

Medical Facility Fires

These short topical reports are designed to explore facets of the U.S. fire problem as depicted through data collected in USFA's National Fire Incident Reporting System (NFIRS). Each topical report briefly addresses the nature of the specific fire or fire-related topic, highlights important findings from the data, and may suggest other resources to consider for further information. Also included are recent examples of fire incidents that demonstrate some of the issues addressed in the report or that put the report topic in context.

Findings

- Between 2004 and 2006, an average of 6,400 fires occurred in medical facilities each year, resulting in over \$34 million in losses.
- Fifty-five percent of medical facility fires are small, confined cooking fires.
- Medical facilities offering 24-hour care account for 89 percent of medical facility fires. Twenty-four-hour care facilities also account for 94 percent of cooking fires in all medical facilities.
- Fire peaks coincide with meal preparation times.
- Automatic extinguishing systems are found more often in 24-hour care facilities than in clinics or medical offices.

Between 2004 and 2006, there was an average of 6,400 fires in medical facilities each year that were responsible for approximately 5 civilian fire deaths, 175 injuries, and \$34 million in property loss annually.¹ Medical facilities include hospitals, clinics, infirmaries, and other facilities that provide care to the sick and injured. Fires in these buildings² can be particularly dangerous due to the presence of oxygen and other flammable substances and the challenge of evacuating patients who may not be ambulatory.

This topical report focuses on fires in medical facilities that were reported to the National Fire Incident Reporting System (NFIRS) between 2004 and 2006 and examines the causes and basic characteristics of these fires.

Loss Measures

Table 1 compares the loss measures for fires in medical facilities, averaged over this 3-year period, to those in nonresidential buildings.³

Table 1.—Loss Measures for Medical Facility Fires (3-year average, NFIRS data 2004 to 2006)

Loss Measure	Nonresidential Building Fires	Medical Facility Fires
Fatalities/1,000 fires	0.8	1.2
Injuries/1,000 fires	12.3	25.6
Dollar loss/fire	\$21,898	\$5,312

Source: NFIRS 5.0

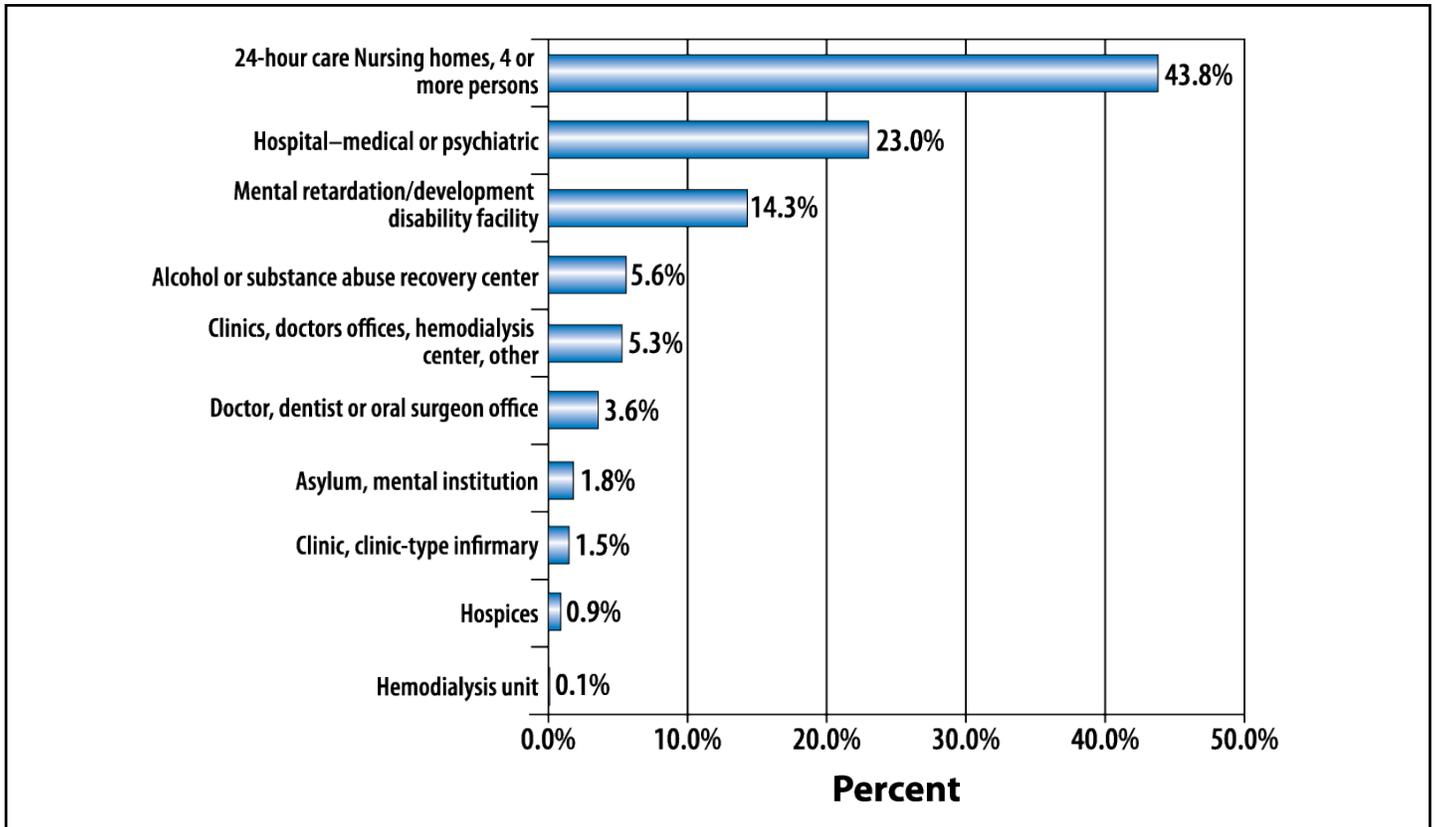
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Type of Medical Facility

State-licensed nursing homes providing 24-hour nursing care for more than 4 persons account for 44 percent of all medical facility fires (Figure 1). Hospital fires are the second most common type of medical facility fires (23 percent), followed by developmental disability facilities caring for 4 or

more people on a 24-hour basis (14 percent). Facilities that provide 24-hour care—nursing homes, hospitals, developmental facilities, abuse recovery centers, mental institutions, and hospices—represent 89 percent of fires in medical facilities. Fires in doctors’ offices and clinics account for the remaining 11 percent.

Figure 1.—Medical Facility Fires by Property Use.



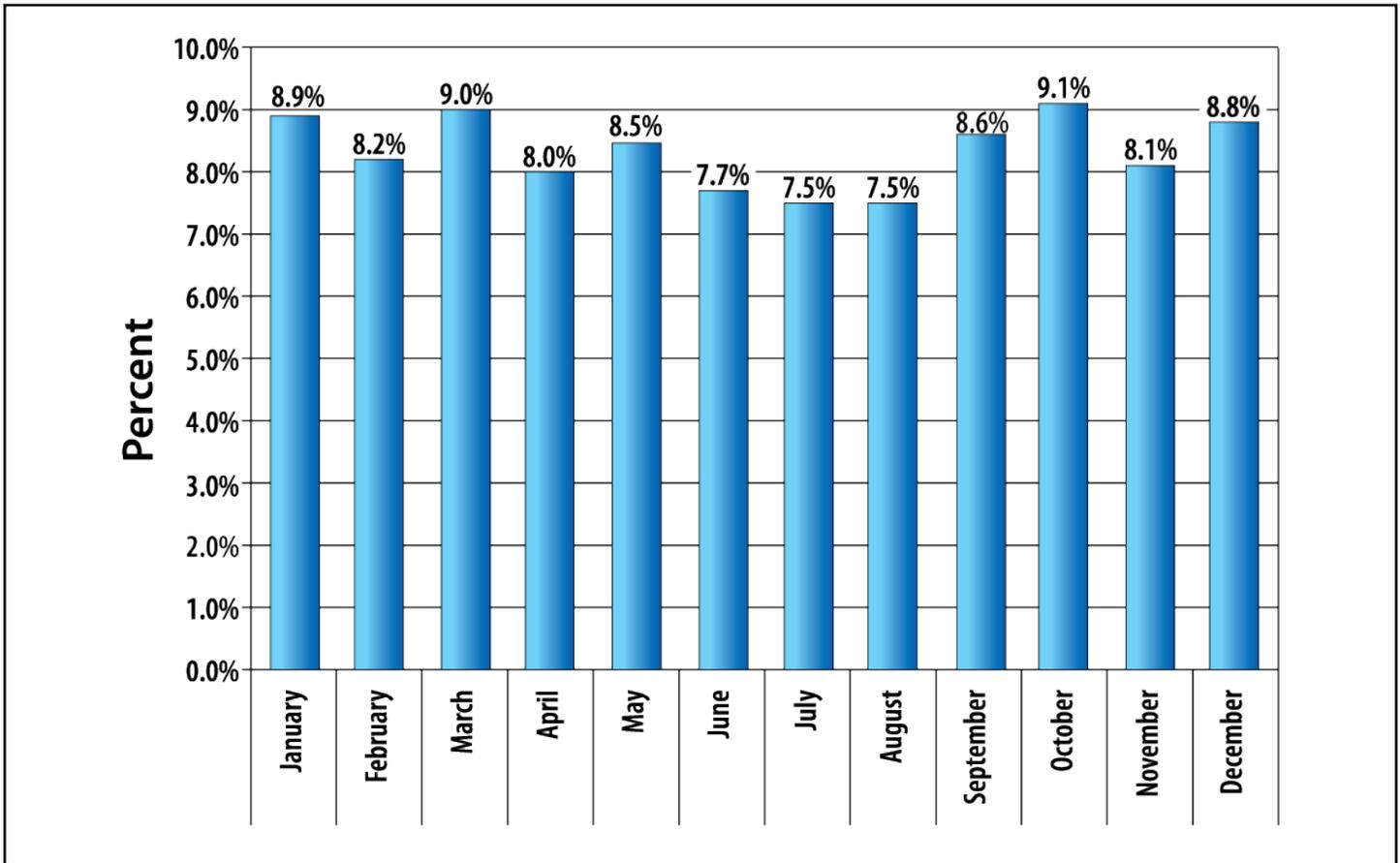
Source: NFIRS 5.0
11,737 incidents

When Fires Start

Between 2004 and 2006, medical facility fires occurred somewhat uniformly throughout the year, with a slight

decrease during the summer months of June through August. January, March, October, and December had the highest percentages of fire with approximately 9 percent each. (Figure 2).

Figure 2.—Medical Facility Fires by Month (2004 to 2006).

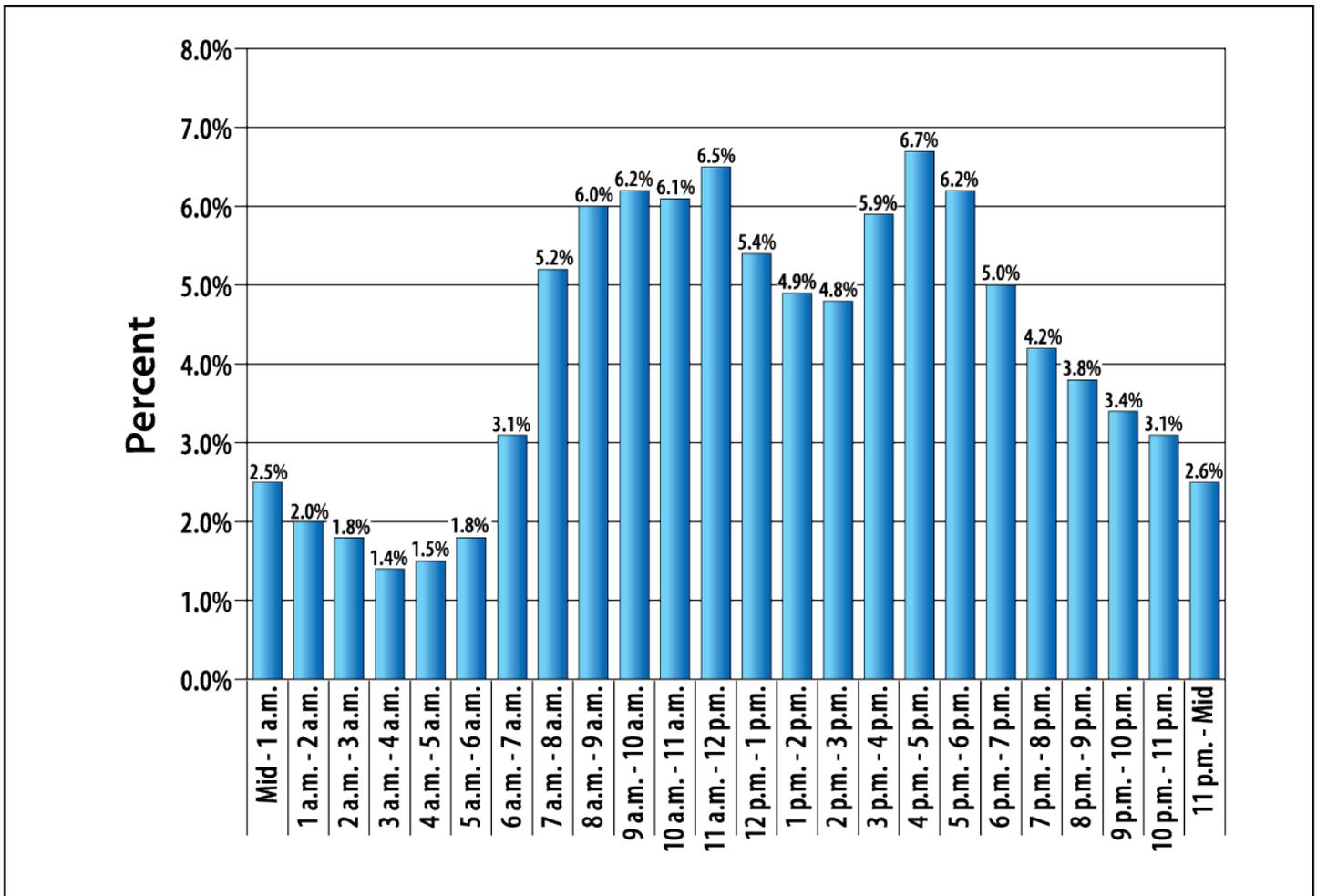


Source: NFIRS 5.0
11,737 incidents

Very few medical facility fires occur late at night and early in the morning. As noted in Figure 3, medical facility fires were lowest in the very early morning between 3 a.m. and 4 a.m. Fires increased sharply between 6 a.m. and 8 a.m., and continued to increase slightly until a peak of approximately 7

percent from 11 a.m. to noon. The number of fires decreased in the early afternoon and peaked a second time in the late afternoon between 4 p.m. and 5 p.m. These periods of fire incidence coincide with the morning and evening cooking periods.

Figure 3.—Medical Facility Fires by Time of Day (2004–2006).



Source: NFIRS 5.0
11,737 incidents

Type of Fire

Building fires consist of two major categories of incidents: fires that are confined to specific types of equipment or objects (confined fires) and those that are not (nonconfined fires). Confined building fires are small fire incidents that are limited in scope, confined to noncombustible containers, rarely result in serious injury or large content losses, and

are expected to have no significant accompanying property losses due to flame damage.⁴ Sixty-five percent of medical facility building fires are these small fires as shown in Table 2. Confined cooking fires alone account for 55 percent of medical facility fires. Twenty-four-hour care facilities account for 94 percent of confined cooking fires in medical facilities (as well as 94 percent of all cooking fires, both confined and nonconfined fires, in medical facilities.)

Table 2.—Medical Facility Fires by Type of Incident (2004 to 2006)

Incident Type	Percent
Nonconfined fires	34.6
Confined fires	65.4
Cooking fire, confined to container	55.0
Chimney or flue fire, confined to chimney or flue	0.5
Incinerator overload or malfunction, fire confined	0.3
Fuel burner/boiler malfunction, fire confined	2.9
Commercial compactor fire, confined to rubbish	0.3
Trash or rubbish fire, contained	6.3
Total	100.0

Source: NFIRS 5.0
11,737 incidents

Note: Total may not add to 100 percent due to rounding

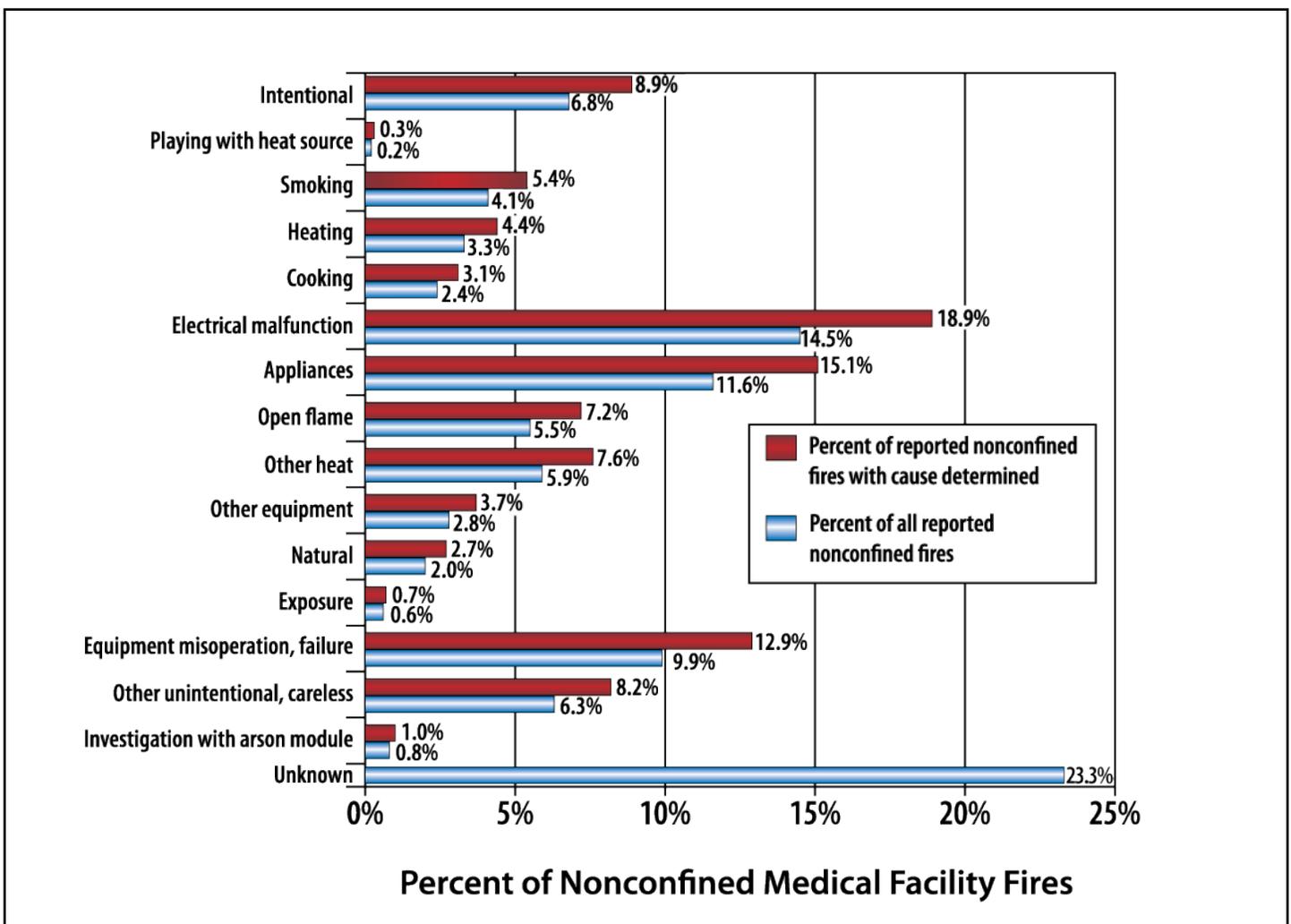
Confined fires are allowed abbreviated NFIRS reporting and many reporting details of the fire are not required. The remainder of this topical report will address nonconfined medical facility fires, except for the smoke alarm data

analyses where confined fires are examined also.

Causes of Nonconfined Medical Facility Fires

While cooking is undoubtedly the leading cause of fires in medical facilities overall (64 percent), it plays a very small role in medical facility nonconfined fires. As shown in Figure 4, electrical malfunction (19 percent), appliances (15 percent), and equipment misoperation (13 percent) are the leading causes of nonconfined fires in medical facilities. These three causes account for 47 percent of the nonconfined fires in medical facilities when the cause is known. In 23 percent of medical facility fires, the cause is unknown. In the 26 percent of fires where the equipment involved in the fire ignition is specified, clothes dryers were reported as the leading equipment involved (26 Percent).

Figure 4.—Cause of Nonconfined Medical Facility Fires (2004 to 2006).



Source: NFIRS 5.0
4,065 incidents
950 incidents with unknown cause of fire

Where Fires Start—Area of Fire Origin in Nonconfined Medical Facility Fires

As shown in Table 3, the three leading areas of fire origin—laundry area, bedrooms, and kitchens—reflect the predominance of 24-hour care facilities in medical facility fires. The laundry area is the leading area of origin of nonconfined medical facility fires (15 percent), followed closely by bedrooms (14 percent). Kitchens and other cooking areas are the third leading area of fire origin, accounting for 10 percent of medical facility fires.

Table 3.—Leading Areas of Fire Origin in Nonconfined Medical Facility Fires (2004 to 2006)

Area of Fire Origin	Percent of Nonconfined Medical Facility Fires
Laundry area, wash house (laundry)	15%
Bedrooms	14%
Cooking area, kitchen	10%

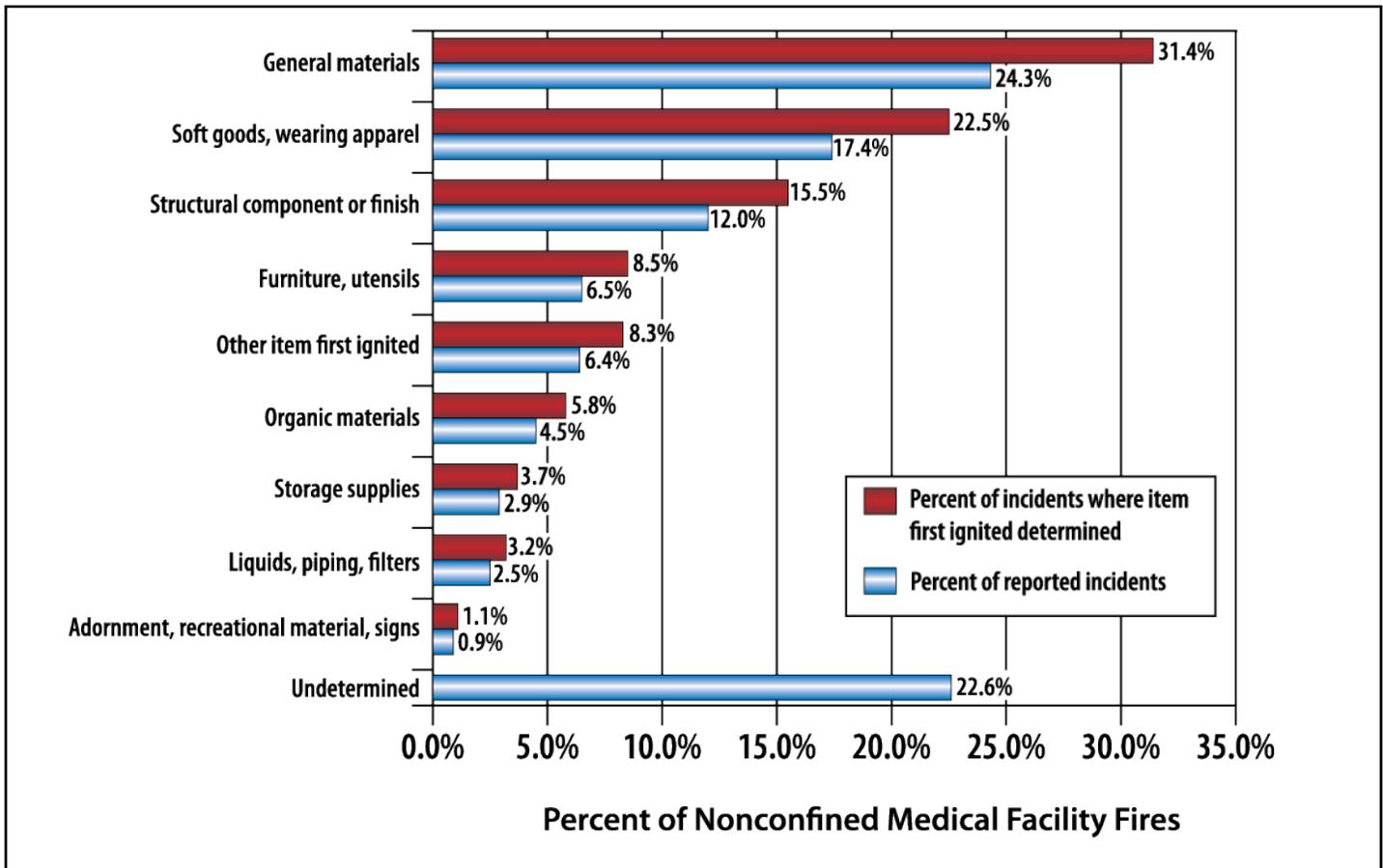
Source: NFIRS 5.0
 4,065 incidents
 185 incidents with area of origin undetermined
 Note: Percentages reflect those incidents where area of fire origin was determined.

What Ignites Nonconfined Medical Facility Fires

The category “general materials” is the leading category of items first ignited and accounts for 31 percent of nonconfined medical facility fires. Within this category, the insulation around electrical wiring is the leading type of item first ignited overall, accounting for 18 percent of all medical facility fires. This finding is consistent with electrical malfunction as the leading cause of nonconfined medical facility fires. Soft goods (such as linens) and wearing apparel are the items first ignited in 23 percent of medical facility fires.

Another leading category of items first ignited, as seen in Figure 5, is “structural components or finishes” (16 percent). This includes insulation, roofing, doors, carpets, and the like, though none of these subcomponents alone account for a large portion of nonconfined medical facility fires.

Figure 5.—Item First Ignited in Nonconfined Medical Facility Fires (2004 to 2006).



Source: NFIRS 5.0
 4,065 incidents
 919 incidents with item first ignited undetermined

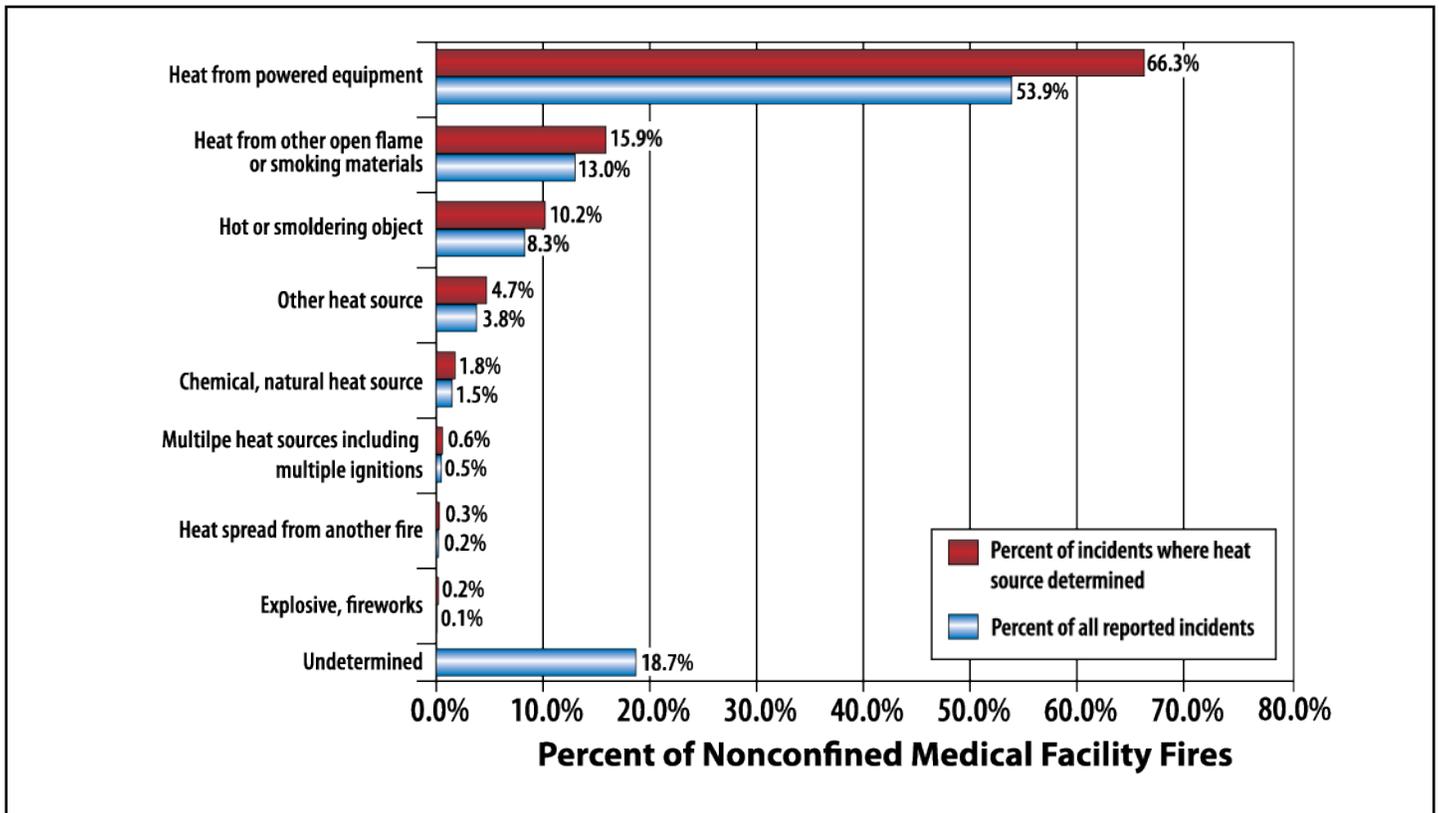
Heat Source for Nonconfined Medical Facility Fires

A clear majority of nonconfined medical facility fires derive their heat source from powered equipment (66 percent). The subcomponents of this category are the leading sources of heat, not only within this category, but also in all nonconfined medical facility fires: unspecified types of powered equipment are responsible for 24 percent of all fires; electrical arcing—18 percent; radiated or conducted heat from

powered equipment—17 percent; and sparks from operating equipment—7 percent. (Figure 6.)

The next leading category of heat sources in nonconfined medical facility fires is heat from other open flames or smoking materials (16 percent). Within this category, the most prevalent source of heat is from cigarettes, accounting for approximately 5 percent of all nonconfined medical facility fires.

Figure 6.—Sources of Heat in Nonconfined Medical Facility Fires (2004 to 2006).



Source: NFIRS 5.0
 4,065 incidents
 759 incidents with heat source undetermined

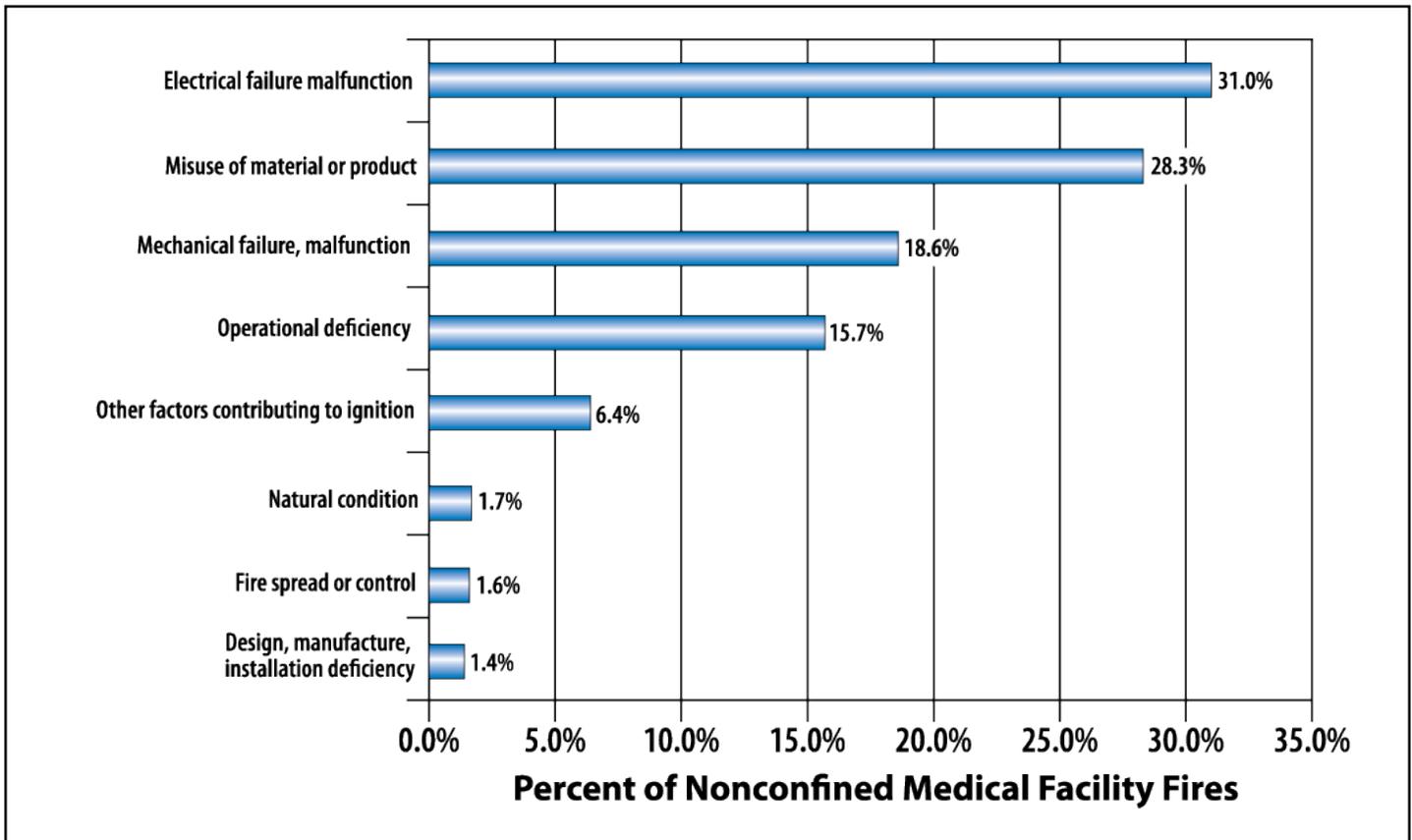
Factors Contributing to Ignition in Nonconfined Medical Facility Fires

Thirty-one percent of nonconfined medical facility fires are the result of an electrical failure or malfunction as shown in Figure 7. The most common form of electrical failure in this category is other, unspecified electrical failures or malfunctions, which

are responsible for 12 percent of all medical facility fires.

The next leading category is the misuse of materials at 28 percent. Within this category, heat sources that are left too close to combustibles account for 9 percent of all medical facility fires, and abandoned or discarded materials account for 7 percent.

Figure 7.—Factors Contributing to the Ignition of Nonconfined Medical Facility Fires (2004 to 2006).



Source: NFIRS 5.0

2,312 incidents where factors contributing to ignition were specified

Note: Includes only incidents where factors that contributed to the ignition of the fire were specified. Multiple factors contributing to fire ignition may be noted for each incident. Total may sum to more than 100 percent.

Suppression/Alerting Systems in Medical Facility Fires

Smoke alarms were present in 80 percent of nonconfined medical facility fires and are known to have operated in 55 percent of the nonconfined medical facility fires. Only 11 percent of nonconfined fires in medical facilities had no

smoke alarms present in the building at the time of the fire (Table 4). In another 9 percent of these fires, firefighters were unable to determine if a smoke alarm was present.

In 22 percent of fires where smoke alarms were present, the alarms failed to operate because either the fire was too small to activate the alarm or the alarm did not operate properly.

Table 4.—NFIRS Smoke Alarm Data for Nonconfined Medical Facility Fires (2004 to 2006)

Presence of Smoke Alarms	Smoke Alarm Operational Status	Smoke Alarm Effectiveness	NFIRS Incident Count	Percent
Present	Fire too small to activate smoke alarm		572	14.1
	Smoke alarm operated	Smoke alarm alerted occupants, occupants responded	2,027	49.9
		Smoke alarm alerted occupants, occupants failed to respond	66	1.6
		No occupants	97	2.4
		Smoke alarm failed to alert occupants	8	0.2
		Undetermined	45	1.1
	Smoke alarm failed to operate		141	3.5
Undetermined		281	6.9	
None present			463	11.4
Undetermined			365	9.0
Total fires			4,065	100.0

Source: NFIRS 5.0
4,065 incidents

Note: The data presented in Table 4 are raw data counts from the NFIRS data set. They do not represent national estimates of smoke alarms in nonconfined medical facility fires. They are presented for informational purposes. Total may not add to 100 percent due to rounding.

Overall, automatic extinguishing systems (AESs) were present in over half—56 percent—of nonconfined medical facility fires. The presence of these systems was substantially higher for 24-hour care facilities (63 percent) than for offices and clinics (20 percent).

Table 5.—NFIRS Automatic Extinguishing System Data for Nonconfined Medical Facility Fires by Facility Type (2004 to 2006)

AES Presence	24-Hour Care Facilities		Offices/ Day Clinics		Overall	
	Count	Percent	Count	Percent	Count	Percent
AES present	2,132	63.3	140	20.1	2,272	55.9
AES not present	1,087	32.3	505	72.6	1,592	39.2
Unknown	150	4.5	51	7.3	201	4.9
Total incidents	3,369	100.0	696	100.0	4,065	100.0

Source: NFIRS 5.0
4,065 incidents

Note: The data presented in Table 5 are raw data counts from the NFIRS data set. They do not represent national estimates of AESs in nonconfined medical facility fires. They are presented for informational purposes. Totals may not add to 100 percent due to rounding.

In the majority of confined medical facility fires (75 percent), smoke alarms operated and alerted occupants (Table 6). In only 7 percent of confined medical facility fires, the occupants were not alerted by the smoke alarm.⁵ Firefighters did not determine if a smoke alarm was present in 18 percent of these confined fires.

Table 6.—NFIRS Smoke Alarm Data for Confined Medical Facility Fires (2004 to 2006)

Smoke Alarm Effectiveness	Count	Percent
Smoke alarm alerted occupants	5,753	75.0
Smoke alarm did not alert occupants	520	6.8
Unknown	1,399	18.2
Total incidents	7,672	100.0

Source: NFIRS 5.0
7,672 incidents

Note: The data presented in Table 6 are raw data counts from the NFIRS data set. They do not represent national estimates of smoke alarms in confined medical facility fires. They are presented for informational purposes. Total may not add to 100 percent due to rounding.

Note that the data presented in Tables 4, 5, and 6 are the raw counts from the NFIRS data set and are not scaled to national estimates of smoke alarms and AES in medical facility fires.

Examples

- May 2006: The Mercy Surgical and Diagnostic Center in California caught fire and had an estimated \$750,000 of damage to the building before firefighters could put out the fire. Investigators believe the fire was arson.⁶
- December 2006: A fire began in an exam room in the medical clinic of Lansing's Cristo Rey Community Center. Of the 10 rooms, 2 were completely destroyed, 3 were badly damaged, and the remaining 5 had either smoke or water damage. Investigators believe the fire was started either as a result of an electrical malfunction, or arson.⁷
- March 2009: A carelessly discarded cigarette is suspected to have started a mid-afternoon fire, heavily damaging a professional building that housed medical offices. The flames began outside the one-story brick building and entered through the eaves. The structure appeared to be a total loss, although medical records inside were thought to be salvageable. Thirteen employees and several patients evacuated without injury as flames spread quickly.⁸

Conclusions

Medical facility fires affect a vulnerable population, as many patients in medical facilities may not have the independence to escape a fire incident. Thus, proper care must be taken to ensure that safety measures and regulations are adhered to for all medical facilities. Routine fire escape drills must be practiced and all medical staff must be trained and responsible in the event of a fire emergency. It also may be beneficial for medical facility personnel to look into nonflammable or flame-retardant materials to use in hospitals, especially in terms of bedding and gowns, since many medical facility fires start in laundry rooms and bedrooms and on items such as linens and apparel.

NFIRS Data Specifications for Medical Facility Fires

Data for this report were extracted from the NFIRS annual public data release (PDR) files for 2004, 2005, and 2006. Only version 5.0 data were extracted.

Medical facility fires were defined as:

- Incident types 111 to 123:

Incident Type	Description
111	Building fire
112	Fires in structure other than in a building
113	Cooking fire, confined to container
114	Chimney or flue fire, confined to chimney or flue
115	Incinerator overload or malfunction, fire confined
116	Fuel burner/boiler malfunction, fire confined
117	Commercial compactor fire, confined to rubbish
118	Trash or rubbish fire, contained
120	Fire in mobile property used as a fixed structure, other
121	Fire in mobile home used as fixed residence
122	Fire in motor home, camper, recreational vehicle
123	Fire in portable building, fixed location

Note: Incident types 113 to 118 do not specify if the structure is a building. Incident type 112 is included as previous analyses have showed that incident types 111 and 112 are used interchangeably.

- Aid types 3 (mutual aid given) and 4 (automatic aid given) were excluded to avoid double counting of incidents.
- Property use 311 to 343:

Property Use	Description
311	Nursing homes licensed by the State, providing 24-hour nursing care for four or more persons.
321	Mental retardation/development disability facility that houses, on a 24-hour basis, four or more persons.
322	Alcohol or substance abuse recovery center where four or more persons who are incapable of self-preservation are housed on a 24-hour basis.
323	Asylum, mental institution. Includes facilities for the criminally insane. Must include sleeping facilities.
331	Hospital: medical, pediatrics, psychiatric. Includes hospital-type infirmaries and specialty hospitals where treatment is provided on a 24-hour basis.
332	Hospices. Includes facilities where the care and treatment of the terminally ill is provided on a 24-hour basis.
340	Clinics, doctors' offices, hemodialysis centers, other.
341	Clinic, clinic-type infirmary. Includes ambulatory care facilities. Excludes facilities that provide overnight care (331).
342	Doctor, dentist, or oral surgeon office.
343	Hemodialysis unit, free standing; not a part of a hospital.

- Structure type:
 - 1--Enclosed building,
 - 2--Fixed portable or mobile structure, and
 - Structure type not specified (null entry).

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Notes:

¹ National estimates are based on data from the National Fire Incident Reporting System (NFIRS) (2004 to 2006) and non-residential structure fire loss estimates from the National Fire Protection Association's (NFPA's) annual survey, *Fire Loss in the United States*. Fires are rounded to the nearest 100, deaths to the nearest 5, injuries to the nearest 25, and loss to the nearest million dollars.

² In the NFIRS version 5.0, a structure is a constructed item of which a building is one type. To coincide with this concept, the definition of a building fire for NFIRS 5.0 has, therefore, changed to include only those fires where the NFIRS 5.0 structure type is 1 or 2 (enclosed building and fixed portable or mobile structure). Such fires are referred to as "buildings" to distinguish these buildings from other structures that may include such structures as fences, sheds, towers, and bridges in addition to many other constructed items. In addition, incidents that do not have a structure type specified are presumed to be buildings.

³ The average annual fire death and injury loss rates computed from the national estimates will not agree with average fire death and injury loss rates computed from NFIRS data alone. The average annual fire death rate computed from national estimates would be $(1000 * (5/6,400)) = .8$ deaths per 1,000 medical facility fires and the average annual fire injury rate would be $(1000 * (175/6,400)) = 27.3$ injuries per 1,000 medical facility fires.

⁴ NFIRS distinguishes between "content" and "property" loss. Content loss includes loss to the contents of a structure due to damage by fire, smoke, water, and overhaul. Property loss includes losses to the structure itself or to the property itself. Total loss is the sum of the content loss and the property loss. For confined fires, the expectation is that the fire did not spread beyond the container (or rubbish for incident type 118) and hence, there was no property damage (damage to the structure itself) from the flames. However, there could be property damage as a result of smoke, water, and overhaul.

⁵ In confined fires, the entry "smoke alarm did not alert occupants" can mean: no smoke alarm was present, the smoke alarm was present but did not operate, or the smoke alarm was present and operated but the occupant was already aware of the fire.

⁶ "Arson Suspected in Merced Clinic Fire," ABC30.com, May 29, 2006, <http://abclocal.go.com/kfsn/story?section=news/local&id=4215824> (accessed July 23, 2008).

⁷ Lori Dougovito, "Fire at Cristo Rey May be Arson, Medical Center Damaged," wilx.com, December 7, 2006, <http://www.wilx.com/news/headlines/4856851.html> (accessed July 23, 2008).

⁸ Robert Kelly, "Cigarette Is Linked to Fire in Building at Edwardsville Business Center," St. Louis Post-Dispatch, STLtoday.com, March 17, 2009, <http://www.stltoday.com/stltoday/news/stories.nsf/illinoisnews/story/A27410BE97F53FF38625757C00774B92?OpenDocument> (accessed March 17, 2009).