

Dr. Jordan reviewed the evolution of burn centers, which proliferated in the specialized unit era of the 1970's. While some burn units are doing well financially, many are not. Generally designed to treat major burn injuries and featuring expensive capital equipment, such centers were now having to adjust to treat larger numbers of smaller injuries. Burn centers need a mix of small and large burns to operate effectively. Maintaining specialized staff in the face of census demands which vary by season is challenging. By treating more of the smaller injuries, census levels become less sensitive to the occasional arrival and departure of massively burned patients.

Since surgeons are trained to treat small burns, payer source may influence decisions to refer a burn patient. Problematically, that means burn centers receive disproportionate numbers of charity care cases among the patients referred with smaller burns. Community hospital physicians also occasionally take too long to decide what to do with a burn patient, resulting in a poorer graft take for retained patients.

The overall threat to burn centers of reduced reimbursement was discussed. There was a reference to a drop in burn service listings in the American Burn Association directory, and the relative contribution to this phenomenon of reduced burn admissions, stricter listing criteria and increased reluctance to be identified as a specialized burn care facility.

The question was raised whether increased referrals to burn centers would ultimately increase or reduce overall costs. Respondents stressed the need to treat large numbers of relatively small burns in burn centers. This would both result in quicker and cheaper rehabilitation of those small burns, and enable the burn center to maintain their efficiency of operation, and thereby their availability for treating larger burns.

Figure 6. List of Burn Injury Conference Attendees

John Hall, Jr., Ph.D.
National Fire Protection Association

Bea Harwood
U.S. Consumer Product Safety Commission

John Ottoson
U.S. Fire Administration

Dale Ray
U.S. Consumer Product Safety Commission

Joseph Rees
National Coalition of Burn Center Hospitals

Ruth Schultz, RN, MPH
National Center for Injury Prevention and Control, Centers for Disease Control and Prevention

Lee van Lenten, MD
Biophysics and Physiological Sciences, National Institute of General Medical Services, NIH

William Zamula
U.S. Consumer Product Safety Commission

William R. Clark, MD
SUNY Health Science Center

G. Fred Cromes, PhD
University of Texas SW Medical Center at Dallas

Alan Dimick, MD
University of Alabama Hospital

Cleon Goodwin, MD
Cornell-New York Medical Center

John Heggers, PhD
Shriners Burn Institute

Claudella Jones, RN
National Institute of Burn Medicine

Marion Jordan, MD
Washington Hospital Center

Arthur D. Mason, MD
U.S. Army Institute of Surgical Research

Gwendolyn Smith, RN
Crozier-Chester Medical Center

Glenn Warden, MD
Shriners Burn Institute

Peter Brigham, MSW
Burn Foundation

Ted Miller, PhD
National Public Services Research Institute

Patricia Smith-Regojo, RN
Saint Agnes Medical Center

Nancy M. Pindus, MBA
The Urban Institute

5. BURN INJURY JURY VERDICT ANALYSIS

This chapter estimates the monetary value of pain and suffering associated with nonfatal burn and anoxia injuries. Despite its name, juries typically also include compensation for lost quality of life in this category. The theoretical framework for this estimation procedure can be found in Cohen (1988), Viscusi (1987) and Rodgers (1989, 1992). The basic nation 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.

Table 15 provides some basic summary statistics on the cases received from Jury Verdict Research, Inc. (JVR) and some comparative statistics on burn survivors discharged from California hospitals. To ease comparisons, the percentages shown in this table are percentages of cases with known values, except that the unknowns are a percentage of all cases. The JVR data include 606 survivors of burn or fire-related injuries; 397 of these survivors were successful in bringing private lawsuits against negligent parties who were in some way responsible for the injury. The remaining 209 burn victims settled their claims with a monetary out-of-court settlement.

Comparing JVR and California hospital data shows those experiencing flame or electrical burns were more likely to sue than those experiencing scald burns. This difference probably results from both greater burn severity and a greater likelihood of finding someone to sue (notably, electric companies and suppliers of products that contain accelerants, like propane tanks and cigarette lighters). Trial dates range from 1979 to 1992, with all dollar figures update to 1992 dollars. The age and sex distributions of the two groups of survivors are similar. Predictably, the JVR data are for more serious burns than the average, probably more typical of burn center cases. The JVR data often do not state the cause of house fires. A typical suit might charge a landlord with contributory fire code violations. The data do include a few fires explicitly caused by cigarettes.

Table 16 summarizes the data on monetary losses and awards. The jury verdict analysis excludes punitive damages and damages to third parties, for example, due to loss of consortium. Not all cases have information on past or future losses. Generally, the JVR case summary indicates past losses and breaks out past wage losses, past medical expenses, future wage losses, future medical expenses, and in a few cases past property damage. Table 16 averages losses only

over those cases where such losses were indicated. For example, among 397 jury verdict summaries, 177 indicated past medical losses. The average medical charges for those 177 cases were high -- $100,308 (in 1992 dollars). This mean, however, is below the $124,735 burn center mean hospital plus physician charges for flame burns, and the burn center charges ranged higher. The JVR mean also is below the $119,772 California hospital mean for flame burn plus anoxia injuries, but well above the $46,493 average for all hospitalized flame burn survivors. Thus, the JVR cases appear to be reasonably typical serious burns.

Pain and suffering was estimated in all cases where JVR indicated some past or future losses. It is possible that JVR excluded some losses in these cases, in which case pain and suffering is overestimated. However, in cases where medical charges were reported, for example, it was impossible to distinguish whether wage losses were really zero or simply unreported.

Past and future loss estimates are primarily losses reported by the plaintiff. Since these estimates may be inflated for purposes of litigation, and may be disputed by the defendant, they may be an overestimate of actual out-of-pocket losses. To the extent that JVR reported losses are an overestimate of actual out-of-pocket losses, the pain and suffering estimates are likely to be underestimated. If out-of-pocket losses are overstated, the defendant is likely to raise this issue at trial and juries are likely to discount the losses. Thus, by subtracting out the full reported loss, too much was subtracted from compensatory damages when estimating pain and suffering.

Many states have contributory negligence rules that require a reduction in the actual award to account for the percentage of plaintiff negligence. Table 16 does not reduce the award to account for contributory negligence. To do so would dramatically and incorrectly decrease the pain and suffering estimates in many instances. Data on reductions in awards for contributory negligence were coded but not analyzed here.

Since many of the cases did not report past or future losses, NPSRI attempted to estimate these out-of-pocket losses in both jury award cases and private settlements with sufficient information on the nature of injury. This attempt used the cases with actual losses reported to estimate the functional relationship between injury characteristics and total monetary losses. Out of the 282 cases with past loss estimates (195 jury awards and 87 settlements), sufficient data were available to yield a sample size of 241 cases. Table 17 shows the resulting regression model. The model was quite successful in estimating past losses, explaining about 40% of the variance in the natural log of past losses. The most significant variable was percentage of body

burned. Other explanatory variables of importance were third degree burns, emotional trauma, amputations, and various other physical injuries that accompanied the burns.

The estimated coefficients in Table 17 were used to predict past losses for cases lacking past loss data. The regression equations estimating pain and suffering were estimated both with and without these additional cases. Table 18 estimates pain and suffering using only those cases where JVR included past losses. It is based on a sample of 165 jury award cases out of the 195 cases reported that contained past loss estimates. The remaining 30 cases were excluded primarily due to misswing information about the independent variables used in the regression. One extreme outlier was excluded after analysis of residuals. Table 19 provides an identical model using only past medical losses instead of past wage and medical losses. Table 20 provides the same model with the full set of cases - including those where losses were estimated using the procedure described above. It is based on a sample of 298 jury award cases out of 384 cases reported. The remaining 86 cases were excluded primarily due to inadequate information, and in a few cases, due to residual analysis that indicated they were extreme outliers.

Tables 18-20 indicate some success in modeling pain and suffering, with 50-60% of the variance being explained. In addition to explanatory variables for pain and suffering such as out-of-pocket charges, degree of burn and percentage of body burned, the analysis attempted to control for factors external to actual pain and suffering that might affect the jury award, such as type of liability, responsible party, and presence of plaintiff negligence.

Two major caveats apply to this analysis. First, Viscusi (1988) recommends a Tobit analysis for estimating pain and suffering, due to the fact that some jury awards are for an amount less than out-of-pocket expenses. However, the four cases where this was true in the JVR data did not ultimately end up in the sample because of missing information about the independent variables. Thus, Tables 18 through 20 use ordinary least squares to estimate pain and suffering.

Second, the cases used in this analysis are not necessarily representative of the distribution of fires or fire injuries in the U.S., nor injuries caused by cigarette fires. Indeed, it would be coincidental to find that they match the distribution of fires in the population. Instead, the jury award cases are used here to estimate the functional relationship between physical damages (e.g., lost wages, medical charges and severity of burns) and the "pain and suffering" component of jury awards. Once this functional relationship is estimated, pain and suffering can be estimated for any distribution of fire-related injuries. The estimates will be most reliable for victims like

hospitalized cigarette fire victims whose medical losses are of the same order of magnitude as the losses in the JVR data.

Although nothing is known about how representative these cases are of burn survivors who sue and recover damages in a jury trial for injuries, information received from JVR indicates that their database currently represents about 40% of jury verdicts in the U.S. (To control for the fact that they have been increasing their coverage over the past few years, a trend variable was included in the regression equations reported here. This variable was not significant.)

Comparison with Prior CPSC Estimates

The pain and suffering equation estimated in Table 20 can be compared to the equation in CPSC's Injury Cost Model (ICM), as reported in Rodgers (1992, Table 4). One of the most direct comparisons is the relationship between "specials" (medical charges and wage losses) and pain and suffering. The ICM estimated coefficient on the natural log of "specials" is between 0.478 and 0.526, while Tables 18 and 20 indicate a coefficient of 0.43 to 0.45. With standard errors of 0.073 and 0.035 respectively, the coefficients estimated here are virtually indistinguishable from those estimated by Rodgers. Also, age and gender have no explanatory power in either model.

Another way to compare the ICM estimates to those derived here is to calculate the predicted pain and suffering for a typical burn case using both models. This was done by multiplying the regression coefficients times the mean values of the variables reported in Table 20, then summing the products. This yields an estimated pain and suffering value of $458,090 ($577,258 if the Table 18 coefficients are used instead and $535,033 with the Table 19 coefficients and mean medical losses). Using the mean values for flame burns only, the comparable coefficients are $688,010, $901,341, and $759,552 respectively. The regression using medical losses only (Table 19) consistently falls in the mid-range of the two regressions that consider medical and productivity losses.

In order to obtain comparable estimates using the ICM coefficients, a few additional calculations had to be made. For example, the proportion of category 3 and category 4 injuries were estimated directly from the JVR data, by examining the percentage of body burned. Using the mean values from Table 20, the ICM yields a pain and suffering estimate of $1.1 million.

The difference in estimates seems smaller when viewed in natural logs. The ICM model yields an estimate of 13.9 versus 13.2-13.3 from the JVR model.

One possible reason why the results obtained here produce lower pain and suffering estimates than those generated by the ICM is that the typical burn case represented in Table 20 is considerably more severe than the typical consumer product injury case used to generate the ICM estimates (which include many types of injuries other than burns). According to Rodgers (1922, Table 2), the average "specials" for consumer product injury jury awards used to generate the pain and suffering estimates was only $16,804. Only 7.6% of the cases analyzed had specials of over $50,000, with average specials for those cases of only $101,640. In contrast, the average specials reported for the 298 burn injury cases used to generate the estimates shown in Table 20 was $183,505. Since only a handful of cases used to estimate the ICM model had specials this high, the ICM regression equation may have been less accurate at these extreme values. The differences, however, also appear even larger when compared at $16,804 mean. There the ICM estimates pain and suffering at $348,000, compared to $158,388 to $206,504 with the burn regression equations.

This comparison highlights an important caveat when attempting to use any of these models to estimate pain and suffering. Since regression models are best at predicting values that are close to the average values of the independent variables in the data used to generate the regression coefficients, it is important to try to use cases of comparable severity when generating pain and suffering estimates. Since the medical component of "specials" for a typical hospitalized California flame burn survivor is on the same order of magnitude as the JVR mean, the models reported here should predict typical pain and suffering losses well for hospitalized burn injuries .

Table 15. Summary Statistics: Jury Verdict Research Data and California Hospital Discharge Data on Burn Survivors

	JVR Cases	% of Known	CA Cases	% of Known
Number of Cases				
Jury Award	392	64.7%		
Settlement	209	34.5%		
Both*	5	0.8%		
Demographics				
- Work Status				
Employed	311	67.5%		
Unemployed	81	17.6%		
Student	61	13.2%		
Homemaker/Retired	8	1.7%		
Unknown (% of Total)	145	23.9%		
- Gender				
Male	434	73.9%	310	77.5%
Female	153	26.1%	90	22.5%
Unknown (% of Total)	19	3.1%		
- Age				
Under 18	124	20.8%	83	20.8%
18-64	463	77.5%	277	69.2%
65+	10	1.7%	40	10.0%
Unknown (% of Total)	9	1.5%		
Cause of Burn				
Fire/Flame	303	52.4%	658	36.0%
Electricity	102	17.7%	83	4.5%
Scald	80	13.8%	650	35.6%
Explosion	38	6.6%	116	6.4%
Chemical	29	5.0%	128	7.0%
Contact w/hot surface	26	4.5%	191	10.5%
Other/unknown (% of Total)	28	4.6%	287	13.6%
Highest Degree Burn				
3rd Degree	338	74.5%	141	35.5%
2nd Degree	91	20.0%	216	54.0%
1st Degree	15	3.3%	16	4.0%
No burn	10	2.2%	26	6.5%
Unknown (% of Total)	152	25.1%		
Percent of Body Burned	298	28.8%	250	17.9%

* These cases involved partial settlements by other parties to the suit prior to the jury award. They have been included elsewhere as jury awards.

Table 16. Out-of-Pocket Losses, Jury Awards and Settlements for Burn Survivors

	CASES	MIN	MAX	MEAN	MEDIAN
Medical Charges					
Jury Awards	177	$164	$556,254	$100,308	$54,452
Settlements	85	76	892,618	110,512	43,939
Wage Losses					
Jury Awards	105	$ 40	$2,918,016	$115,271	$24,388
Settlements	34	555	1,727,457	95,275	27,374
Future Losses					
Jury Awards	33	$3,940	$7,787,564	$664,790	$53,155
Settlements	12	5,922	251,079	90,630	75,379
Compensatory Damage Award					
Jury Awards	384	$ 2	$27,800,000	$1,800,000	$822,945
- w/specials	194	2	27,800,000	1,900,000	901,528
- w/o specials	190	1,980	17,500,000	1,770,000	700,860
Settlements	132	1,669	14,800,000	1,700,000	848,288
"Pain and Suffering"*					
Jury Awards	195	0	$19,000,000	$1,540,000	$579,190
Settlements	87	0	$13,900,000	$1,320,000	$491,542

* Pain and suffering is estimated to be the difference between compensatory damage awards and the three loss categories - past medical, past wages, and future losses. Instances where this calculation yields a negative number have been recoded zero.

Table 17. Estimation of Past Wage and Medical Losses

Dependent Variable = Ln (Constant 1992 Dollar Past Losses)

Independent Variables	Mean of Variable	Coefficient	Standard Error
Constant	---	14.18	2.60***
Demographics, etc.			
EMPLOYED	.618	0.5097	0.249**
AGE	30.5	-0.0017	0.007
SEX	.195	-0.212	0.281
YRDISP	87.4	-0.056	0.0295*
PERCENT	28.6	0.034	0.0056***
THIRD	.635	0.664	0.236***
LIMB	.079	1.336	0.438***
DIGIT	.037	1.894	0.553***
FRACTURE	.012	1.587	0.985*
MINOR	.012	0.615	0.990
EMOTIONAL	.091	1.166	0.363***
ANOXIA	.041	1.069	0.525**
Cause of Injury (default: fire)			
CHEMICAL	.050	0.189	0.486
EXPLOSION	.071	0.532	0.422
SCALD	.129	-0.592	0.340*
CONTACT	.058	-0.433	0.474
ELECTRICITY	.178	0.326	0.321
Sample Size		241	
Adjusted R-squared		.395	

* = significant at $p < 0.10$ ** = significant at $p < 0.05$

*** = significant at $p < .01$

Table 18. Pain & Suffering for Burns (cases with past losses known only)

Independent Variables	Mean of Variable	Coefficient	Standard Error
Constant	---	7.47	0.88***
Demographics, etc.: EMPLOYED	.636	-0.320	0.258
AGE	31.3	-.00005	0.007
SEX	.170	-0.233	0.288
PROFESSIONAL	.042	0.367	0.524
Injury Severity: Ln (Medical & Wages)	11.057	0.430	0.073***
PERCENT	30.73	0.0199	0.006***
THIRD	.655	0.337	0.234
LIMB	.091	0.315	0.411
DIGIT	.042	0.089	0.576
SCARS	.236	-0.028	0.245
EMOTIONAL	.091	0.500	0.373
AGGRAVATE	.006	-0.542	1.331
SERIOUS	.036	-0.375	0.632
ANOXIA	.048	0.302	0.491
Cause of Injury: CHEMICAL	.042	0.620	0.528
EXPLOSION	.085	-0.414	0.374
SCALD	.115	-0.600	0.345*
CONTACT	.048	-1.199	0.603**
ELECTRICITY	.200	0.156	0.324
Liability Issue: WORKCOMP	.170	0.464	0.565
MALPRACT	.018	0.242	1.049
OCCNEG	.170	0.544	0.548
PREMISES	.200	0.293	0.520
PRODUCTS	.400	0.335	0.527
INVOLVE	.430	-0.254	0.209
BUSINESS	.285	-0.032	0.225
GOVT	.012	-1.045	0.954
Sample Size		165	
Adjusted R-squared		.553	---

* = significant at p < 0.10 ** = p < 0.05 *** = p < .01

Table 19. Pain & Suffering for Burns (estimated from medical losses only)

Independent Variables	Mean of Variable	Coefficient	Standard Error
Constant	---	5.97	1.17***
Demographics: Plaintiff Employed	0.631	0.14	0.33
Age of Plaintiff	31.71	0.0005	0.01
Sex (male=0, female=1)	0.17	-0.22	0.38
White Collar Worker	0.05	-1.77	0.63***
Injury Severity: LN(Medical)	10.75	0.62	0.10***
Percent of Body Burned	30.54	0.02	0.01**
Third Degree Burns	0.68	-0.40	0.32
Amputation of Limb(s)	0.09	1.15	0.51**
Amputation of Finger or Toe	0.05	1.11	0.70
Scars	0.21	0.26	0.33
Emotional Trauma	0.07	1.20	0.56**
Aggravate Existing Condition	0.007	-0.29	1.65
Other Serious Injury	0.03	-0.16	0.89
Anoxia	0.05	0.08	0.66
Cause of Injury: Chemical Burn	0.04	0.78	0.71
- Explosion	0.09	0.09	0.48
- Scald or Steam	0.11	-0.66	0.45
- Contact with Hot Surface	0.05	-3.26	0.73***
- Electricity	0.21	-0.58	0.41
Liability Issue: Worker Injury	0.17	0.20	0.70
- Malpractice	0.01	1.11	1.43
- Occupational Negligence	0.17	0.78	0.67
- Premises Liability	0.19	0.62	0.66
- Products Liability	0.42	0.15	0.63
- Negligence of Plaintiff	0.44	-0.12	0.27
- Business Firm Defendant	0.28	-0.004	0.29
- Government Defendant	0.01	-0.76	1.16
Sample Size		149	
Adjusted R-squared		0.54	1.45

* = significant at $p < 0.10$ ** = $p < 0.05$ *** = $p < .01$

Table 20. Pain & Suffering for Burns (including cases with estimated losses)

Independent Variables	Mean of Variable	Coefficient	Standard Error
Constant	---	6.169	0.510***
Demographics etc: EMPLOYED	.547	0.140	0.171
AGE	31.9	-0.0054	0.005
SEX	.201	-0.089	0.193
PROFESSIONAL	.037	0.615	0.389
Injury Severity: LN(Medical & Wages)	12.12	0.450	0.035***
PERCENT	28.85	0.0206	0.004***
THIRD	.621	0.438	0.160***
LIMB	0.91	0.181	0.293
DIGIT	.037	-0.056	0.415
SCARS	.195	0.114	0.184
EMOTIONAL	.091	0.637	0.246***
AGGRAVATE	.013	-0.629	0.613
SERIOUS	.027	-0.021	0.467
ANOXIA	.030	0.353	0.427
Cause of Injury: (default, fire) CHEMICAL	.047	0.020	0.342
EXPLOSION	.081	0.125	0.262
SCALD	.138	-0.548	0.228**
CONTACT	.047	-0.925	0.380**
ELECTRICITY	.164	0.569	0.243**
Liability Issue: WORKCOMP	.164	0.561	0.320*
MALPRACT	.030	0.772	0.499
OCCNEG	.181	0.644	0.297*
PREMISES	.174	0.486	0.298*
PRODUCTS	.369	0.677	0.281**
INVOLVE	.379	-0.169	0.146
BUSINESS	.228	0.171	0.174
GOVT	.010	0.286	0.700
Sample Size		298	
Adjusted R-squared		.640	

* = significant at p < 0.10 ** = p < 0.05 *** = p < .01

6. LITIGATION COSTS

Litigation costs were estimated using RAND Corporation studies. Kakalik and Pace (1986) find court costs for non-auto tort claims average $954 (inflated to November 1992 dollars using the Consumer Price Index - All Items), and defense attorney fees and expenses average $11,766, or 97.4 percent of average plaintiff fees and expenses. They value time and out-of-pocket expenses (for example, for transportation) at $1,908 per case for plaintiffs and $6,678 for defendants. Defendants also spend an average of $1,272 on claims processing.

The comparison of jury verdicts with burn incidence by cause showed that flame burn victims are 1.45 times more likely to sue than the average burn victim. Hensler et al. (1991) find that only one percent of people who mostly blamed themselves for their injuries hired lawyers, compared to 13 percent of those who mostly blamed someone else. These percentages rise with injury severity. Non-work, non-motor vehicle injuries lead to far fewer claims. At most three percent of seriously injured people in this category seek liability compensation. Often, there is no one to sue. If the at-most three percent claiming rate applied to burn injuries overall, the claiming rate for flame burns would be about four percent (3% * 1.45). For occupational injuries (firefighter injuries in this context), Hensler et al. report a 7-percent claiming rate.

The plaintiffs' costs average 33 percent of the award or settlement (Hensler et al., 1991). At the time of interview, 50 percent of those who claimed with legal representation had obtained payment, 9 percent had not, and 40 percent had cases pending. Ultimately, NPSRI assumes 70 percent will receive some compensation. Wage and housework loss data from Chapter 8, the medical cost data from Chapter 2, and the pain and suffering estimates in Chapter 8 can be combined with the estimates above to compute expected litigation costs. These computations use best estimates of actual jury verdicts rather than of pain and suffering. Actual awards are 4 percent lower than average losses due to contributory negligence. For fatalities, guided by Jury Verdicts Research averages through 1986, NPSRI assumed fatal awards average $1.2 million for civilians and $1.5 million for firefighters.

The equation to compute litigation costs for civilian fire deaths and hospitalized flame burn injuries is: .04 * [954 + 1908 + 6678 + 1272

+ 0.7 * 0.33 * (1.0 + 0.974) * (Medical + EMS + Productivity + Quality of Life)].

For firefighter injury, the same equation applies except that the claiming rate of .04 is replaced by a rate of .07.

7. EMERGENCY TRANSPORT COSTS

NMES data show that the average payments for private ambulance transport are $221 for hospitalized cases and $167 for nonhospitalized cases. By comparison, NMCUES showed averages of $200 and $176 respectively. (All payments were inflated to November 1992 dollars using the Consumer Price Index - All Items). Cost of injury studies (e.g., Rice et al., 1989) typically accept NMES/NMCUES data as average ambulance transport costs.

Charges for helicopter transport average $2,381. Charges for fixed wing aircraft transport average $2,743 for piston planes, $3,662 for turboprops, and $3,108 for turbojets. These figures are from the 1992 Transport Charge Survey (an annual Journal of Air Medical Transport survey). They include base fees, mileage charges, and medical team professional fees if any. Rice et al. (1989) estimate about 3,000 burn cases were transported by air in 1985.

Rice et al. (1989) assume 20 percent of burn survivors treated in the emergency room and released were transported by ambulance. Transport charges per case average $33.

Among hospitalized burn victims, Burn Foundation data suggest probabilities of helicopter transport, ambulance transport, and double transport (for transfers) of 11%, 57%, and 29% respectively. Table 21 breaks these figures down by injury category, arriving at average transport charges of $454/burn center case. Burn plus anoxia cases average twice this amount. Community hospital burn admissions average a $143 transport charge. Overall, transport charges average $268/admission.

To compute community hospital admissions in Table 21, observe that the NHDS estimates 57,000 burn admissions in 1990 and the annual American Burn Association survey estimates 23,000 burn center admissions. Thus, community hospital cases in the Burn Foundation catchment area should equal (57000-23000)/23000 times the burn center cases. Helicopter transports were subtracted from direct admissions. The analysis then assumed the distribution of community hospital cases by nature (i.e., burn only, burn plus anoxia, etc.) would match the distribution of direct burn centers admissions not transported by helicopter.

To compute total transport charges, all transfers were assumed to have an ambulance transport prior to transfer. Other assumptions were that all community hospital transports were by ambulance and that the probabilities of transport equalled the probabilities for Burn Foundation burn center cases not transported by helicopter.

The estimates in Table 21 use the Burn Foundation transport profile. Querying other burn centers at the expert conference or by telephone suggested that nationally helicopter transport to burn centers might occur 15-20 percent of the time rather than 11 percent. Table 22 summarizes their estimated transport rates. Also, NEISS suggests a thermal burn transfer rate of 24.8 percent might be more accurate than a 29 percent rate. The average transport would cost $327 rather than $268 with these percentages. The average Burn Center transport would cost $600. These estimates seem more representative than the estimates from Burn Foundation data alone.

For injury deaths, coroners' costs average $394. This figure was applied to burn deaths. About 40 percent of flame burn deaths occur at the hospital, presumably with transport charges similar to burn center cases. The remaining cases presumably are not transported. Overall, transport and coroner charges per death average $576.

Table 21. Analysis of Emergency Transport, Based on Burn Foundation Data

	Burn Only	Burn + Anoxia	Anoxia Only	Burn DK Anoxia	Total
NUMBER OF CASES BY TRANSPORT					
Ambulance	1606	284	23	105	2018
Helicopter	214	143	2	29	388
Other	1012	69	10	16	1107
Total	2832	496	35	150	3513
PERCENTAGE OF CASES BY TRANSPORT					
Ambulance	56.7%	57.3%	65.7%	70.0%	57.4%
Helicopter	7.6%	28.8%	5.7%	19.3%	11.0%
Other	35.7%	13.9%	28.6%	10.7%	31.5%
Total	100.0%	100.0%	100.0%	100.0%	100.0%
DETAILS OF ADMISSIONS AND PROBABILITY OF TRANSFER					
BC Direct	806	112	18	44	980
LessCopter	755	86	17	37	895
BC Transfer	1990	382	17	105	2494
AllBurnCntr	2796	494	35	149	3474
CommunHosp	4467	333	128	207	5135
Total	7263	827	163	356	8609
% Transfer	27.4%	46.2%	10.4%	29.5%	29.0%
% Burn Cntr	38.5%	59.7%	21.5%	41.9%	40.4%
TRANSPORT CHARGES PER CASE (in November 1992 dollars)					
Burn Center	$366	$915	$304	$680	$454
CommunHosp	$136	$178	$154	$192	$143
All	$224	$618	$186	$396	$268

DK = Unknown if; Cntr = Center

Source: National Public Services Research Institute, 1993, estimated from Burn Foundation data.

Table 22. Estimates of Percentage Transported by Transport Mode at Selected Burn Centers

Burn Center	Admits*	Helicopter	Ambulance	Other
San Diego	400	10	40	50
Washington	200	20	75	5
Tampa	200	30	60	10
Baltimore	250	20	75	5
St. Paul	200	20	75	5
Syracuse	100	neg.	60	40
Cleveland	350	20	45	35
Tulsa	200	25	60	15
Portland	200	20	50	30
Dallas	400	20	50	30
Seattle	400	20	40	40
Philadelphia	900	11	57	32
COMPOSITE	3800**	20	55	32
		(ROUNDED TO NEAREST 5%)		

* Annual average to nearest 50 admissions, based on data submitted to American Burn Association for the years 1986-1990.

** These 12 generally larger burn centers represent about 15% of the nation's burn centers and admit about 13 to 15% of the nation's burn center patients. These figures were estimates by burn managers. They may be biased to the high side due to the more memorable nature of a helicopter transfer compared to other modes.

Source: The Burn Foundation, 1993.

8. TOTAL COSTS BY INCIDENT SEVERITY

This chapter summarizes the costs of cigarette fire injury by incident severity. For burn injury and anoxia injury, it lists total medical costs including emergency transport, productivity losses, litigation costs, and pain and suffering. Table 23 summarizes the costs per case. It also estimates total costs for all cigarette fire burns without accelerants.

The case counts in this table largely come from NFIRS with unknowns distributed. CPSC removed cigar and pipe fires and arson from the data (about 4 percent of the nonfatal cases and 5 percent of the fatalities). The hospitalized smoking fire incidence estimates were described earlier. Unpublished CPSC data were used in the emergency room estimates. These data show 46 percent of emergency room cases treated for residential flame burn are in incidents attended by the fire department. This percentage was divided into NFIRS counts of cigarette flame burns and anoxias treated in emergency rooms (including admitted cases). It was not applied to non-burn injuries or other levels of treatment. It adds 3,297 to the NFIRS count of cases treated in emergency rooms. One of the case studies describes a serious cigarette fire that was not attended by the fire department.

The percentage transported by category also came from NFIRS data. Emergency room cases in fires not attended by the fire department were considered not transported. All firefighter deaths were assumed to involve transport.

Litigation, Productivity, and Pain and Suffering Computations

Litigation costs were assumed to apply only to hospitalized and fatal cases. Computing litigation costs and possibly pain and suffering requires data on productivity losses -- lost earnings, fringe benefits, and housework. These were computed in stages. First, the NFIRS age and sex profile for cigarette fire victims was inserted in a standard lifetime earnings model (King and Smith, 1988; Rice et al., 1989; Miller et al., 1991; Douglass et al., 1990). Following King and Smith, the computations used a 2.5-percent discount rate and a 1-percent productivity growth rate, toward the high middle of the rates typically used in jury verdicts (U.S. Supreme Court, 1983). (High-end rates yield low-end loss estimates.) This yielded the loss per fatality. The loss was low compared to the average loss for U.S. fatal injuries because the average cigarette fire victim is much older, and therefore earns less, than the average fatal injury victim. An NFIRS

age-sex profile also was used for firefighters. The firefighter lifetime earnings estimate is conservative because it uses an average age-earnings profile. Paid firefighters earn above-average salaries (Bureau of the Census, 1991, Table 678), and volunteers probably earn at least the average, as well as contributing productive volunteer labor to society.

Average earnings losses for nonfatal injury include both a temporary disability component and a permanent disability component. Table 24 shows probabilities of permanent partial and total disability for burns and for all injuries (used here for firefighter injury and for civilian non-burn injury). Partial permanent disability reduces earning power by 17 percent on average (Miller et al., 1991). This percentage is used for nonhospitalized permanently disabling burns and all non-burns. For permanently disabling hospitalized burns, this study assumes a 33-percent average. Multiplying disability probabilities times expected lifetime earnings yields the permanent disability component of lifetime productivity loss.

To compute the short-term component of productivity loss, the average daily value of household production from Miller et al. (1991) and Douglass et al. (1990) and the U.S. average daily per capita income (averaged across 365 days) including supplements (Bush, 1993) were used. For nonhospitalized injuries (burn and total), the days of wage work lost were assumed to equal the NHIS average number of beddays plus 20 percent of the NHIS restricted activity days reported in National Safety Council (1992). For household production, productivity on all bed days and restricted activity days were assumed to be lost. Nonhospitalized burn productivity losses were distributed between emergency room and other medical treatment cases in proportion to the medical payments involved. Anoxia productivity losses were assumed to equal burn productivity losses for nonhospitalized cases and one third of burn losses for hospitalized cases.

Clearly, the short-term productivity losses estimated here are less accurate than the medical losses. For this reason, the pain and suffering regression based on just medical losses seems a better choice than the one that also requires productivity losses. Table 23 largely uses estimates from that regression for burn and anoxia injuries. The other regression would yield much larger estimates for nonhospitalized injury and lower estimates for hospitalized injury. The regression computations use the NFIRS smoking-fire-related mean percentage female and percentage of burns involving anoxia. They use the means for jury verdicts on flame burns only for other variables (with contributory negligence deductions and other causes set to zero). For anoxia only cases, all burn characteristics were set to zero and anoxia was set to one.

The nonhospitalized pain, suffering, and lost quality of life estimates from even the medical cost regression seemed high. For this reason, pain and suffering for non-hospitalized burn or anoxia injury was computed from hospitalized burn injury pain and suffering using the assumption that it varied linearly with medical costs. This assumption reduced the pain and suffering estimates for burn injuries treated in the emergency room by a factor of 5 and for burn injuries treated at the scene or a physician's office by a factor of 10. With this assumption, the average nonhospitalized cigarette burn survivor has combined productivity and pain and suffering losses of $10,142. By comparison, using completely different methods that rely heavily on one physician's estimates of typical impairment following burn injury, Miller et al. (1993) estimate the comparable losses for all nonfatal burn survivors at $7,641.

The $2 million dollar average value for the family's lost quality of life, pain, suffering, and productivity losses per fatality came from prior CPSC regulatory analyses. Subtracting productivity loss yields a value of $1.39 million for lost quality of life. The same $1.39 million loss was assumed to apply for firefighter deaths. These numbers are quite conservative. Department of Transportation (DOT) regulatory analyses use a $2.6 million value. The value comes from a meta-analysis of 47 technically sound studies. Viscusi suggests a higher range of $3-5 million per death averted. The Environmental Protection Agency, with the consent of the U.S. Office of Management and Budget uses values as high as $9 million. The Nuclear Regulatory Commission uses $5 million for radiation burn deaths. Using even DOT's relaively conservative values would raise the estimated annual cigarette fire losses by $700 million.

For all injuries, Table 23 uses the estimates of pain, suffering, and productivity loss from Miller et al. (1993). It then nets out the productivity loss estimates. Miller et al.'s estimates are routinely used in regulatory analysis by the U.S. Department of Transportation. Applying the burn regression equation to compute pain and suffering for all hospitalized injury would yield an estimate of $200,000 instead of the $235,000 shown here.

The litigation costs were computed using the parameters in Chapter 6 and the costs in Table 23. No legal fees were associated with unsuccessful claims taken on a contingent basis. Similar to the CPSC Injury Cost Model, medical insurance administrative costs were computed as 7 percent of medical payments, with a minimum of $15 per claim.

Summary of Costs

Each cigarette fire death cost $2.1 million on average, hospitalized injuries cost $875,000, and other medically treated injuries (including an unknown number of firefighter hospitalizations) cost $15,000. Nonfatal costs were higher for burn victims than for victims of other types of injury. The costs of firefighter injury exceeded the costs of other victim injury because of differences in age profiles.

Injury costs of 1990 cigarette fires without accelerants totalled $3.5 billion (in November 1992 dollars). Pain and suffering and productivity losses dominated this total. They are 98 percent of the losses for fatalities and 92 percent for nonfatal injuries. Medical payments for cigarette fires totalled almost $75 million (Figure 7). Deaths accounted for 69 percent of the cigarette fire injury costs. Hospitalized survivors accounted for 28.5 percent of total costs, and the less seriously injured accounted for 2.5 percent (Figure 8).

Table 23. Costs by Cost Category for Cigarette Fire Burns and Total Costs for 1990 Injuries

	Cases	Medical/EMS	Productivity	Pain & Suffer	Legal/Admin	Total
BURN						
Fatal	894	12,000	610,000	1,450,000	22,000	$2,100,000
Hospitalized	1062	51,000	39,000	785,000	16,000	900,000
ER Only	1236	700	3,000	11,000		14,000
Other Treatment	503	100	400	1,500		2,000
ANOXIA ONLY						
Fatal	230	11,000	610,000	1,450,000	22,000	2,100,000
Hospitalized	116	5,000	12,000	110,000	3,000	130,000
ER Only	1310	700	3,000	10,000		13,000
Other Treatment	274	100	400	1,500		2,000
OTHER CIVILIAN INJURY						
Fatal	29	12,000	610,000	1,450,000	22,000	2,100,000
Hospitalized	107	14,000	29,000	235,000	6,000	280,000
Other Treatment	563	600	1,000	11,000		13,000
FIREFIGHTER INJURY						
Fatal	3	12,000	840,000	1,450,000	30,000	2,350,000
Non-fatal	1349	1,000	3,000	22,000	2,000	27,000
SUM OF COSTS FOR ALL INJURIES COMBINED (K = thousands of November 1992 dollars)						
Fatal	1156	13,000K	705,000K	1,673,000K	27,000K	2,420,000K
Hospitalized	1285	56,000K	46,000K	872,000K	22,000K	1,000,000K
Other Treatment*	5235	4,000K	13,000K	62,000K	2,000K	80,000K
Total	7676	73,000K	764,000K	2,606,000K	51,000K	**3,500,000K**
% of Total		2.1%	21.9%	74.6%	1.4%	100.0%

* Includes hospitalized firefighter injuries. Also includes injuries in incidents not attended by the fire department. **Totals were computed before rounding.**

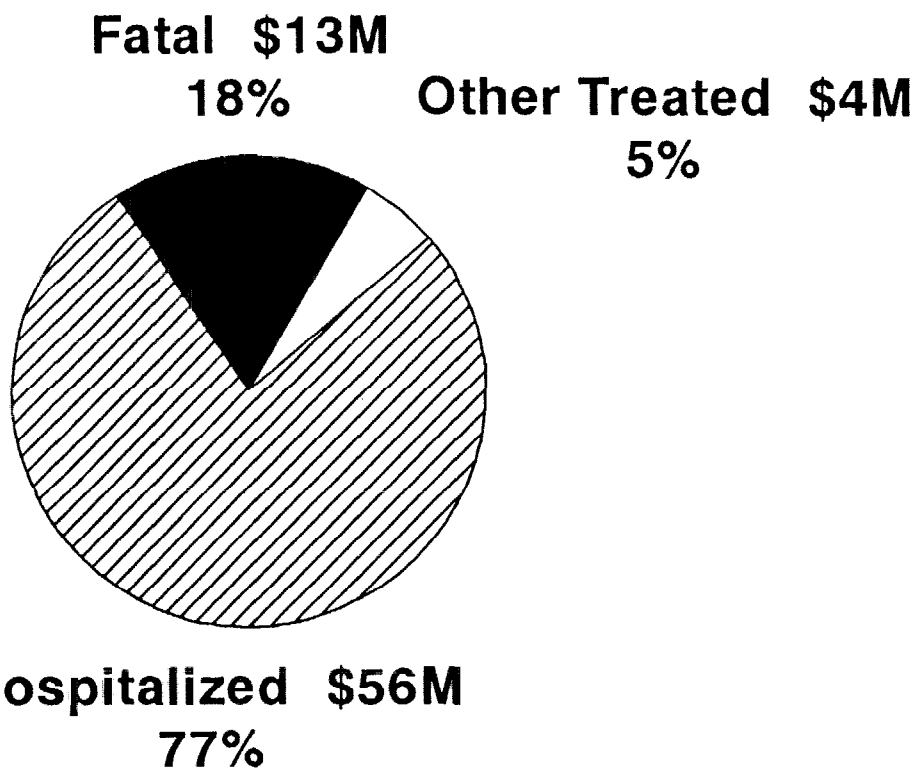
Source: National Public Services Research Institute, 1993.

Table 24. Permanent Disability Probabilities for Burn Injuries and All Injury

	BURN INJURY		ALL INJURY	
	Partial	Total	Partial	Total
Hospitalized	13.9%	1.2%	18.65%	1.3%
Not Hospitalized	1.0%	.14%	0.6%	.03%

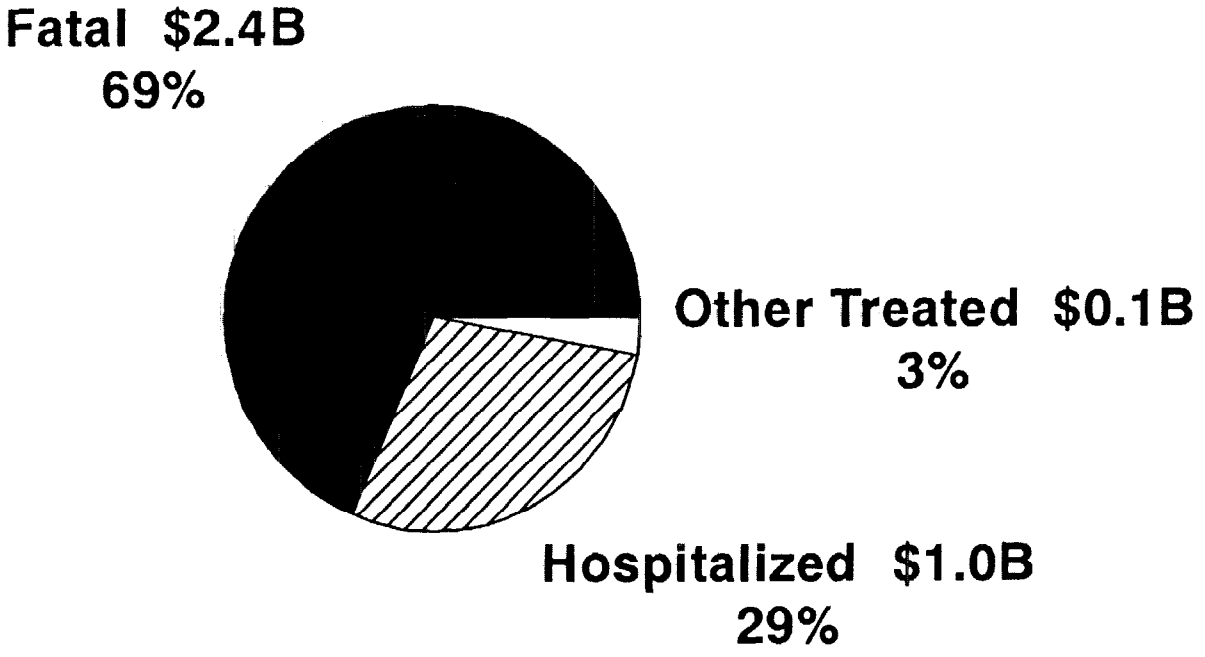
Source: Miller et al., 1993. Computed from DCI and NEISS worker injury data.

Figure 7. Distribution of Cigarette Fire Medical Costs by Injury Severity



Source: National Public Services Research Institute, 1993, in 11/92 $

Figure 8. Distribution of Cigarette Fire Injury Costs by Injury Severity ($3.5 Billion for 1990)



Source: National Public Services Research Institute, 1993, in 11/92 $

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APPENDIX: Number of NHDS Burn Discharges by Year for Primary Diagnosis and All Diagnoses.

YEAR	Primary Diagnosis	95% Confidence Interval	All Listed Diagnoses	Burn Plus Anoxia Cases
1970	90,000	74-106K		
1971	84,000	69-99K		
1972	95,000	79-111K		
1973	92,000	77-107K		
1974	88,000	74-102K		
1975	94,000	77-111K		
1976	92,000	74-110K		
1977	101,000	83-119K		
1978	92,000	76-108K		
1979	89,000	74-104K		
1980	88,000	72-104K		
1981	90,000	75-105K		
1982	80,000	67-93K		
1983	86,000	74-98K		
1984	86,000	76-96K	99,304	3,001
1985	69,000	60-78K	82,563	2,964
1986	68,000	60-76K	81,278	1,288
1987	57,000	50-65K	68,391	1,577
1988	76,000	64-87K	86,247	2,991
1989	60,000	50-69K	67,157	2,358
1990	57,000	48-66K	66,274	1,536
1991	52,000			

Source: National Hospital Discharge Survey data compiled by National Public Services Research Institute and the Burn Foundation, 1993.

APPENDIX: Burn Causation Variables for Length of Stay Regressions

CPSC DEFINITION OF:

- **FLAME** = 1 for injuries caused by fire and flames, in structures or clothing, (cause codes E890-E899, and E923); FLAME = 0 otherwise.

- **ELEC** = 1 for injuries caused by electric current (cause codes E925); ELEC = 0 otherwise.

- **CHEM** = 1 for nonintentional poisoning by liquid substances, gases or vapors, (cause codes E861-E869, E901, and E924.1); CHEM = 0 otherwise.

- **SCALD** = 1 for burning or scalding by hot liquids or vapors, or explosion of a pressure vessel (cause codes E924.0 and E921); SCALD = 0 otherwise.

- **RADIAT** = 1 for exposure to radiation (cause codes E926, E873.3, and E879.2); RADIAT = 0 otherwise.

- **HOT OBJECT/HEAT** = 1 for injuries cause by hot objects, excessive heat (cause codes E873.5, E900, E924.8, and E924.9); HOT OBJECT/ HEAT = 0 otherwise.

Expanded causes include those listed above and add arson, suicide and intentional injury.

- **FLAME** = 1 adds arson, suicide by fire, injury by explosives, (cause codes E968.0, E985, E988.1, and E958.1).

- **ELEC** = 1 adds lightning (cause code E907).

- **CHEM** = 1 adds suicide or assault by poison or caustic substance (cause codes E980, E961, E950, and E952).

- **SCALD** = 1 adds injury by intentional means (cause codes E986.3, E988.2, and E967.0).

Additional causes were used as follows:

- **MV** = 1 for motor vehicle crashes involving a collision in a moving motor vehicle (cause codes E810-E816, and E819); MV = 0 otherwise.

- **OTHMV** = 1 for nontrafffic incidents (cause codes E820-E829, E817, and E818); OTHMV = 0 otherwise.

- **VEHMACH** = 1 for water transport incidents and other vehicle or machine incidents (cause codes, E830-E844.1 and E919); VEHMACH = 0 otherwise.

SUICIDE = 1 for suicide and self-inflicted injury by any means (cause codes E950-E959); SUICIDE = 0 otherwise.

ARSON = 1 for assault by fire (cause code E968.0) ARSON = 0 otherwise.

INTENT = 1 for injury purposely inflicted by others or undetermined (usually intentional) if purposely inflicted (cause codes E960 - E988.2); INTENT = 0 otherwise.

APPENDIX: List of Variables for Pain and Suffering Regressions

Demographics

EMPLOYED	Was plaintiff employed at time of injury? (0=no or don't know; 1=yes)
AGE	Age of plaintiff. Approximations were used if unknown but sufficient information given to approximate.
SEX	Sex of plaintiff (0=male; 1=female)
PROFESSIONAL	White collar/professional (1=office worker, manager or professional; 0=no or unknown)
YRDISP	Year of case disposition.

Injury Severity

PERCENT	Percent of body burned. If not indicated by JVR, but sufficient information was available, estimates were made based on the "diagram of nines" published by the American Burn Association and American College of Surgeons.

NOTE: The following injury severity variables were coded 1 if the JVR write-up mentioned the injury, and 0 if there was no mention. In some cases, these injuries might have occurred, but apparently were not a major claim in the lawsuit.

THIRD	Third Degree Burns.
LIMB	Amputation of limb(s).
DIGIT	Amputation of finger or toe.
SCARS	Permanent scarring mentioned.
EMOTIONAL	Emotional trauma mentioned.
AGGRAVATE	Aggravation of existing condition.
MINOR	Minor (nonburn) injury mentioned, such as contusions, abrasions, lacerations, sprains or strains.
FRACTURE	Fractured bone(s).
SERIOUS	Other series (nonburn) injury mentioned, such as heart attack, serious crushing of limbs, nerve damage or internal injuries.
ANOXIA	Anoxia/smoke inhalation mentioned.

Cause of Burn Injury (all 0-1 dummy variables)

NOTE: The default is burn injury caused by fire.

CHEMICAL	Contact with chemical, hot plastics, molten metals, etc.
EXPLOSION	Explosion such as gas water heater.
SCALD	Injury due to hot water or steam.
CONTACT	Contact with hot surface.
ELECTRIC	Electricity.

Liability Issues (all 0-1 dummy variables)

WORKCOMP	Workplace injury.
MALPRACT	Medical malpractice.
OCCNEG	Occupational negligence such as gas company worker who causes explosion injuring customer.
PREMESIS	Inadequate protection or precautions taken causing owner/manager of premesis to become liable for injury.
PRODUCTS	Defective consumer product.
INVOLVE	Was plaintiff somehow involved in the activity leading up to burn injury, such as active involvement in accident, consumption of alcohol or drugs that might help cause accident, etc.
BUSINESS	Was a business one of the defendants?
GOVT	Was the government one of the defendants?

BURN FOUNDATION CONSORTIUM MEMBERS

RATIOS OF COSTS TO CHARGES
(from Medicare reports)

Fiscal Year	Hospital				
	CCMC	SAMC	LVH	SCHC	Mean
1987	.594	.580	.696	.691	.640
1988	.575	.626	.676	.656	.633
1989	.548	.584	.646	.608	.597
1990	.486	.533	.589	.640	.562
1991	.493	.513	.567	.642	.554
1992	.468	.440	.565	.614	.522

(Composite decrease of 18% in mean (unweighted) RCC from 1987 to 1992)

Appendix B

Experiences of Burn Survivors: Case Studies

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Estimating the Costs to Society of Cigarette Fire Injuries

Submitted to:

Consumer Product Safety Commission
Directorate for Economic Analysis

Contract CPSC-C-93-1118

William W. Zamula, Project Officer

July 9, 1993

EXPERIENCES OF BURN SURVIVORS: CASE STUDIES

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OVERVIEW OF CASE STUDIES

This report presents the findings of one task of the study, "Estimating the Costs to Society of Smoking Fire Injuries." This task called for in-depth investigational case studies of burn and anoxia injuries, with emphasis on injuries in cigarette fires. To our knowledge, only one prior case study (Rice, MacKenzie and Associates 1989) probes the long term effects of a burn injury. This report consists of an overview and individual case studies. The overview describes the purpose and methods; provides a summary description of the case study respondents and the interview experiences; and presents a synthesis of common themes and recommendations that emerged from the interviews.

Purpose and Methods

Estimates of the costs of burn injuries using existing data on medical expenditures, hospital discharges, and insurance and legal claims, do not fully describe the impact of these injuries. The purpose of the case studies was to obtain information on the effects of burn injuries on families and society, particularly those impacts which are not readily quantified or captured in standard reporting systems. Particular emphasis was placed on psychosocial costs, long-term impacts of the injury, and impacts on overall quality of life.

The data collection approach was based on the model of in-depth epidemiological investigations (pre-accident; accident; post-accident) utilized by the Consumer Product Safety Commission. Data collection materials included an open-ended discussion guide, a functional capacity questionnaire, and two brief forms to be completed by the respondent (data collection materials are included at the end of this report). Telephone interviews included all items in the discussion guide and the functional capacity questionnaire (one case study involved an in-person interview for the convenience of the respondent, who was still hospitalized). The two brief forms consisted of a checklist titled, "Effect of the Injury on Family and Other Relationships," and "Effects on Overall Quality of Life." These forms were completed during the interview in about half of the cases; in the other cases the respondent mailed the completed forms to the interviewer. The purpose of these forms was to supplement information obtained in interviews where the respondent was reticent in discussing personal feelings, and to provide a standard assessment of quality of life before, six months following, and some time after, the injury. The quality of life "scale" ranged from "terrible" to "terrific." Interviews ranged from 35 minutes to two hours in length.

Difficulty in locating and recruiting respondents for the case studies was a significant problem, which directly affected the methods and extent of this task. Even with the assistance of experienced and committed professionals at burn centers and advocacy groups, the process was lengthy and frustrating. The difficulties included the identification of appropriate candidates from files that, in some cases, were not automated or could not be accessed more than a few years after discharge; the lack of home telephone numbers (some candidates were discharged to shelters); the general mobility of the population; and the unwillingness of some who were contacted to participate in an interview (often because they did not want to think about their injury or recovery). The experience in this study mirrors that reported by other researchers who have used case studies to describe injury impacts (see, for example, Rice, MacKenzie and Associates 1989).

Interview Respondents and Interview Experiences

Interview respondents were referred to us by a national burn survivors' support group and by several burn centers in the eastern and midwestern United States. In recruiting respondents, every effort was made to obtain broad representation by socioeconomic and educational status, sex, race, and length of time since injury. Selection criteria specified cigarette-related fires as the primary emphasis, followed by other flame-related injuries. Despite the difficulty in recruiting respondents, as the table on the following page shows, the completed case studies do offer diversity.

A total of nine interviews were completed. While self-selection bias is unavoidable, the motivations for participation are presumed to be as diverse as the individual situations and personalities represented. Each case study presents a unique experience. Although methods and interviewing techniques were quite uniform, the depth and emphasis of each case study varies because some respondents were more articulate, or more willing to express personal feelings to the interviewer. Three points should be noted in this regard. First, it was apparent that a number of respondents found it difficult to talk about their injuries, even many years after their recovery. Second, denial is an early stage of recovery from psychological trauma. Although a comprehensive psychosocial assessment was not done, it was apparent that some respondents had coped with their tragedies by denying parts of what occurred. Third, several of the respondents have histories of substance abuse, making it difficult in some cases to ascertain whether their disabilities were a result of burn injuries or substance abuse. Since the telephone interview methodology precluded access to medical records, such questions could not be resolved.

SUMMARY OF INTERVIEW RESPONDENTS

Sex	Male	3
	Female	6
Race	White	8
	Black	1
Time Post-Injury	4 months - 27 years	
Cause of Fire	Cigarettes	5
	Arson	1
	Other	1
	Unknown*	2
Quality of Life Now	Better	7
	Worse	1
	N/A**	1

* In both of these cases, cigarettes or matches were considered a possible cause.
** Too soon after the injury to assess.

Each interview was conducted by one of two experienced interviewers who, collectively, have conducted hundreds of interviews with individuals and family members participating in health, social service, educational, and vocational rehabilitation programs. Both interviewers were deeply moved by their discussions with these nine burn survivors. The multiple tragedies experienced by many of these individuals and the long term impacts of their injuries on virtually every aspect of their lives, was striking. Yet, the perseverance of these individuals to get on with, and in most cases, improve their lives, was indeed impressive.

Synthesis: Common Themes and Recommendations

A number of common themes emerge from these case studies. While the small number of cases calls for caution in drawing conclusions, the findings presented broaden our understanding of the circumstances and impacts of burn injuries, particularly those related to smoking fire injuries.

Discussions of the circumstances surrounding injuries revealed that, in most cases, the respondents had experienced other stressful life events close to time of injury. For example, events which preceded or were ongoing at the time of the injury included household moves, separation from

spouse, depression, hospitalization, and unemployment. Other stressful events that occurred subsequent to the injury included death of a spouse, death of a child, divorce, mental health problems requiring clinical intervention, and unemployment of a spouse. While some of these events appeared to be directly related to the fire, others were independent occurrences. The incidence of multiple tragedies and crises in the lives of these injury survivors is consistent with findings of other research. For example, a prospective study of individuals who were seriously injured in motor vehicle crashes found that 29 percent had experienced a death in their extended family in the year preceding the crash (Siegel, Mason-Gonzalez, et al. 1991).

The relationship of these injuries to drug or alcohol use is noteworthy. Three of the five cigarette fires resulted directly from falling asleep or passing out due to the effects of alcohol or tranquilizers while smoking. A fourth fire injury involved a long-time heroin addict.

In terms of treatment received, there was general satisfaction with the medical aspects of care and most respondents had access to a specialized burn treatment center. Respondents were hospitalized from two weeks to nine months, and most had subsequent hospitalizations for reconstructive surgery (23 for one respondent and 30 for another). Intense pain was mentioned repeatedly as a most significant memory of the hospital experience. There was less satisfaction with psychosocial services. Several respondents particularly noted the need for professional counseling to cope with disfigurement.

Health insurance through the burn survivor's employer or their spouse's employer paid for most of the medical costs incurred by four of the nine respondents. One respondent was eligible for care through the Veterans Administration, and one respondent's care was paid for by Workers Compensation (this case was not a cigarette-related fire). Three respondents were either Medicaid recipients or had no means of paying their bills.

In terms of the recovery process, several respondents noted that dealing with feelings of guilt was one of the most difficult aspects of their recovery. Particularly in cigarette fires, respondents felt "it was my fault," or felt that they had done something "stupid." The value of talking with other burn survivors and survivors support groups was noted in several cases. Talking with others who had been through similar experiences was felt to be particularly helpful for working through feelings of guilt and changes in appearance. Six respondents have permanent functional capacity losses as a result of their burn injuries.

The only respondent that reported litigation was not involved in a cigarette fire injury. When asked about litigation, respondents generally replied that there was no one to sue since they were

responsible for the fire. Even when the cause of the fire was unknown, the fear that they may have been responsible kept people from pursuing a case.

Responses concerning quality of life were inspiring, especially considering the substantial adverse affects of the injuries noted above. Six respondents very definitely felt that their lives had improved since their injuries. Some respondents returned to school, which resulted in improved self esteem and career advances. Other positive changes reported were increased family closeness, improved health behaviors and attitudes (such as quitting smoking and exercising more), an increased sensitivity to disabled persons, and a greater appreciation of life.

Conclusions and Recommendations. These case studies provide evidence in support of the belief that the costs of burn injuries are underestimated. Not only are there costs which are not readily quantified, there are also quantifiable costs which may not be routinely captured in conventional reporting systems. One case study describes serious burn injuries sustained in a cigarette fire where the fire department was never notified because the fire was extinguished by a family member. Another case study reports on reconstructive surgery scheduled more than 25 years after the burn injury.

The case studies also suggest some recommendations to be considered, in the areas of prevention and treatment. Although the statement "don't smoke in bed" is familiar, it seems that there is a need for more explicit education and warnings specifically related to the effects of drugs (drowsiness, loss of consciousness, slowed reflexes) and the dangers of smoking while "under the influence." In one case study, the individual fell asleep while taking prescription tranquilizers. Physicians prescribing such medications should inquire about their patients' smoking behaviors and alert their patients to exercise caution while smoking. The case studies also suggest that much more attention be given to the psychosocial aspects of recovery, both through formal services and support groups. Respondents did indicate that there were times in the recovery process that they were not receptive to such services, but then later felt that they could have benefitted from counseling. Therefore, it is important that these services be offered at several points during treatment, both for inpatients and outpatients.

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INDIVIDUAL CASE STUDIES

In the individual case studies that follow, names have been changed and identifying information has been eliminated to protect the anonymity of respondents.

Mr. Anders (10 years post-injury)

Overview

Mr. Anders is a 49 year-old white male who was injured in 1983. In fact, he remembers the exact date of his injury and indicates that, for six or seven years following the injury, he recognized the "anniversary" date. Injured in a residential fire, Mr. Anders had second and third degree burns over 31 percent of his body.

He has been married for 23 years, and has two daughters, ages 21 and 16. His current job, which he has held for over 6 years, is as an operations/financial manager for a company in the Midwest. He has a doctorate in biochemistry, which he had completed prior to his injury. Since then, he has completed advanced degrees in business administration and management. In addition to his regular job, he teaches at a university.

Injury and Circumstances Surrounding the Injury

At the time of his injury, Mr. Anders was living alone in an apartment. He had moved three months previously to start a new job, and his family was to join him later. He was burned in a fire in his apartment at about 1:00 in the morning. The cause of the fire was not definitely determined, but it appeared to have started in the kitchen trash can. Mr. Anders believes the fire was probably started by a cigarette that was not completely extinguished when he emptied an ash tray into the trash before going to bed that night. He believes the neighbors upstairs must have seen smoke and called the fire department. The fire department got him out of the building, and no one else was injured in the fire. All of the burns were to his upper body, from the rib cage up.

Treatment and Services Received

Mr. Anders was in the hospital for six weeks. He then recovered at home and went to the burn clinic for weekly outpatient visits. He also had physical therapy three times per week. The

purpose of the clinic visits was to check on the healing of his wounds and schedule surgeries. He experienced severe pain throughout this period. Strong pain medication, such as morphine and codeine, was provided only in the early stages following his injury. Subsequently, the only pain medication available to him was aspirin, which was not very effective in relieving the pain. Mr. Anders had 10-12 surgeries; his last procedure was in February 1984, almost a full year after the injury. Skin grafts were taken from his legs for his back. In the early stages he wore pressure garments, did stretching exercises, and had surgery to release contractures.

The hospital had a process for care planning, where all of the clinical staff and the patient worked as a team. Mr. Anders thinks this worked well, but, in looking back, feels the hospital could have done more to involve the support group of burn survivors in this process. He feels pain management at the hospital was inadequate, but understands that attitudes toward pain control have changed considerably since his injury.

The hospital also had psychological and social services available, as well as a support group of burn survivors. A psychiatrist did drop by briefly while Mr. Anders was in the hospital, but Mr. Anders didn't want to admit that he needed "that kind of" help at that time. The social service department was very helpful in working out things related to his employer, insurance, and similar matters, but Mr. Anders feels that because the staff have not experienced burn injuries, they can't relate to some of the psychological issues faced, the way the support group can. He feels that the hospital is very supportive of the burn survivors group. For example, they provide controlled access to patients on the burn unit and training through their volunteer department. There is a good relationship between the burn unit nursing staff and support group visitors.

Recovery and Adjustment Process

Mr. Anders indicates he experienced pain, lack of sleep, and strong feelings of guilt for about a year. During the early stages there was a lot of denial of the injury, followed by feeling sorry for himself. At these stages, Mr. Anders feels that visitors from the support group can't be very helpful. Mr. Anders indicated that he experienced mood swings and real ups and downs in feelings of self esteem, even on a daily basis, in the early stages of his recovery. He also experienced short-term memory loss for about the first year after his injury. He was very afraid that he had sustained permanent brain damage, and he feels that it would have been helpful to hear from others that such short-term memory loss is not unusual, and is temporary. He dealt with this fear by reading books with suggestions for memory techniques, and this helped him to

get through this period. In looking back, he thinks the memory loss may have been part of the depression he experienced for the first year post-injury.

Since he had no long term disability coverage, having just started a new job, Mr. Anders' employer allowed him to return to work early and work one or two hours a day in order to continue his benefits. His wife immediately moved in order to care for him, while their children stayed with grandparents for a month before joining them. It was the summer of 1984 before Mr. Anders could resume regular physical activity.

He was very dependent after his injury, and this was difficult to handle. For example, he couldn't brush his teeth because he couldn't bend his arms. (Mr. Anders also noted that it is hard to remember this stage now.) His wife had do some wound debridement, which was very hard for her. It "killed him" because he felt he had ruined everything--she was angry and she was right to feel angry. Psychologically, one of the hardest parts of the recovery process was dealing with the guilt he felt about what he had put his family through. In his support work now with other burn survivors, he tries to help people get past the feeling of having "done something stupid."

He found the burn survivors support group to be the most help in his psychological recovery. The founder of the local group came to talk to him while he was still in the hospital; he had experienced a tragic burn six months before. The support group visits burn unit patients and also has monthly meetings. Mr. Anders went to support group meetings sporadically for a couple of years, but then began to feel that going to the monthly meetings was "wallowing in it," so he stopped going. He got to the point where he realized he was going to live and it was time to set new goals for himself (this was late August 1984). At this point, he started to redesign his career and rebuild his life. The injury changed his life because he couldn't go back to the work he was doing--he was a laboratory biochemist and couldn't continue this work with open wounds. He became more involved in financial management and computer applications, and returned to graduate school.

Mr. Anders' arms and legs are scarred. He has some facial scarring, but very little, even though some grafting was done under his eyes. Because he has very little facial scarring, the issue of disfigurement doesn't come up much in his daily life. If children stare at him in the gym, he tells them it's OK to ask questions about what happened to him. But, the first two years after the injury were very bad--he had a "big red spot" on his forehead, wore pressure garments, and had limited movement--this experience has given him an idea of how to handle disfigurement in others. He feels he learned a valuable lesson because now he knows how others feel who are

disabled or disfigured. He thinks that disfigurement restricts people in what they can apply their talents to, because others are uncomfortable with it, thus limiting their opportunities. He finds that peer burn survivors can be helpful in dealing with this issue. On the other hand, he notes that, at least for a man, there is something "macho" about scars.

Years after the injury, when he felt he was recovered, he got involved in United Way volunteer activities. Then, about two years ago, he thought he should give something back for all the care he got in the hospital, so he became an active volunteer with the burn survivors group. He goes to the hospital once every two weeks and visits a few patients on the burn unit each time. He also takes phone calls from those in need of support. The support group has languished in the last few years because one person was doing all the work; when this individual died, they had to regroup, and Mr. Anders has been involved in this effort.

Impact on Family

Mr. Anders feels his support systems were extensive. People at work were very supportive, and support from family and friends was "unbelievable." They encouraged him a lot. His wife and daughters were helped by the employee assistance program (EAP) provided by his employer. The counseling there provided a place where his wife could express her anger. His injury was very hard on his children. His older daughter who was 11 at the time of his injury, still can't handle flames at all. His younger daughter smokes, but is not allowed to smoke in the house.

Getting through the injury was "a matter of will," for Mr. Anders and for his wife. They were determined to make it, and their marriage is stronger as a result. In fact, the injury strengthened the family; his children were very good through it all and everyone pulled together.

Costs and Lost Productivity

The cost of all of Mr. Anders' medical care was covered by his employer. The losses of his belongings were covered by his homeowners' insurance policy. Since he had just moved, there wasn't that much in his apartment. He is very grateful that no one else was injured in the fire. One loss not easily quantified is that he was about one-third through a book he was writing and the manuscript was destroyed in the fire. Due to his own recovery time, he was not able to complete the book, and since it was related to computer technology, the material was out of date by the time he would have been able to get back to it.

He probably lost nine months from work, since he wasn't very productive when he first went back. His wife was not working at the time, but she probably couldn't have worked because of the demands of caring for him and driving him to and from work. He estimates that he cost his company hundreds of thousands of dollars in lost productivity.

Mr. Anders indicated that his medical bills were about $100,000 (early 1980s prices). The hospital bill alone for the first six weeks was $57,000, which was covered almost completely by insurance. He estimates that his family paid about $3,000 out of pocket.

Functional Capacity Limitations

Mr. Anders feels the residual effects of his injury are very minor--mostly a loss of flexibility and dry skin. He has all of his fingers, but there is some scarring which slightly limits his ability to spread the fingers of his left hand. For example, he can no longer play the guitar. There is a general loss of flexibility due to scarring, but by working hard, he maintains his flexibility. He joined a gym and works out a couple of times a week. He thinks the stretching through weight lifting really helped his physical recovery. Mr. Anders did have burns to his eyes and has residual scarring of his left cornea. However, this has not affected his vision. As for pain, he experiences very mild distress with no disability, and he does not take any pain medications.

Litigation

Mr. Anders did not undertake any legal action. The apartment building did not have a smoke detector, and there was only one way out of the building. But, he felt strongly that the fire was probably his fault, so he didn't want to pursue any litigation.

Quality of Life

The injury has had some positive effects. First, he quit smoking. Second, the injury has given him a different appreciation of life. He is more active and more persistent in trying to reach his goals. He feels more alive, and life is more precious. He is now involved in many things, so that if one goes wrong he has other interests. In contrast, before the injury, he was a "workaholic," working 10 to 12 hours a day and on weekends. Now he works fewer hours at his job, teaches, and does volunteer work.

Mr. Anders describes himself an unusually "upbeat" person, and says that "he works at it." He rates his quality of life as mixed to good before the injury. Six months after the injury, his quality of life was" terrible." Today he would rate his quality of life as "terrific." He no longer defines himself as a "burn survivor," and is looking ahead to deciding where he wants to go next in his career.

Other Comments, Findings

Mr. Anders finds that visiting other burn survivors is inspirational because many are doing very well. He found that some of the issues raised in the interview were hard to talk about, even after 10 years and a good recovery. "It's hard to predict how you will react to some things." For example, late 1984 was the first time he barbecued, and, to his surprise, it didn't bother him at all.

Mrs. Bailey (10 years post-injury)

Overview

Mrs. Bailey is a 49 year-old white woman. She is a married and has two children. She is a housewife and lives in a suburban area on the East Coast. She was injured in December 1983. She had second and third degree burns over 65% of her body, but has returned to her regular activities and feels that her long-term disabilities are minor.

Injury and Circumstances Surrounding the Injury

Mrs. Bailey was in her home in the kitchen around 11:30 or 12:00 at night. She was drunk and she was smoking a cigarette. She had either fallen asleep or passed out, and the cigarette ignited her clothes. The fire woke her up; she called for her husband and he came into kitchen and put the fire out himself with water. The fire department was never called. Mr. Bailey had first degree burns on his hands because at first he tried putting the fire out with his hands. No one else besides Mr. and Mrs. Bailey was injured in the fire. The only property damage was to the kitchen floor and chair padding.

Treatment and Services Received

Mrs. Bailey was taken to the to hospital right away. Her initial hospitalization, at a burn center, lasted three months. Physical therapy was started when she was still in intensive care at the burn center. She also received occupational therapy while hospitalized. The hospital team included a social worker, a physical therapist, an occupational therapist, nurses, and doctors. Special equipment included pressure garments, weights for exercising, and an exercising bar to reach up to. There was no psychological counseling at the hospital, and she feels she would have liked some had it been available.

It was hard for her to understand what was going on, especially during her initial hospitalization. Although everything was fine at the hospital, the nurses have to be "tough" with burn patients and she didn't understand this at first. They have to get the patient to move around, and she didn't want to because it hurt--now she understands that it was in her best interest.

Even with morphine, she was in constant pain. She was on morphine for about the first one and one-half months after her injury, and was still taking codeine when she went home. Mrs.

Bailey was discharged to her home, and returned to the hospital weekly for physical therapy. She has had plastic surgery about six or seven times since her injury.

Recovery and Adjustment Process

Mrs. Bailey noted that she went through "all of the stages that the terminally ill go through."[1] Initially, there was a tremendous amount of denial--she didn't believe what had happened to her and wanted to go home right away. The hospital didn't tell her how seriously injured she was (she found out later that she had a 2 out of 10 chance of survival). Even when a priest came in and gave her "last rites," she believed him when he told her it was just to pray for her recovery. Her husband didn't let on about how serious her injury was either.

The pain and disfigurement were the hardest parts of her injury to cope with. She continued to experience pain for three years. No one explained to her that it would go away--she thought she would be in that kind of pain her whole life. After three years, very gradually, the pain stopped. No one in the hospital talked to her about disfigurement. Due to her disfigurement, she didn't go out much, and only very gradually got back into activities outside the home. Psychologically, it was a difficult adjustment, especially because of the guilt she felt about the incident. She relied on her own strengths and the support of her family to get through this period.

It took her about three years to get back to her daily activities. Since she was a housewife before her injury as well, there was very little change in her activities or lifestyle. The main changes have been that she is much more concerned with improving her own health habits and those of her family (e.g., smoking and drinking). She is also probably a little less likely to participate in "fun" activities with family and friends since her injury.

Impact on Family

Mrs. Bailey's family was very supportive, but it was a strain for all of them. Her two children were 14 and 15 at the time of the injury, so they were old enough to help out. She was

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[1] See, Kubler-Ross, 1969. On Death and Dying. The five steps identified and described by Kubler-Ross are: Denial and Isolation; Anger; Bargaining; Depression; and Acceptance.

able to manage at home alone, so no one needed to take off from school or work to care for her. Mr. Bailey took time off work to drive her to hospital appointments.

Costs

The costs of Mrs. Bailey's care were covered by the health insurance policy that her husband had through his employer. Homeowners insurance covered damages to the kitchen floor and furniture. There were some out-of-pocket expenses not covered by insurance.

Functional Capacity Limitations

Mrs. Bailey has less mobility in her legs. She also has trouble lifting her left hand over her head, and she has a little trouble lifting heavy objects, but otherwise she has no long term disabilities.

Overall Quality of Life

Before the fire and six months after the fire, Mrs. Bailey's quality of life was "terrible." Now, she is doing the activities she wants to be doing and her injuries do not hamper her. She rates her current quality of life as mixed to good.

Litigation

No litigation was pursued as a result of this injury.

Mr. Carter (16 years post-injury)

Overview

Mr. Carter is a 39 year-old white male. He was injured in 1977, sustaining second and third degree burns over 60 percent of his body. He is married and has a 21 month-old daughter. He also has two grown sons from a previous marriage. He holds a professional position in agricultural management in a midwestern city.

Injury and Circumstances Surrounding the Injury

Mr. Carter was injured when he went to investigate a brush fire on a dairy farm where he was working (milking cows). It turned out that the brush fire was caused by a downed wire--Mr. Carter was electrocuted (knocked unconscious), and his clothes caught on fire. In addition to the burns, his left hand was amputated from the elbow. He also lost the tip of the index finger and thumb on his right hand.

No one else was injured in the fire and, since the fire occurred outdoors, there was no loss to personal property other than his clothing.

Treatment and Services Received

Mr. Carter was taken to an acute care hospital that had a burn unit. He was in intensive care at this hospital for three to four months, and then was transferred to a rehabilitation facility when he became more independent. The burn center promoted independence, which Mr. Carter feels was very positive. He spent two months in the rehabilitation hospital. He received physical therapy and occupational therapy in the first hospital and in the rehabilitation hospital. Counseling was available at both facilities, but he was not interested in these services. He was provided with special equipment, such as a one-handed shirt buttoner.

After discharge from the rehabilitation hospital, he returned to the burn center monthly to work with the surgeon and talk about next steps in his treatment. They maintained an ongoing dialogue about his care plan. Mr. Carter has had about 30 reconstructive surgeries since his discharge from the rehabilitation hospital.

Mr. Carter doesn't recall any problems in getting access to all of the care he needed. At first, he didn't get much explanation about his treatment because he was too sick and medicated to participate in his treatment planning. At the time, Mr. Carter says, the care he received

seemed fine, but looking back now, he thinks he could have used more help in "dealing with the change in his life," although he indicates that he's not sure he would have accepted such help then.

Plans and preparations for obtaining a prosthesis were made after his discharge from the rehabilitation hospital. He was not satisfied with the prosthetics consultant used by the hospitals where he was treated, because he felt he was not involved enough in the decisionmaking process. He went to another city to obtain his prosthesis, and he was fitted for the prosthesis six months after his hospital stay.

Recovery and Adjustment Process

Mr. Carter indicates that he "went through the typical five steps described by Elisabeth Kubler-Ross for terminally ill patients."[2]

Initially, he never felt he wanted to die, so he just focussed on living. Everything was focussed on basic survival. The hospital didn't let him look at himself for four months. His wife was pregnant at the time of his accident. When his son was born, he couldn't see him for three months due to risk of infection.

The next stage, according to Mr. Carter, occurred at the rehabilitation hospital, where he was functioning, but in pain and realizing the impact of the injury. The hardest step was dealing with the scars, the need for many services, and "facing a society that doesn't accept disabilities." At this stage, he was working on getting better and getting out of the hospital. The nurses and his family were especially important in helping him through this phase of recovery.

When he came home, he had to "face the fact I couldn't do what I did before." Mr. Carter returned to school for his masters degree shortly after he came home. He was offered a teaching assistant position, and continued on to complete his doctorate. His family also suffered another tragedy during this period, when his infant son died. Through all of this, he was "determined to survive."

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[2] See, Kubler-Ross, 1969. On Death and Dying. The five steps identified and described by Kubler-Ross are: Denial and Isolation; Anger; Bargaining; Depression; and Acceptance.

Mr. Carter says he spent the next 8 to 10 years trying to prove to everyone that he was "normal." He indicates that he had to "stifle" himself to do this, by not acknowledging his feelings or special needs.

At first, he didn't want to ask for anything special. Now he is beginning to ask for things like a voice-activated computer (he only has three fingers to type with). He thinks that some type of mentoring program to share experiences might have helped him to ask for special tools and other types of assistance earlier, as well as provided some practical advice for coping with his disabilities, since caregivers "just haven't been there."

In the past three years, he has been reassessing himself and his life. He has become more involved in issues related to society's view of diversity and differences. He is involved in a national leadership program through his employer, and has been running programs on "valuing the physically challenged." He is becoming more accepting of himself and is trying to get people to respect each other more.

Mr. Carter sums it up by saying, it has been a long process, and "all of the time there is a feeling of isolation--you look in the mirror every day and see the evidence of what has happened to you."

Impact on Family

Mr. Carter feels that his family learned a lot from his injury, and that he learned a lot about his family. His wife was very supportive and pushed him to be independent (although he has since divorced and remarried, Mr. Carter notes that his divorce was not related to his injury, but to "marrying too young" -- they are still "good friends").

Mr. Carter's mother "couldn't deal with his accident." She was overly protective, which made it hard. Mr. Carter describes most of his family as "tough-it-out" types, who tend to be supportive, but not introspective. His family doesn't treat him differently because of his disabilities. In fact, he believes it has been a good experience for his children because it has made them much more accepting of differences in people.

Costs and Other Losses

Mr. Carter couldn't go back to his work on the dairy farm at all. His wife couldn't work for six months due to his care and the care of their newborn. They lived on Social Security

during this period, on a very tight budget. Workers' Compensation covered the cost of his care because he was injured while on the job.

Litigation

Mr. Carter filed suit against the power company because of the downed wire. Mr. Carter's brother is a lawyer and he handled everything at the time. Mr. Carter was too sick to be involved, and remembers little of the specifics. The case was settled out of court after about 5 to seven years, and he receives an annuity payment.

Functional Capacity Limitations

Mr. Carter was a runner before his injury; now he does not have full motion in his foot due to the burn injury. He can't his raise left arm all the way over his head.

With a prosthesis on one arm and three fingers on his remaining hand, he can't hold small objects very well. Activities like buttoning clothes are awkward for him. To hold larger objects, he uses his right arm. One ear was also burned off, and he misses some sounds as a result, but the hearing loss is "not dramatic."

He no longer experiences any pain, and does not take any medication.

Quality of Life

Physically, Mr. Carter feels "OK." He is happy to be rediscovering things about himself--he describes himself as an "optimist." He is trying to decide what he really wants to do next in terms of his career. He values things differently since his injury, for example, "family is number 1." He also thinks he is more of a risk-taker since his injury.

Yet, he feels the impact of the injury will never go away completely because society won't accept it. He is still stared at in stores, for example.

Ms. Clark (9 months post-injury)

Overview

Ms. Clark is a 29 year old white woman. She suffered third degree burns over 40 percent of her body nearly nine months ago, in 1992. Ms. Clark, a long-time heroin addict, was living in an abandoned house with 15 other people. After her hospitalization, Ms. Clark went to live with her mother, sister, and brother at her mother's house. She has many physical and emotional problems, and has no money or job. She is a high school graduate.

Injury and Circumstances Surrounding the Injury

Ms. Clark was alone in the house one day, and awoke to a fire. She was eight months pregnant at the time. The house was very hot, and there was fire and smoke everywhere. She ran through the fire to escape, and her clothes were burned. She then jumped out a third floor window, breaking many bones in the fall. She collapsed on the ground. Eventually emergency vehicles took her to the nearest hospital. She woke up in a different hospital that had a burn center, where she stayed for three months. Her baby died in the hospital.

The cause of the fire was arson. The house was destroyed. Police apparently caught the arsonist at the scene, and he was convicted. He since has been sentenced to prison.

Ms. Clark had third degree burns on both hands, both feet, the back of her arms (shoulder to elbow), and her whole back. She also broke her pelvis and several ribs, and punctured a lung and her bladder in the fall; her upper teeth were knocked out. A bone was shattered in her foot, and she now has arthritis in her leg and back.

Treatment and Services Received

Ms. Clark's treatment was complicated by her intravenous drug use, and by her advanced pregnancy. Medical personnel had a hard time finding veins for medication, and could not give too much morphine for her pain, "or it would kill the baby." The baby died shortly after she arrived at the hospital.

Ms. Clark had seven skin graft surgeries. She felt that her medical care was good--"they did a great job." She liked some of the nurses; she disliked others. She received several months of treatment in the hospital. She returned for follow-up every two weeks, then once a month,

then every two months, and now every three months. She described long waits to see the burn specialist and the orthopedist.

Ms. Clark also had physical and occupational therapy in the hospital. Special clothing was provided, although she apparently did not wear it very often. She used a walker at home a few times and returned it to the hospital.

The social worker at the hospital helped her to apply for SSI, which was denied (she is appealing this) and offered to arrange for drug treatment. She apparently received no counseling or psychotherapy, which she now regrets: "I should've had counseling...I got a mind like a kid."

Recovery and Adjustment Process

Dealing with her changed appearance has been the hardest part of recovery for Ms. Carter. She has many scars, and feels that her body is ugly. She noted, "I cry a lot over that." She feels no one will love her with her "messed up body". She is lonely and depressed, and has poor self-esteem.

Ms. Clark "thinks about it (the fire) all the time", how she jumped out of the window, and how no one broke her fall. She wishes that the incident never happened. She blames herself for being in an abandoned house, and for her drug habit. Ms. Clark started using alcohol, pills, and marijuana when she was 12 years old. At age 13, she started shooting up. She noted that "I've been in 20 different rehabs since 1981". While she has tried to stay off drugs, she has had relapses since the fire. She attended an outpatient drug program after she left the hospital, and was recently in a rehabilitation facility. The first time she relapsed, her mother "threw her out", and she went to her sister-in-law's house. Her mother invited her back "right before Mother's Day."

The death of her baby was a loss for Ms. Clark, but the impact of the loss was not clear. Ms. Clark has four other children who live with relatives. The father of the baby who died is in prison.

Impact on Family

Ms. Clark's injuries affected her family a great deal. Her mother, a cashier, was "really upset" and visited her every day at the hospital. Her mother's employer gave her one week of paid leave. She took off from work at other times, and visited evenings and weekends. Her parents are divorced, and her father, a longshoreman, lives in another city. He, too, came every

day to see her. Her sister also helped take care of her. Ms. Clark is closer to her sister than to her brother.

Her mother's boss sent her flowers, which truly amazed her. Her godmother and some friends arranged a benefit for her and raised $1,500. Much of this money was used to buy clothes (she lost all she had in the fire).

Due to her drug habit, and many unpleasant incidents in the family, her mother previously "threw her out of the house". Her injuries helped bring her and her family back together. She always thought they would not want her back. She noted, "I never thought I would see that day."

Costs

Ms. Clark receives a modest welfare check. She also has a Medicaid card, which covered some of her medical expenses. She recently has been getting a number of doctor and hospital bills, which she cannot pay: "I have no money."

Litigation

Both Ms. Clark and her mother "wanted to sue someone", but the idea was dropped. Ms. Clark felt that she was "in the wrong" by being in an abandoned house. No litigation was involved.

Functional Capacity Limitations

Ms. Clark currently has many physical disabilities, most stemming from the fall. While her burns are not currently painful, she suffers from intense itching. Her pain varies from mild to severe, depending on the day and time. She feels worse on a rainy day. She cannot stand or walk more than fifteen minutes, and cannot run at all. Her foot is "locked" (stiff) from the fall. She can walk from one room in the house to another, but must rest after doing so. It takes her a long time to climb a flight of stairs. She can walk 150 feet, but must sit down and take a break. Though she gave the walker back to the hospital, she still needs it. She estimated it would take her about fifteen minutes to walk one third of a city block.

While she can hold a pen, her hands "get tight" after a while, and she needs to rest. It hurts to lift her left arm over her head. Ms. Clark cannot bend and touch her hand to her foot. While she dresses herself, it is not easy and takes "a while". It hurts her to take off her slacks. She is only able to lift light objects.

Additionally, her vision has been affected. She sees spots and "blurry things" now. Also, she has experienced some gynecological irregularities, and has some problems with bladder control.

Ms. Clark has short-term memory loss, but thinks that this may be due to the drugs. She has a problem making decisions, and needs help with finances and other aspects of her life.

Quality of Life

Ms. Clark is grateful to be alive, to have a place to live, and to have food and clean clothes. However, she likes to be on her own, and come and go as she pleases. She would rather be somewhere else, though she cannot afford it. Her boyfriend, who is black, is not allowed to come to her mother's house. She blamed her mother for being prejudiced, but also noted that he is a crack addict. She currently is not using drugs, but indicated "I don't know about tomorrow." She is not attending outpatient drug treatment although it is available. Ms. Clark rated her quality of life as "terrible" before the fire, as "bad" six months afterward, and as "mixed" today.

Mrs. Davis (2 years post-injury)

Overview

Mrs. Davis is a 52 year old black woman. In 1983, she quit her job to be a full time foster mother, primarily for children with special health care needs. Mrs. Davis was burned in a house fire nearly two years ago, in 1991. She suffered first and second degree burns on her legs, back and arms. After discharge from a burn center, Mrs. Davis and her family lived with her grown daughter while searching intensely for new housing. Mrs. Davis, her husband, five foster children, and one grandson now live in a different county, far from the site of the fire.

Injury and Circumstances Surrounding the Injury

One summer afternoon, Mrs. Davis was sitting on the front steps of the house her family had rented for 20 years. A neighbor told Mrs. Davis that smoke was coming out of a window. She immediately went into the house. Two of her foster children, aged 11 and 4, were in an upstairs back bedroom. She remembers "trying to get the baby out" of the bedroom. She has no memory of anything after that, until she awoke in a hospital bed.

People have told Mrs. Davis that she was overcome with smoke and burns and collapsed. She also was told that her neighbors "dragged her out of the house." The older child apparently survived by crawling out of an upstairs window. He also may have been helped by a neighbor. The 4 year-old died in the fire.

The cause of the house fire is unknown. It may have resulted from children playing with matches. The house was 90 percent destroyed.

Mrs. Davis was burned on her hands, arms, legs, and back. She had minor blisters on her face, which have since healed. She currently has no pain or physical limitations due to the burns, although she has some itching. She has a great deal of scarring, and "dark and light spots" on her body.

Treatment and Services Received

Mrs. Davis felt that her medical care was good. She had no surgeries--"they said I didn't have to do it." She had physical therapy in the hospital, but no counseling or other support services.

Upon discharge, she received medications and cream for the burns. She was given self-care instructions about bathing, skin care, and staying out of the sun. She returned to see a burn specialist, who said she was "doing okay." She then told him she could not afford to pay him for future visits. He said she looked okay and told her it was all right not to come back to see him.

Recovery and Adjustment Process

Family and friends helped care for Mrs. Davis after she was released from the hospital. A woman friend, who was in a wheelchair, cleaned the wounds on Mrs. Davis' back as she showered. Mrs. Davis noted that her family, friends, and neighbors all have been very supportive. She did not participate in any support groups.

While not facially disfigured, Mrs. Davis has many scars on her body. She "covers up more with clothes", and no longer wears sun dresses or shorts. If people inquire about her appearance, she hesitates, unsure if she wants to tell people what happened.

Mrs. Davis felt the hardest part about her experience was accepting things...the fire, the losses, the burns. She is filled with hurt and pain. She still feels guilty about losing the child she took care of for nearly three years..."somehow I could have done more".

Another source of sorrow for Mrs. Davis was that she felt "cut out" of anything related to his death. Caseworkers did not let her know when the funeral was. She "could not send flowers or say goodbye." As she was unable to express her sorrow, she has no sense of closure. She avoids the site of the fire, though the family lived there for 20 years. She "still hears the baby cry."

Mrs. Davis' biggest frustration was being homeless. She "got no help from the city" on housing. After visiting several housing agencies with long waiting lists, the Davises finally obtained a list of houses. She and her husband looked all over for houses. Since her old neighborhood was drug infested, she felt she should find a better area for the children.

The Davises moved into a house in a more rural area about two months after her discharge from the hospital. Mrs. Davis has experienced extraordinary stress and loss, and has been quite depressed. She had five grown children of her own, in addition to her foster children. The same month as the fire, one of her natural sons was shot and killed.

Mrs. Davis described herself as "a fighter", and said she puts her children first. She noted that she is the one who has to be "real strong" and keep the family together. She stays very busy, is active in church and community, and enjoys caring for children. However, the tremendous

stress she has experienced has certainly taken its toll. She recently went to a medical clinic with chest pains..."feeling depressed...feeling like I was having a heart attack." She was given medication, and the pains went away.

The foster children she cares for receive regular visits from a psychiatrist. During one of these visits, he told Mrs. Davis that she needed to see a psychiatrist herself. She felt unable to afford this.

Impact on Family

Mrs. Davis' husband is a construction worker. As he was looking for housing, helping with the children, and visiting his wife at the hospital, he lost his full time job. Since the fire, he has not been able to find steady work, only day work. He has been very frustrated about this situation, which has added much stress to their marriage. Mr. Davis previously had a drinking problem, but had quit drinking. After the fire, he started drinking again, but has since stopped. During this time, he "was picked up on a DWI" (driving while intoxicated).

The Davis' foster children were very worried about Mrs. Davis. They "thought they had lost me, too." They needed a lot of reassurance and calming while she was hospitalized. Mrs. Davis' natural daughter, with whom the family stayed, was very helpful. She took off work "a lot" to help care for the children and to visit her mother in the hospital. She used accumulated paid leave.

Additionally, the Davis family lost virtually everything in the fire... furniture, possessions, important records and pictures. They were able to salvage only a few pieces of furniture.

The Davises had three smoke detectors in their former house. They now have six in their new residence. In addition, the family has "regular fire drills--how to get out of the house in case of fire."

Costs

Mrs. Davis had no health or home insurance, and owes $10,000 to the hospital. She informed the hospital of her financial situation, and "they are not bothering me." The hospital provided medication for her. She bought some pain pills on her own. Her biggest out-of-pocket costs were moving expenses. The Davises used their savings for rent and a security deposit; they also had to buy basics like linens, furniture, and kitchenware. She estimated it cost them $6,000 to move.

Functional Capacity Limitations

Mrs. Davis has no physical limitations stemming from her burns.

Litigation

No litigation was involved.

Quality of Life

Mrs. Davis rated her quality of life as "good" before the fire, as "terrible" six months afterward, and as "mixed" today.

Ms. Deale (27 years post-injury)

Overview

Ms. Deale is a 52 year-old white woman. She was injured in November, 1966, when she was 26 years old. She was burned over 35 percent of her body (3rd degree) mostly on her hands, arms, and shoulders. She is divorced and lives alone with her dog. She works as a secretary for a state government agency in an Eastern state.

Injury and Circumstances Surrounding the Injury.

The year prior to Ms. Deale's injury was a very difficult one. She had gone through a painful separation. She was pregnant and her husband was physically abusive, so she left him. Since she was emotionally fragile and had no financial resources, she gave her son up for adoption.

At the time of the injury, Ms. Deale was working two jobs, and was on tranquilizers, prescribed because of her emotional state at the time. She had taken a sleeping pill and was smoking a cigarette--she fell asleep and was found on the kitchen floor with the melted telephone in her hands. Her arms and hands were severely burned. The little finger on her right hand was later amputated due to contractures.

Ms. Deale was sharing an apartment at the time of the fire, but her roommate was at work; apparently someone outside the building saw the smoke and hit a fire alarm box. All of her belongings were destroyed in the fire, but she especially remembers that her "hope chest" was destroyed. The only thing she remembers about the fire is being carried downstairs on a stretcher.

Treatment and Services Received

Ms. Deale was transported to a nearby community hospital. A tracheotomy was performed right away and she remained in intensive care at this hospital for two to three weeks. Ms. Deale did not have health insurance, but she was eligible for care through the Veterans Administration (VA) because she had been in the Marines from 1962-1963. She was moved to the VA hospital in a nearby city.

Ms. Deale remembers very little about the first few weeks after her injury. The mirrors were covered in her hospital room, and she was very sedated.

Her first stay at the VA hospital lasted nine months. Ms. Deale was the only woman in the VA hospital at the time, and they had never had a burn patient before. She was "helpless" because she was bandaged from her fingertips to her shoulders. She felt that the staff at the VA hospital was "wonderful," but that her scarring was worse because of how dressings were changed there. She attributes this to staffing limitations, lack of experience with burn care, and just the fact that this happened 27 years ago, and burn care has advanced since then. Dressing changes, especially, were very painful. But, she remembers the itching even more than the pain. Her care consisted primarily of pain relief, tranquilizers, and physical care. Once she was less sedated, her medical care was explained to her and she was able to understand her treatment. She received a limited amount of physical therapy at the VA hospital, but no other special therapies. There was no special clothing (i.e., pressure garments) at that time. No counseling was offered to her at the VA hospital. Ms. Deale feels that counseling might have helped her to adjust to her changed appearance.

She felt more comfortable at the VA hospital because of her military background. Also, she felt that patients and staff at the VA hospital were more accepting of appearance because they were accustomed to seeing disfiguring war injuries that were much more severe. She feels the staff did everything possible to help her at the VA hospital. She was especially fond of one nurse that cared for her. This nurse had a heart attack and died while Ms. Deale was still a patient at the hospital. Her doctor was understanding, and had the "best bedside manner." When she started feeling better, Ms. Deale tried to help with the care of the other patients.

She returned to the hospital every year for five years for reconstructive surgery. This included the amputation of her finger, which was so skillfully done that it is "hardly noticeable" to others. Although she can't make a fist, the surgery saved her hand. In 1983, she went back for more surgery on her right hand to get full extension of the thumb from the forefinger. She has had at least 23 operations since her injury. In fact, in August, she is going back for surgery on her left arm to release skin under the arm so that she can have a fuller range of motion with that arm.

Recovery and Adjustment Process

After discharge from the VA hospital, Ms. Deale got her own apartment in the city where the VA hospital was located, so that she could continue her care with the same doctors. She was able to manage on her own. She was unemployed and lived on social security disability

payments. Since she was new to the area, she spent all of the time during the week alone in her apartment. Family and friends visited only on weekends. Ms. Deale describes herself as "a hermit" during this period.

After the injury, her "self esteem was zero." She was seeing a psychiatrist in 1970 who was not all understanding. She attempted suicide with pills. She fell in her apartment, received a gash in her head, and was in intensive care for three weeks. She was treated at the VA hospital again and got excellent care--this was probably the turning point for her. She was treated by a wonderful female psychologist at the VA who encouraged her to go back to school and get a college degree. Her military benefits paid for her education. She completed a bachelor's degree in police science and joined the National Guard in 1972. This was her first job since her injury. She chose the National Guard because she wanted to be in the military again and the National Guard offered part-time positions. She was the only enlisted woman at the time, but she felt she was accepted.

Ms. Deale feels that doing well in school really helped her self esteem. She later became a state employee, and continues working for a state agency today. She taught herself to type again, and now works as a secretary and types 80 words per minute. However, she can no longer take shorthand quickly.

Ms. Deale indicates that it took her years to accept how she looked. Even though the scars have faded, she is still self-conscious. She doesn't mind talking about her injury, but she hates when people stare. Her arms were "bright red" for years--she wore long sleeves, even getting special permission to wear a long-sleeved uniform all year-round. She continued to wear only long sleeve blouses until about 1980. Outside of the military, she feels she has faced job discrimination due to her appearance. She rarely dates because of her self-consciousness. In addition to the scarring on her arms, she has scars all over her body from skin grafts. She goes to very quiet beaches only, and is much more of a loner than she was before her injury. Ms. Deale is much less willing to ask her family or friends for help since her injury, and tends to keep to herself.

Impact on Family

Ms. Deale feels that her family was very supportive. Her sister lives in the same city as the VA hospital, so she visited often and helped her when she was discharged from the hospital. Her mother lives in another city, and came to visit monthly, as did an aunt and uncle. The injury

did not cause much change in her relationship with her family. Her parents were divorced and she didn't get along with her father before the injury. He didn't come to see her and he rejected her attempts to keep in touch after her injury.

Ms. Deale did get to meet her son and reestablish contact with him a number of years ago. He committed suicide one-and-half years ago, which has caused Ms. Deale considerable emotional pain.

Costs

The VA covered all costs of her care except for the stay in the acute care hospital, which she didn't pay because she had no money. She presumes that the hospital wrote off the bill.

Functional Capacity Limitations

Ms. Deale has some permanent limitations as a result of her injury, mostly affecting her arms and hands. She has difficulty cutting her food, her arms tire easily, her hands cramp up, and certain actions, such as opening car doors, are awkward. She can't hold the steering wheel of the car with her left hand. Because her fingertips are very smooth, she has difficulty turning pages.

Since the burns also destroyed glands in her armpits, she doesn't sweat and heat affects her tremendously. She can lift one arm up all the way over her head with some pulling. Scar tissue prevents her from lifting her other arm all the way (the surgery scheduled for August should correct this).

She still has phantom pain in the amputated finger and itching. Her level of discomfort is mild or worse, but she takes no pain medication.

Litigation

Ms. Deale did not pursue any litigation because she felt the fire was her fault.

Quality of Life

Ms. Deale indicates that her quality of life before the fire was "bad;" six months after the fire it was "terrible," and today her quality of life is "good." She is much more self-confident, and has improved her own health habits. She quit smoking in 1977 due to an ulcer. She started smoking again in 1983, but is now trying a nicotine patch, and has gone from smoking two packs of cigarettes a day to less than one pack a day.

She is seeing a psychiatrist now to resolve problems related to her son's suicide and her relationship with her father.

Ms. Deale indicates that she has "always been for the underdog," and her injury has made this more so. She is much more understanding of others with disabilities.

She spends a lot of time by herself, but she is content with her life. She is interested in genealogy, reading, and computers. Her dog is a good companion. At the time of this interview, Ms. Deale was about to leave on a vacation trip to Scotland.

Mr. Engle (4 months post-injury)

Overview

Mr. Engle is a 55 year-old white male. He was injured in February, 1993, and was interviewed while still an inpatient at a burn center in an Eastern city. He was burned over 55 percent of his body (third degree), mostly on his hands, legs, and face. He is divorced, and has one grown son. Mr. Engle has a college degree and had worked in the area of city planning and development. He is an alcoholic. At the time of his injury he was unemployed and sharing a house with a woman friend.

Injury and Circumstances Surrounding the Injury

The fire occurred late at night. Mr. Engle had had a few drinks and was sitting on the couch with the newspaper when he fell asleep. The cigarette fell on the newspaper and started the fire. The smoke detector woke up his housemate. The neighbors had already called the fire department. He was transported by ambulance to the nearest hospital, but because of the severity of his injuries, he was immediately transported by helicopter to the burn center. Because his teeth were "in bad shape," they all fell out when a breathing tube was inserted in his mouth at the time of the injury.

No one else was injured in the fire. The house was severely damaged, but not destroyed. His belongings were completely destroyed.

Treatment and Services Received

Mr. Engle remained in intensive care at the burn center for almost four months. He is now in a "step-down" unit of the burn center. He has been on this unit for about two weeks, and will probably remain in the hospital another three to four weeks. He is receiving physical therapy and social services at the hospital. The staff have been very helpful so far and have explained his treatment plan to him. He notes that his schedule in the hospital is "very busy." "They work you hard so that you will be able to do things for yourself."

He has had some surgery, and more is scheduled while he is still in hospital. The injuries are very painful, and he is still on constant medication.

Mr. Engle was not aware of any support group at the hospital. He has talked with a chaplain, but there "has been no follow-through."

Recovery and Adjustment Process

Mr. Engle has been a member of Alcoholics Anonymous (AA) for many years, and he has contacted them from the hospital. He also says he would not smoke again. Mr. Engle is very uncertain about the future. His housemate had to move elsewhere and "won't take him back," so he has no place to go upon discharge. The social worker at the hospital is working to help him find a place. He has no family in the area. His son lives in California and his brother lives in Texas.

Impact on Family

Mr. Engle's injury has had a financial as well as an emotional impact on his family. His family is, of course, concerned about him. His son came to see him from California. His son got him new glasses, since his were lost in the fire. He ordered and purchased them outside of the hospital because the hospital "was taking too long," and his son paid for the glasses. Mr. Engle has been in touch with his brother, but he has not seen him since the injury.

Costs and Other Losses

The only insurance Mr. Engle has for his medical care is Medicaid. The rental house he was living in is being reconstructed by the owners. Mr. Engle assumes that the landlord's insurance is paying for this. However, the lease apartment in his housemate's name and Mr. Engle's name was never added to the lease. As a result, his belongings are not covered by any insurance, because, technically, he was not a tenant. Mr. Engle indicates that he was not aware that his name was never added to the lease and expressed some anger at his housemate for this oversight.

Functional Capacity Limitations

It is too early to adequately assess the long-term impacts of Mr. Engle's injuries. He is just starting to stand with a walker. He should be able to walk by the time he is discharged. He can hold things in his hands and move his hands and fingers, although his right hand is more severely burned than his left. He has limited ability to lift his arms, but this is being worked on every day with the physical therapist. He can't tell yet if his vision has been affected because he just got new glasses. He is wearing pressure garments on one hand and on his arms.

Litigation

No litigation is planned.

Quality of Life

Mr. Engle indicates that his quality of life was not satisfactory before the injury. He had not been working for several years. Now he just feels he has lost everything and is uncertain about the future--no home, no clothes, no money, no job.

Mrs. Green (7 years post-injury)

Overview

Mrs. Green is a 35 year-old white woman. She was burned over 43 percent of her body in a house fire in 1986. While the cause was uncertain, investigators believed it was either an electrical or cigarette-caused fire. She suffered some second degree and some third degree burns (most were third degree). Her husband died in the fire. She remarried and had a baby 18 months after the fire. She and her husband now have two children.

Injury and Circumstances Surrounding the Injury

Mrs. Green and her husband were asleep in an upstairs bedroom of their rental house in an Eastern city. The house had no smoke detectors. She "smelled something"--or something woke her--and she tried in vain to wake her husband. She tried to leave the room. As she opened the bedroom doors (there were two doors that opened in), heat and smoke rushed in and burned her. She put her arms up in front of her face, and her face was not burned.

Rescue personnel found her under a window, on the floor, inside the same room. Apparently, a neighbor heard some glass crashing, or saw smoke, and called the fire department. She was taken to the nearest hospital, which had a burn center. She has no memory of the early events after she opened the bedroom doors. Mrs. Green's face, hands, and feet were not burned, but she sustained serious burns to her upper body, from the knees up.

Treatment and Services Received

Mrs. Green was unconscious for about two weeks after the fire, was "drugged out" and on a respirator. She "almost died" in the fire. Mrs. Green had nine graft operations. She recalled the burn treatments as very painful. She remained in the same hospital for about six months. She saw a social worker at the hospital a few times. The social worker offered her counseling, but Mrs. Green felt that she "didn't need it," and did not have a problem dealing with her burns, or accepting her injuries.

Mrs. Green believed that the hospital had a good burn unit, and that she received good care. She still keeps in touch with the nurses, who she said "helped pull her through". She described the nurses as very caring, and "very special people".

After her release from the hospital, Mrs. Green returned a few times to see the plastic surgeon, and to have her pressure garments checked. Overall, she had fairly minimal follow-up care. She received one month of physical therapy after leaving the hospital. Her arm, especially her elbow, was stiff, and stuck in a bending position. She was unable to eat with that arm. Physical therapy included exercises, which helped to loosen up her arm. She recently consulted a plastic surgeon about her arms, who told her it would not be productive to have further surgeries--that it "would just be trading one scar for another."

Recovery and Adjustment Process

Though she sustained serious burn injuries, and lost her husband in the fire, Mrs. Green indicated that she was able to deal with these tragedies in a largely positive way. In her words, "I'm pretty much a survivor; I had to accept it; why be depressed?" She had a very supportive family, who helped her through difficult times. Caring friends also made a difference.

She was not told that her husband had died until one month after the fire. She believes that her mother's decision to delay telling her the truth was a very good idea.

The hardest part about her recovery was having to "start over." She had no husband, no job, no house, and no belongings. " I went back to being 18-20 years old." She moved back in with her parents, and "felt like a little kid". She was unhappy being so dependent on her family, yet they provided a great deal of emotional support. She coped with her new situation by staying very busy--going to school, seeing friends, and later getting a job. She is now employed full time as a dog groomer.

Mrs. Green has always been open about her injuries and her scars. "I never tried to hide it--never covered it up; I wore shorts when I wanted to". She also wore her pressure garments out frequently. "People accepted it," she remarked. She did not receive any professional help dealing with her losses--"I didn't need it." Her family and friends helped her get through the rough times. Knowing that people still cared for her, "no matter what", had a big impact.

Mrs. Green was not involved in a formal support group. However, there was informal support among the patients in the hospital. They kept track of each other's progress through their families, who would check on other patients and report back.

Impact on Family

Throughout her recovery, Mrs. Green grew closer to her mother, who became quite protective of her daughter. She felt that her experience brought her parents closer together. She also got much closer to her brothers, who "helped her through everything". Her brothers checked up on her more often, calling frequently. She lived in a two family house, with her aunt and uncle next door, so someone was always around.

Costs and Other Losses

Mrs. Green's health care expenses were covered 100 percent by private insurance through her husband's employer. She was unaware of any out-of-pocket expenses incurred. Renter's insurance covered damages, but not the full value. She estimated compensation at about one-third. She also received her husband's life insurance.

Mrs. Green was a homemaker at the time of the fire. Her whole life changed after the incident. She lost her husband, three dogs and one cat (one cat survived), and all her possessions. Her mother took a great deal of personal leave, vacation time, and finally a leave of absence from her job to be with her daughter. She had accumulated much leave time over the years.

Functional Capacity Limitations

While she currently has no physical disabilities, Mrs. Green has extensive scarring and nerve damage. This is not painful now, but is uncomfortable. She suffers from itching, tingling, and gets welts/hives. She is in good health currently.

It hurts Mrs. Green to lean on her elbows. If she squats, she has trouble getting back up, and is uncomfortable. Also, her skin is thin, and is easily damaged. She must be very careful, use high sunscreens, and cannot sit in the sun. She currently has more discomfort than pain at this time.

Litigation

An attorney settled the estate of her husband, but there was no involvement in litigation related to the fire.

Quality of Life

Mrs. Green described herself and her family as "survivors". She currently is very happy with her life. She remarked, "there must be a reason why I'm still here." Mrs. Green indicated that her quality of life before the injury was "mixed," six months after the injury, it was "mixed," and today her quality of life is "terrific."

Mrs. Hall (9 years post-injury)

Overview

Mrs. Hall is a 48 year-old white woman. She suffered third degree burns over 86 percent of her body nine years ago, in 1984. Several years later, Mrs. Hall returned to school for a college degree, and has been employed for about one year as a social worker in a midwestern city. She is divorced, and has nine children and six grandchildren.

Injuries and Circumstances Surrounding the Injury

Mrs. Hall was alone in the basement of her mother's house, and was using flammable cleaning liquids. She lit a cigarette, and the fumes ignited. While she has no memory of what happened next, people have told her that she ran up the steps, and neighbors broke in a door to help her. An ambulance took her to a local hospital; then a helicopter took her 20 miles to the nearest burn center. About two months later, she was transferred to another hospital that had a burn center, as it was affiliated with her insurance coverage. She has little memory of the first two months following the incident. She later was transferred to a hospital rehabilitation center.

Several months before her injury, Mrs. Hall suffered a nervous breakdown and was hospitalized for 30 days. She received shock therapy prior to her discharge. Once home, she took anti- depressant medication and began seeing a psychiatrist. She was discharged about two months before the fire.

Mrs. Hall's face was severely burned. She lost the end of her nose and the outer ear lobes. Her eyes, however, were not burned. She had no breast tissue left. She also has adhesions under her chin, and permanent hair loss. Due to these bald spots, she always wears a wig. She has many scars all over her body.

She also suffered from calcium buildup in her elbows, which virtually locked in place. She was unable to bend her arms, and used a special utensil with a long extension to feed herself. As her skin is so thin, it is easily damaged, and she still gets skin infections easily, such as "cellulitis."

Mrs. Hall has had many surgeries, including breast and nose reconstruction. Yet, her nostrils are not even, and she has trouble breathing. She could have more surgery, but, in her words, "you reach a time when you say that enough's enough."

While she had very little memory of the earliest events, she gradually became aware of dressing changes, surgeries, and "indescribable pain". She remembers that doctors took tissue for skin grafts from her lower legs, which were not burned. She indicated that this process was extremely painful, and "gruesome" to look at. As she started to heal, her nerve endings got "reconnected", and for about two years, she suffered intense pain. Even today, she has some residual pain, although she describes her health as good.

Treatment and Services Received

While she believes her medical care was good, Mrs. Hall did not like one of the hospitals, and felt staff did not address her emotional needs.

Eventually, she started going home on weekends, but returned for skin grafts to her head. She was released from the hospital a little over eight months after the injury. She was unable to wear the typical pressure garments, due to a head infection. Instead, she wore a total body suit, for 23 hours a day. It left only her toes and hands out, and was "very uncomfortable to wear".

After Mrs. Hall was out of the hospital, she returned to the burn clinic weekly for follow-up. A visiting nurse came to do dressing changes, and she saw her doctor every week. Her follow-up medical care lasted about one and one-half years. She remarked that, at this time, she thought she would "never go out [of the house] again."

Mrs. Hall received physical therapy and occupational therapy, at the burn center, the rehabilitation hospital, and later, at home. She felt that medical and support services were all good.

Recovery and Adjustment Process

The first time she saw her reflection---an "80 pound skeleton"---she did not recognize herself. The hospital called in a psychiatrist, with whom she met weekly for about two months. She indicated that these sessions were not helpful, but admitted that "I wasn't ready (to talk about it)".

At first, the burned parts of her body were always wrapped up, and there were no mirrors in her room. "The only thing I could see myself in was the television screen." Later, another hospital had a mirror in the room. A social worker asked her if she wanted the mirror draped. Mrs. Hall told her no, but avoided looking in it. She feels strongly that she did not get the

professional help she needed to cope with facial disfigurement and self-image. Disfigurement was "only dealt with in a support group."

One day, a burn survivor visited her in the hospital. He was burned facially "as bad or worse than I was". Mrs. Hall recalled that meeting this person was an important step in realizing that "it could get better." A plastic surgeon also talked with her around this time about reconstruction. While he did give her some hope, he "didn't let me think he would perform miracles."

The burn survivor/visitor got her involved in a support group that met monthly. At first, all her family attended. Her family's attendance tapered off, and she started going to the group by herself. She found the group's support very helpful. By the third or fourth year after her injury, Mrs. Hall started visiting other persons with burn injuries in the hospital.

She did see a social worker three to four years after the incident, and received counseling for about two and one-half to three years. She found these sessions helpful.

At first, Mrs. Hall isolated herself, doing only "what was necessary." Her life started turning around about three to four years after her injury. She improved with each surgery, and made some "wonderful friends" when she started attending college. She described her return to school as a turning point.

She now "feels normal" and forgets about her burns. Her family and friends are accepting of her. However, sometimes strangers stare at her, which reminds her of her injuries. She mostly wears long sleeves, but said "you can't cover up your face." She does use special cosmetics, but scars are still apparent.

Impact on Family

Mrs. Hall felt that her family could have used more help in coping with the injury and its effects on their lives. She felt that their need for emotional support was not met. It was very difficult for them to deal with her changed physical appearance. She didn't look like she did before, and the younger children were "scared to death" of her--"they didn't know who I was". It took about a year for them to accept her. Her children are very protective of her, and get upset even now if someone stares at her.

Mrs. Hall's mother devoted herself to caring for her daughter, and was very supportive--"like a rock". For one and one-half years, she took over the family and household. Mrs. Hall felt extremely dependent on her mother for virtually everything. Previously very self-reliant, she

became angry and frustrated at being so dependent on someone. Mrs. Hall remembered "a blow-up --a big argument" that she had with her mother. "I told her it was my house, my kids, etc." After this argument, her mother stayed away for three days.

Mrs. Hall and her husband had marital problems prior to the fire. Her injuries "added additional problems" to their relationship. Moreover, her husband was resistant to getting counseling. The Halls divorced three years ago, in 1990, following an eighteen-month separation. Their four oldest children are married. The five younger ones, four girls and one boy, live with their father. At the time of the divorce, Mrs. Hall could not afford to care for the children. However, she has joint custody of them, and sees all her children often. She also has six grandchildren.

Costs and Lost Productivity

Mrs. Hall's expenses, both inpatient and outpatient, were covered by a Health Maintenance Organization (HMO), through her husband's employment. All costs were included until her divorce. She had minimal out-of-pocket expenses, such as for a wig and cosmetics. Her counseling sessions required a co-pay, but this was reduced. She received SSDI for herself and the children, and also Medicare. After the divorce, she had only Medicare. She is currently covered through an HMO at her job. Also, the state Vocational Rehabilitation agency paid for part of her college education.

At the time of the injury, Mrs. Hall was working part time in a restaurant. She was physically unable to return to work. Mrs. Hall's mother quit her job and "practically moved in" to care for her. Her former husband and her children also provided care, especially at night and on weekends. Mrs. Hall remarked that she "lost three to four years of her life" due to her burn injuries, and that she has "begun to reclaim them in the last five years."

Functional Capacity Limitations

Mrs. Hall's injuries have slightly reduced her ability to walk or run. She also has problems lifting her arms over her head. She has some trouble bending over. She can dress herself, but has trouble with zippers and buttons. As a result of her injuries, Mrs. Hall currently experiences mild pain.

Litigation

No litigation was involved.

Quality of life

Though she went through several years of physical and emotional suffering, Mrs. Hall stated that currently, "I have never been better." She has a job, a supportive relationship with a man, caring friends, and enjoys life--"I even go dancing!" She is "physically and emotionally healthier than ever before." She credits her support systems and caring people. She "drew strength out of a bad situation", and turned it into something positive. She commented, "I had a second chance--I am happy to be here."

Mrs. Hall did not resume smoking after the fire. Mrs. Hall rated her quality of life as "mixed before the fire, as "terrible" six months afterward, and as "terrific" today.

DATA COLLECTION PACKET:
IN-DEPTH INVESTIGATIONS/CASE STUDIES OF BURN INJURIES

Contract CPSC-C-93-1118

THE URBAN INSTITUTE

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Dear :

National Public Services Research Institute and The Urban Institute are conducting a study for the U.S. Consumer Product Safety Commission in support of a report to Congress on the Fire Safe Cigarette. The purpose of this study is to provide information on the costs to society of burn and anoxia injuries.

Nancy M. Pindus
Senior Research Associate
Human Resources Policy Center
202-857-8523 Telephone
202-223-3043 Fax

One important part of this study is to report on the personal impacts of burn injuries. Through interviews with individuals and families, we hope to gain an understanding of the recovery and adjustment process, help provided by family members and others, and the effects of the injury on the individual's and on the family's outlook on life. We are interested in both the short-term and long-term impacts of the injury.

With your permission, we will be contacting you to arrange a convenient time for a telephone interview. We can schedule the interview for after work hours, if necessary. The interview will take about two hours of your time. In addition to talking with the interviewer, you will be asked to complete some brief questionnaires. A postage-paid envelope will be provided to return the questionnaires. Respondents will be paid $25.00 per family for participating in this study. The identity of respondents will be kept confidential. The interviews will be written up as "case studies" with no individual identifying information.

Reports on injury costs and medical data do not fully describe the impacts of injuries. You will be providing important new information by participating in this study. We hope you can assist us.

I have enclosed some additional information about the study. Please feel free to contact me at (202) 857-8523 if you have any questions about the interviews. Thank you.

Sincerely,

Nancy M. Pindus

2100 M Street, N.W.
Washington, D.C. 20037

Project: ESTIMATING THE COSTS TO SOCIETY OF SMOKING FIRE INJURIES
Sponsor: U.S. Consumer Product Safety Commission
Contract No.: CPSC-C-93-1118

Purpose and Approach

In support of a Consumer Product Safety Commission Report to Congress on the Fire Safe Cigarette, this study examines the costs of fire-related burn and anoxia injuries. The research focus is on costs per incident. Study tasks include:

- Estimation of Medical Costs
- Literature Review, Data Analysis, and Conference on Trends
- Case Studies of Burn Victims
- Estimation of Quality of Life Losses
- Analysis of Jury Verdicts on Pain and Suffering
- Analysis of Litigation Costs
- Estimation of Emergency Transportation Probabilities and Costs

Case studies will provide qualitative information on the psychosocial impacts and functional capacity loss associated with burn injuries. Data collection for the case studies will include individual interviews with victims and their families, administration of selected instruments which measure impacts, review of individual patient records, and focus group discussions with patients and their families.

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CPSC Cigarette Fire Injuries: Case Studies

COVER SHEET

Age:____ Sex:____ Race/Ethnicity:____

Date of Injury:_____ Occupation:_____

Nature of Injury

Narrative description of injury:

Part(s) of body injured:

Degree of burn:

% of body burned:

Treatment

Initial treatment:

Hospital length of stay:
Discharged to:
Disabilities at discharge:

Subsequent hospitalizations:

Payment source:
Charges:

CPSC CASE STUDY DISCUSSION GUIDE

I. Introduce Study to Injured Person/Family Member

* Introduce self to individual/family member and let them know that we will be asking about their experiences with the burn injury; explain we are doing this for CPSC.

* Assure them there is no "right" or "wrong" answer. Let them know we will not be sharing the information with the burn center, etc., and that no names will be used with the information.

* Tell them we hope to gain understanding about the effects of burn injuries on injured persons and their families.

* We are primarily interested in long-term effects; interested in short description of incident and current situation.

II. Discussion Topics and Probes

1. Initial "get acquainted, get comfortable" discussion (tell me about yourself, your family, who lives with you, etc.)

2. The Incident: How, when, where it happened (probe substance abuse)
   (Probe) Pre-incident conditions: e.g., unusually tired, upset, awareness of danger, safety precautions taken, etc.

   Who was involved; who was injured;
   Type of injury
   Body part(s) burned, degree, % body burned
   Residual impairments; prognosis
   Perceived health status; pain
   Losses due to fire: house? belongings?

3. Medical care received--acute; long-term
   Frequency of visits to health care facilities
   Any access problems?
   Understood medical terms, procedures, treatments?

4. Support services received--therapies (p.t., o.t. etc.), special clothing, equipment, mental health services/counseling, social services, vocational rehabilitation, housing, transportation, etc.

   Was an individual care/service plan developed with you?
   Any difficulty obtaining services? Quality of services?

5. Unmet needs--physical, emotional, social/recreational; educational/vocational, community; barriers

6. Recovery/Adjustment process:

a. Timing and level of reactions to initial trauma, coping, stages, daily activities, stress; What has been the hardest part of the recovery process for you/for your family?

b. Psychosocial status: Self-esteem; loneliness; isolation

c. Thoughts about injury (blame, regret, life unfair, guilt feelings [re: the fire; burden on family; survivor's guilt])

d. Effect on family/caregivers: Loss of former roles; renewed dependence on spouse/parents/children; role strains; marital/sibling relationships; family cohesiveness/breakups; tensions, communication; positive changes in health habits

e. Support: What has helped you/your family the most through the recovery process? How could services be improved for other injured individuals/families?

7. Disfigurement (If applicable): Dealing with changed physical appearance (especially facial); self-image; reactions of others; community re-entry; acceptance vs. discrimination; emotional problems; any professional help dealing with this? where/when?

8. Support systems: Relationships with family, friends, neighbors, professionals, community; self-help support groups

9. Activities: school; work; housework

--Time lost by the injured
--Time lost/spent by other family members

10. Cost information:

--Payment source for initial stay; for follow-on care
--Care costs to the family (out of pocket); support services --Other care/services (received/needed) not covered by insurance (probe: respite care; special educational services; supplies; special equipment; etc.)

11. Quality of Life Status--injured and caregivers: instrument

What is your life like these days--the good things, the bad things?

12. Litigation/Compensation

Did you or anyone in your household hire a lawyer to help you get compensation for your injury?

Did you file a lawsuit because of your injury?

Who did you sue (multiple defendents are important)?
(post-code)

Own insurance company
Someone else's insurance company
Person who caused fire
Building owner
Supplier of defective product

Is the lawsuit still pending?

Yes
No

If no, did you settle the lawsuit?

If no, did the lawsuit go to trial?

If Yes, did you get some compensation?

If no, so you dropped the suit?

If yes, how far did you pursue it?

Purpose of above series is to determine dispostion of the claim.

13. Any other comments?

Thank you very much for your time!

FUNCTIONAL CAPACITY SCALES

"I want to know if your injuries affected your physical abilities. In this next set of questions, just tell about things that resulted from your injuries."

EATING

Because of your burns/injury, do you have any restrictions on what you can eat, or how food has to be prepared?

No limit

Dietary Restrictions

Tube Feeding

STANDING, WALKING, RUNNING

A. Have your burns made you less able to stand, walk, or run?

Yes

No

(Probe: I'm interested in any change, even a minor one)

B. Can you walk around your home? Yes No

IF NO, SKIP To HAND/ARM

C. Can you climb a flight of stairs (12 steps)?

Yes No Needs assistance; takes long time

IF NO, SKIP To HAND/ARM

D. Can you walk one-third of a city block (150 ft.) ? Yes No

IF NO, SKIP To HAND/ARM

E. Do you need help from someone else to walk that far? Yes No (refers to C.)

IF YES, SKIP To HAND/ARM

F. Do you need a brace, cane, crutch, or walker? Yes No

IF YES, SKIP To HAND/ARM

G. Does it take you a long time to walk one third of a block?

Yes No

IF YES, SKIP To HAND/ARM

HAND AND ARM FUNCTION

A. Because of your burns, do you have trouble holding on to small objects like a penny or a pencil? No problems

Yes left hand right hand

Big objects like a basketball? No problems

Yes left hand right hand

B. Do you have trouble moving either hand to your mouth enough times to eat a meal?

Yes-Left hand Yes-Right hand No problems

C. Do you have any problems lifting either arm over your head?

Yes-left arm Yes-right arm No problems

(If Yes): Can you lift that arm over your head?

Yes-left arm Yes-right arm

BENDING AND LIFTING

A. Because of your burns, do you have any trouble bending over and touching your hand to your foot? (Demonstrate)

Yes No Some difficulty

B. Can you get dressed by yourself?

Yes No Some difficulty

C. Do you have any trouble lifting heavy objects?

Yes No

(If Yes): Can you pick up a bag of groceries? (10 lbs.)

Yes No

VISION

A. Do you have any vision loss due to your injury?

No Yes-right eye Yes-left eye

B. If you got new glasses/contact lenses because of the injury, how well can you see now?

Normal vision Visually impaired Legally blind

Profound loss (gray blind) Totally blind

HEARING

A. Do you have any hearing loss due to your injury?

No Yes-right ear Yes-left ear

B. Do you use a hearing aid?

Yes No

C. If yes, how well can you hear now?

Normal hearing Hearing impaired Profound loss

SPEECH

(Primarily through observation)

No problems

Speaks slowly, hesitates

Trouble articulating

Hard to understand

SEXUAL FUNCTION

Have your burns/injury affected your physical ability to have sexual relations?

No limitations

Some difficulty

Sex not possible

EXCRETORY FUNCTION

Due to your burns/injury, do you have any trouble going to the bathroom?

No limitations

Some problems with control

Incontinent

COGNITIVE FUNCTION

(Ask caregiver as appropriate)

-No limitations

-Can be left alone for several hours

-Needs 24 hour supervision

-Vegetative state

A. Did your burns/injury affect your memory or your ability to think clearly?

Yes No

B. If Yes, do you need others to help you manage your life (e.g., financial matters)?

Yes No

PAIN

A. How would you rate the level of pain you currently experience as a result of your injuries? (circle the number that best applies)

1. Mild distress with no disability. No or occasional use of non-narcotic drugs and/or other non-invasive therapy.

2. Moderate to severe distress with no disability--normal function may require the use of non-narcotic drugs and/or other non-invasive therapy.

3. Can function normally only with the use of narcotic drugs and/or invasive therapy.

4. Due to pain, cannot function normally even with narcotic drugs and/or invasive therapy.

EFFECT OF THE INJURY ON FAMILY AND OTHER RELATIONSHIPS

For each item on the list below, think about how it has changed since your injury. Put an "X" in the box that best describes the change. If things are the same as before the injury, mark "No Change" for that item.

		Much Worse	A little worse	No change	A little better	Much better
1.	Your place in the family.					
2.	Relationship with spouse/parent/child.					
3.	Feeling close as a family.					
4.	Family communications.					
5.	Arguments with spouse/parent/child.					
6.	Trying to improve your own health habits (e.g., diet, exercise, quitting smoking, etc.).					
7.	Trying to help other family members improve their health habits.					

		Much less	A little less	No change	A little more	Much more
8.	Doing fun things together as a family.					
9.	Family members helping each other with household chores.					
10.	Family members helping each other with personal problems.					
11.	Willingness to ask other family members for help.					
12.	Doing fun things with friends.					
13.	Willingness to ask friends and neighbors for help.					
14.	Willingness to seek help from other outside agencies or providers.					

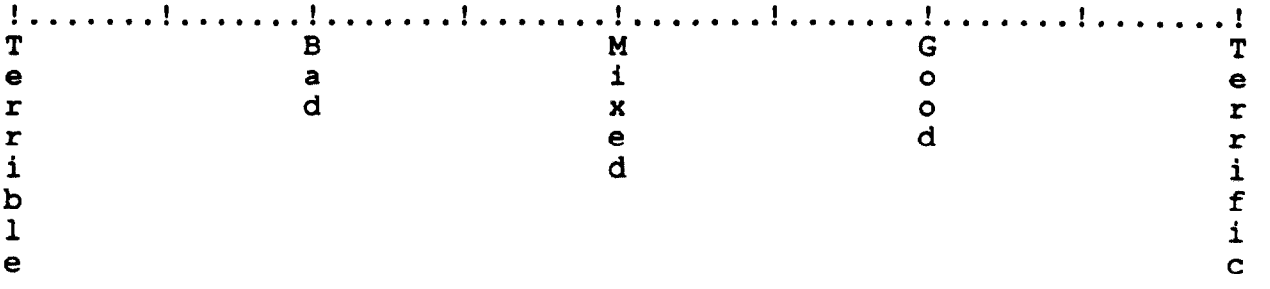
EFFECTS ON OVERALL QUALITY OF LIFE

Many things affect quality of life. These include how you feel about yourself and your family, your housing, your job, your health, and your neighborhood. They also include how much fun you are having, how fairly you get treated, and how pressed you are for money and for time.

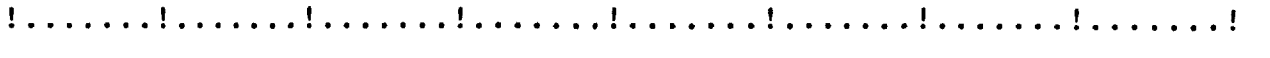
Here are three lines that run from terrible to terrific. In between are bad, mixed, and good. On the first line, make an X to rate your quality of life today. On the second line, rate your quality of life a few days before the fire. On the third line, rate your quality of life six months after the fire.

Quality of Life

TODAY



BEFORE THE FIRE



6 MONTHS AFTER THE FIRE