

Interior Product Related Burn Incidents

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Although flammability standards for upholstered products are being proposed, little reliable data exists on the extent of injuries and burns associated with interior furnishings fires. This paper draws upon both hospital records and State Fire Marshal data for Nebraska to analyze the role of interior furnishings in fire injuries and deaths. The age and sex of victims as well as the source of ignition are also analyzed.

It is estimated that 45,000 residential upholstered furniture fire incidents occur each year in the United States; 33,000 of these fires are associated with cigarettes. It is estimated that the annual rate of 3200 injuries and 800 deaths (out of a range of 544 to 1038 deaths) occur from residential upholstered furniture fires. . . These estimates are based on 1976 and 1977 data from the National Fire Prevention and Central Administration (NFPCA), 1971 through 1976 data from the National Fire Protection As-

sociation (NFPA), and the 1976 mortality data from the National Center for Health Statistics (NCHS). (Consumer Product Safety Commission, 1978)

During the last thirty years government agencies and other interested groups have become concerned with consumer protection from burning fabrics accidents. Proposed measures to reduce fabric related fires include the establishment of legal sanctions against highly flammable fabrics and education concerning fire prevention and safety measures.

The 1953 Flammable Fabrics Act addressed itself to removing "dangerously" flammable clothing textiles from the market place with the understanding that all textiles were "normally" flammable. (Flammable Fabrics Act, 1953). Even so, a large number of burn incidents continued to occur annually. Thus, in 1967, an Amendment to

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the Flammable Fabrics Act was passed which extended coverage to home furnishing textiles and established the procedure for promulgation of interior furnishing standards. To date, interior furnishings flammability standards have been established for carpets and rugs (16 CFR 1630 (FF 1-70) and 16 CFR 1631 (FF 2-70)) and for mattresses and mattress pads (16 CFR 1632 (FF 4-72)). Currently the Consumer Product Safety Commission is considering a standard for upholstered furniture.

If additional standards are promulgated under the Flammable Fabrics Act, they must be based on findings that the regulations are needed to adequately protect the public against unreasonable risk of the occurrence of fire leading to death, injury or significant property damage (Flammable Fabrics Act Amendment, 1967). Data to provide evidence of need have been gathered through three sources: the Flammable Fabrics Accident Case and Testing System (FFACTS) used by the Office of Information and Hazard Analysis Programmatic Center for Fire Research of the National Bureau of Standards; the National Electronic Injury Surveillance System (NEISS), used by the Consumer Product Safety Commission (CPSC, 1975a); and the National Household Fire Survey (NHFS), also used by the Consumer Product Safety Commission (CPSC, 1975b).

Each of these sources of information has limitations. The incidents included in FFACTS were not based on a statistically selected sample. The NEISS study underrepresented the total population by including only those victims treated in emergency rooms. NHFS excluded many occurrences, because its respondents had to recall fires which occurred over a period of time—increasing the chance of errors in recording each incident.

A general problem with projections from fire research is the fact that fire injuries are rare events, and estimates are based on relatively small samples, thus reducing precision. The NHFS reported 139 fire-related injuries among 2,463 fire incidents in 33,856 households surveyed. (CPSC, 1975b). Estimates of incidents in-

volving specific products, or injuries resulting from specific product involvement, are based on a smaller sample size and therefore are less precise than estimates of total fire occurrences.

The Nebraska Study

The objective of the Nebraska Burn Study was to determine the number and characteristics of interior furnishings, burn injuries and deaths for the state for fiscal year 1975. The study was designed to eliminate errors resulting from the sampling techniques used by other data sources.

Information was obtained from medical records of inpatients at Nebraska Hospitals and data on fire-related deaths and injuries collected by the Office of the State Fire Marshal. Hospitals were selected as a major source of data for injuries since they are a primary treatment source for severely ill or injured individuals. Since new regulations must be supported by evidence of death or injury, it was felt that these sources would disclose the majority of pertinent cases. Presumably doctor's offices, psychiatric hospitals, penitentiary infirmaries, college infirmaries, clinics and nursing homes would refer the more severely injured victims to a hospital.

Only inpatients of hospitals were considered part of the population. Outpatients were excluded because many hospitals could not retrieve the medical records of these victims. Each inpatient had a medical record. Data on that record was the only available source of information for completing the burn injury questionnaire.

Hospital Data

One hundred nineteen hospital administrators in Nebraska were mailed detailed instructions and questionnaires. The Medical Records Department at each hospital completed the questionnaires on the basis of the information in the medical records of all patients who had received burn injuries during the fiscal year 1975. Through the endorsement and cooperation of the Nebraska Hospital Association and the encouragement of

the researchers, 117 out of the 119 hospitals participated in the study. During the survey period, thirty-two hospitals reported no burn victims, thus the data is based upon the records of the 85 hospitals reporting burn victims.

Records of State Fire Marshal

A second source of recorded data were the files held by the Office of the State Fire Marshal. These files, which were open to public observation, were used to obtain information for those victims who had died of burns or related injuries, since many burn victims expire before treatment at a hospital. Records held by the Office of the State Fire Marshal listed 47 fire-related deaths for fiscal year 1975.

After duplicate medical case histories were eliminated, a total of 857 hospital admitted burn injuries and fire-related deaths formed the data base for the study. Cases which did not include involvement of bedding, mattresses, carpeting, draperies, upholstered furniture and other interior products were not included in the present analysis. Thus, the number of interior furnishings burn victims for the state of Nebraska for fiscal year 1975 that were either treated as inpatients in hospitals or died totalled 77 (Table 1). Of these, 19 died as a result of their injuries.

Findings

Victims of interior furnishings burns are more likely to die as a result of their burns, or from asphyxiation than burn victims in general. Close to twenty-five percent of the interior furnishings victims died, whereas six percent of all Nebraska burn victims died that year. The interior furnishings victims accounted for only nine percent of the entire burn population, yet accounted for over one-third of the total burn related deaths in Nebraska.

Males represented over 59 percent of Nebraska's interior furnishing burn victims, while the population of Nebraska is only 48.8 percent male. (Table 2). Although there is no significant differ-

Table 1. Distribution of Heat Sources for all Nebraska Burn Injuries and Interior Product Related Injuries.

Heat Source	All Burn Victims	Interior Product Victims
	percent distribution	
Flame	29.1	81.8
Explosion	14.5	5.2
Hot Solid	5.3	6.5
Hot Liquid	22.1	0.0
Hot Gas	2.9	0.0
Electricity	3.9	1.3
Chemical	6.4	0.0
Radiation	.9	0.0
Welding	7.2	0.0
Other	6.0	2.6
Unknown	1.9	2.6
Total	100.0 (N=857)	100.0 (N=77)

ence in the actual number of male and female victims, chi-square analysis controlling for the number of males and females in the population indicates males were involved more frequently than would be expected.

The Nebraska finding of more male victims is similar to the FFACTS data pool, but differs from NEISS. The difference could be attributable to the fact that the Nebraska data represented inpatients while the NEISS data represented outpatients. Industrial accidents may be underrepresented in NEISS data since these victims may have been treated by the plant clinic/physician and then directly admitted to the hospital. Less severely injured workers would be treated in the plant clinic and not in hospital emergency rooms.

The distribution of interior furnishing incidences among the age categories was similar to the population distribution of the state. (Table 3). Previous studies have indicated that children and those individuals 65 or older are more likely to suffer more severe burn injuries and be involved in more burn accidents than those other age

Table 2. Sex Distribution of Interior Furnishings Burn Incident Victims

Sex	Nebraska ¹	Nebraska Population	FFACTS ³	NEISS ⁴ Victims ⁴
			<i>percent</i>	
Male	59.2	48.23 ²	49.69	39.36
Female	40.8	51.17	50.31	60.64
Total	100.0 (N=76)	100.0	100.0 (N=322)	100.0 (N=2007)

¹ $\chi^2=2.22368$, $P=.13$, 1df.

² $\chi^2=752.024$, $P=.0001$, 1df. (1970 Census).

³ $\chi^2=85.9932$, $P=.01$, 1 df.

⁴ Calendar Year 1976, projection from sample of 122.

groups. In the Nebraska study, more accidents involved individuals 0 to 9 years of age than would be expected based upon the population distribution among the age groups. Although persons aged 0-9 comprise 15.5 percent of the Nebraska population, 27.7 percent of the interior burn victims were in this age group. (Table 3). Similarly, persons over 65 were involved in more incidents than would be expected, considering their relative proportion of the Nebraska population. Accidents among the very young or the older individuals may be compounded by limitations in cognitive-discriminative or psycho-motor skills. High incidents in the 65 and over group might be attributable to diminishment of manual dexterity. No longer were these people able to fully use reaction time and comprehension in preventing accidents or removing themselves from situations of serious injury when accidents occurred.

NEISS has shown that 0 to 4 years was the age group least frequently involved in interior product incidents. FFACTS reported the 20 to 44 year olds involved in the largest number of incidents, while 10 to 19 year olds were involved in fewest number of incidents (as was true for Nebraska's 10 to 19 year olds). NHFS data indicated that the majority of persons involved were in the 21 through 45 age group.

Table 3A. Age Distribution for Interior Furnishings Burn Victims and Nebraska Population.

Age	Burn Victims ¹	Nebraska Population ²
		<i>percent</i>
0-9	27.69	15.54
10-19	10.77	19.48
20-44	26.15	32.90
45-64	20.00	19.46
65+	15.39	12.62
Total	100.00 (N=65)	100.00 (N=1,540,260)

¹ $\chi^2=5.32692$, $P=.255367$, 4df.

² $\chi^2=18955.00$, dom, $P=.0001$, 4df.

B. Age and Sex Distribution for Expected Number of Interior-Related Product Thermal Burn Victims Based on Nebraska Population Percentage

Age	Expected Victims	Actual Victims
0-9	10	18
10-19	12	7
20-44	22	17
45-64	13	13
65+	8	10
Total	65	65

$\chi^2=5.23$, $p^1=.01$

Products Involved

Ninety-one interior-related products were involved in the 77 incidents studied. More products were involved than individuals because in some incidents when the first product to ignite was not known, all products known to be involved were recorded.

Upholstered furniture items were the most prevalent products. There were 20 such incidents, dispersed fairly evenly over all age groups. (Table 4). These were followed by mattresses, with 19 incidents and carpets and rugs, with 13 incidents. (These two items were covered by flammability standards at the time of the study.) NEISS reported draperies as the products involved in the fewest number of incidents, while in the Nebraska study, draperies were involved in the fewest number of incidents. Nebraska product involvement was similar to that reported by FFACTS. These differences and similarities are important when one considers that data are currently accumulated through the NEISS system.

Ignition Sources

Matches and lighters were the most frequent ignition sources. (Table 5). Males 0 to 9 years, were the most frequent victims of incidents involving matches and lighters as sources of igni-

tion. The second most numerous ignition source was smoking materials. Males were injured more often than females when the ignition source was the kitchen range.

FFACTS reported matches and lighters as the most frequent ignition source, a fact that has given impetus to the development of child proof book matches and self-extinguishing safety lighters. Smoking materials, such as cigarettes, cigars and pipes were the most common igniters of upholstered furniture; but when mattresses were involved, these were most frequently ignited by matches and lighters. Seventy-five percent of the ignition of upholstered furniture was caused by smoking or falling asleep while smoking, yet the mattress flammability standard is based on the cigarette ignition test.

Playing with matches and lighters was the most frequent activity of the injured individuals, followed by smoking. When age groups were cross-tabulated by ignition source, item to ignite and activity; one composite description picture emerged. Children 0 to 9 years of age were injured through ignition of mattresses from matches or lighters while playing. This description covered 10 percent of the Nebraska home furnishings burn incidents.

Table 4. Interior-Related Product Ignitions Distributed by Sex and Age of Victims

Interior-Related product	Age												Total			%
	0-9		10-19		20-44		45-64		65+		Unknown		M	F	All	
	M	F	M	F	M	F	M	F	M	F	M	F				
Upholstered Furniture	2	2	—	1	4	1	3	—	3	1	2	3	14	6	20	22.22
Carpets and Rugs	2	2	1	2	—	2	2	—	—	—	1	1	6	7	13	14.44
Draperies	—	—	—	1	1	—	—	—	—	—	—	—	1	1	2	2.22
Mattresses	5	5	2	—	1	2	2	—	1	—	1	—	12	7	19	21.11
Blankets	1	1	—	—	2	—	1	1	—	2	—	2	4	6	10	11.11
Other Bedding	1	1	—	—	1	—	—	—	—	1	—	2	2	4	6	6.67
All Items	2	1	1	—	4	2	5	1	2	—	1	1	15	5	20	22.22
Total	13	10	4	4	13	7	13	2	6	4	5	9	54	36	90	100.0

Table 5. Ignition Sources Distributed by Sex and Age of Victims.

Ignition Source	Age												Total			%
	0-9		10-19		20-44		45-64		65+		Unknown		M	F	All	
	M	F	M	F	M	F	M	F	M	F	M	F				
Space Heater	—	1	—	—	—	—	—	—	—	—	—	—	—	1	1	2.18
Range Electric	1	—	1	1	1	—	1	—	—	—	—	—	4	1	5	10.87
Blanket	—	—	—	—	—	—	—	—	—	1	—	—	—	1	1	2.17
Television	—	—	—	1	—	—	—	—	—	—	—	—	—	1	1	2.18
Other Appliances	—	—	—	—	—	—	—	—	—	1	—	—	—	1	1	2.17
Open Fire	—	2	—	—	—	1	—	—	—	—	—	—	—	3	3	6.52
Smoking Material	1	—	—	—	1	1	3	—	2	1	1	3	8	5	13	28.26
Matches/Lighters	6	4	2	—	—	2	—	—	—	—	1	—	9	6	15	32.61
Other	—	—	—	1	—	—	1	1	—	1	—	2	1	5	6	13.04
Total	8	7	3	3	2	4	5	1	2	4	2	5	22	24	46	100.0

Conclusions

Specific conclusions from this study support the need for close supervision of young children and modification of sources of ignition such as matches and lighters to render them child proof. Children playing with matches and lighters, not adults smoking in bed, accounted for the majority of mattress incidents. This leads us to conclude that while the existing cigarette ignition test for mattresses may not be the most appropriate, if an upholstered furniture standard is needed, a cigarette ignition test may be the most appropriate.

Establishment of standards requires a comprehensive understanding of who is likely to be a burn victim, what the source of heat was, the product that was ignited, and the mobility or other limitations of the victim (e.g. sleeping, an infant in a crib, etc.) Further examination must be made of the mortalities associated with interior furnishings burn injuries. Fires often involve several products and it is difficult to attribute the spread of fire, or resulting death to any specific product

or to interior products alone even though they may be involved. One recommendation firmly illustrated by this study is the need for more accurate accounting of factors involved in burn incidents, perhaps through an existing agency such as the Office of the State Fire Marshal or by modifications in the NEISS systems.

References

1970 Census of Population Characteristics of the Population. January 1973. 1: Part 29. Nebraska: U.S. Department of Commerce Publication.

Consumer Product Safety Commission. 1978. Briefing Paper on Upholstered Furniture Flammability Standard. November 17, 1978, Background Report, p. 12.

Consumer Product Safety Commission. 1975a. *Analysis of Flammable Fabrics Data Fiscal Year 1975.*

Consumer Product Safety Commission. 1975b. *Analysis of National Household Fire Survey.* June 1975.

- Consumer Product Safety Commission. 1974, *Reports Required by the Flammable Fabrics Act*, Fiscal Year 1974. (Reprinted from Appendix B-2, U.S. Consumer Product Safety Commission Annual Report, July 1, 1973-June 30, 1974.)
- DesBordes, Lorraine G., Director. 1977 National Injury Information Clearinghouse, Bureau of Epidemiology, U.S. Consumer Product Safety Commission, Washington, D.C. 20207, Personal Communication. (July)
- Phillips, Anne Wight. 1974 "Behavioral Problems in Burn Prevention," *Proceedings of the Eighth Annual Meeting of the Information Council on Fabric Flammability*. pp. 165-172.
- U.S. Congress Senate. 1954 *Amendment to Flammable Fabrics Act Hearings before Sub Committee of the Committee on Interstate and Foreign Commerce*. S3379, 83rd Congress 2nd sess.
- U.S. Congress House and Senate. *Flammable Fabric Act*, Public Law 88-164 83rd Congress, 1953 67 Stat. 1191-1204.
- U.S. Congress House and Senate. *Flammable Fabrics Act Amendment*. Public Law 90-189, 90th Congress, 1967 81 Stat. 568-574.