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**Basic Annual Report
Information from NFIRS:**

A National Perspective

December 6, 2007



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What is an Annual Report?

“A document that summarizes the results of operations and financial status of a company for the past year and outlines plans for the future.”

“A report card.”

“An annual performance review, without a raise.”



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Annual Reports in the Fire Service

- **No standard format**
- **Captures the essence of a multi-tasking, complex operation**
- **Varying Audiences**
- **Each report is unique**



- **Annual Report (*Fire in the United States*) at the National level:**
 - Presents overview of the size and scope of the U.S. fire problem and its components
 - Provides detailed information on the components
 - Seeks to mitigate the fire problem by understanding it
- **The overall USFA format may not apply, but the components of the report are useful for other Annual Reports**
- **Commonalities in analysis and presentation**



Major Analysis Areas

- **Fires**
- **Civilian and firefighter deaths**
- **Civilian and firefighter injuries**
- **Dollar loss (property loss + contents loss)**

Today's focus: Fires



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In the Beginning....

As you prepare your Annual Report:

- **Decide focus**
- **Identify audience**
- **Determine data needs**
- **Determine appropriate analysis tools**
- **Determine appropriate data presentation**



- **Non-NFIRS related data:**
 - Outreach (public education and other)
 - Data on inspections
 - Arson and arson investigations

- **NFIRS related data:**
 - Overall run distributions; fires only (which excludes mutual aid)
 - Dollar loss (missing values)
 - Multiple entry data elements (e.g., human factors contributing to ignition, etc.)
 - Complex analytic issues (e.g., combining data from multiple elements, etc.)



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Analytic Topics Not Addressed Today

continued

- **Trend analysis - comparison of percentage change indicators**
- **Statistical significance**
- **Computation of Rates**



Topics to Consider

- **NFIRS “unknown” codes (U, UU, UUU) and missing data (blanks or null values)**
- **Data interpretation and presentation - is it more effective to present the data in a graph or table?**
- **Confined fires**
- **Mutual aid**
- **NFIRS version 5.0 vs. 4.1**



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**What is it that we
want to know?**

**For the fire portion of a typical
Annual Report:**

- Types of fires
- When fires occur
- Where fires occur
- How much loss
- Cause of fire



With the audience identified and the focus of the report established:

- **Choose analysis tools**
- **Determine NFIRS data elements to use**



- **Software (e.g., Excel, SAS, SQL Server)**
- **NFIRS 5.0 Complete Reference Guide:**
<http://www.nfirs.fema.gov/documentation/reference/>
- **NFIRS Training Courses:**
<http://www.usfa.dhs.gov/fireservice/nfirs/training/index.shtm>
- **Fire Data Analysis Handbook, Second Edition, January 2004:**
<http://www.usfa.dhs.gov/downloads/pdf/publications/fa-266.pdf>

NFIRS 5.0 Complete Reference Guide:

[http://
www.nfirs.fema.gov/
documentation/
reference/](http://www.nfirs.fema.gov/documentation/reference/)

National Fire Incident Reporting System 5.0 Complete Reference Guide

January 2006



FEMA

U.S. Fire Administration
National Fire Data Center

NFIRS Training Courses:

<http://www.usfa.dhs.gov/fireservice/nfirs/training/index.shtm>



National Emergency Training Center

2007-2008

Training Catalog

Catalog of Courses for the
U.S. Fire Administration's National Fire Academy



FEMA

Fire Data Analysis Handbook, Second Edition, January 2004:

<http://www.usfa.dhs.gov/downloads/pdf/publications/fa-266.pdf>

Fire Data Analysis Handbook

Second Edition

FA-266/January 2004



FEMA



Determine Which NFIRS Data Elements to Use

- **Data element(s) appropriate for the information presented**
- **Decide which specific NFIRS codes apply**
- **If NFIRS 4.1 is used, be aware of the differences from NFIRS 5.0**
- **Exclude mutual aid incidents (i.e., where AID \neq 3 and AID \neq 4) to avoid double counting fires**



- **Tables**
- **Graphs**
 - Appropriate scales
 - Bar
 - Histogram
 - Line
 - Pie
- **Source**
- **Appropriate Titling**
- **Proper Labeling**



From the NFIRS basic module

- Version = 5.0
- Exclude mutual aid incidents
(i.e., where AID \neq 3 and AID \neq 4)
- Incident type (INC_TYPE) 100, 111-173

Note: When analyzing only version 5.0 data, exclude incident type 110 (4.1 conversion only)



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What types of fires occur?

Structure

Vehicle

Outside

Other



How to Define Types of Fires Using NFIRS

■ General incident types

- Structures

○ Incident type: 111-123

- Vehicles

○ Incident type: 130-139

- Outside

○ Incident type: 140-162, 164-173 (note, excludes 163)

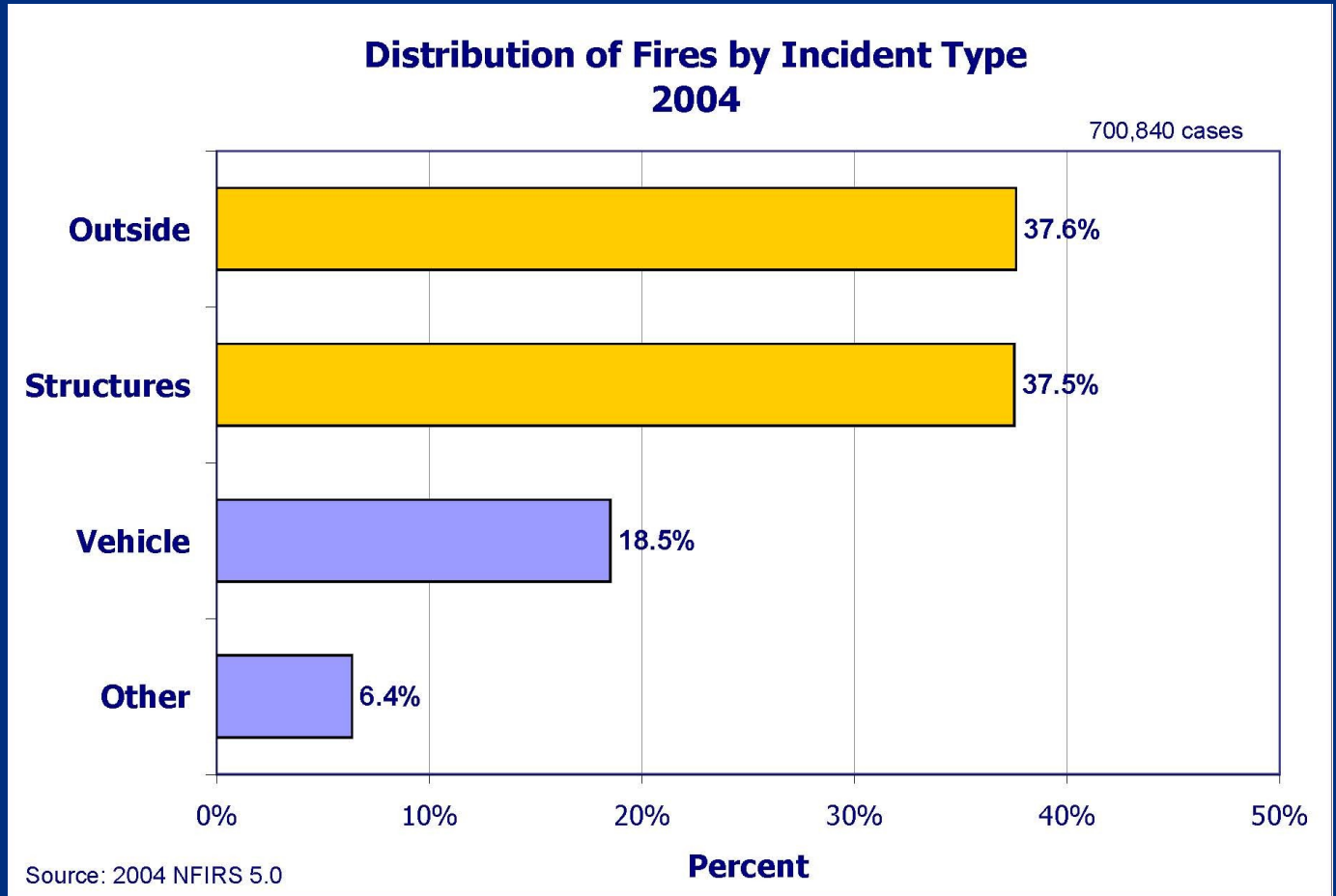
- Other

○ Incident type: 100-109, 163 (outside gas/vapor combustion/explosion)



Examples: Distribution of Fires by General Incident Type

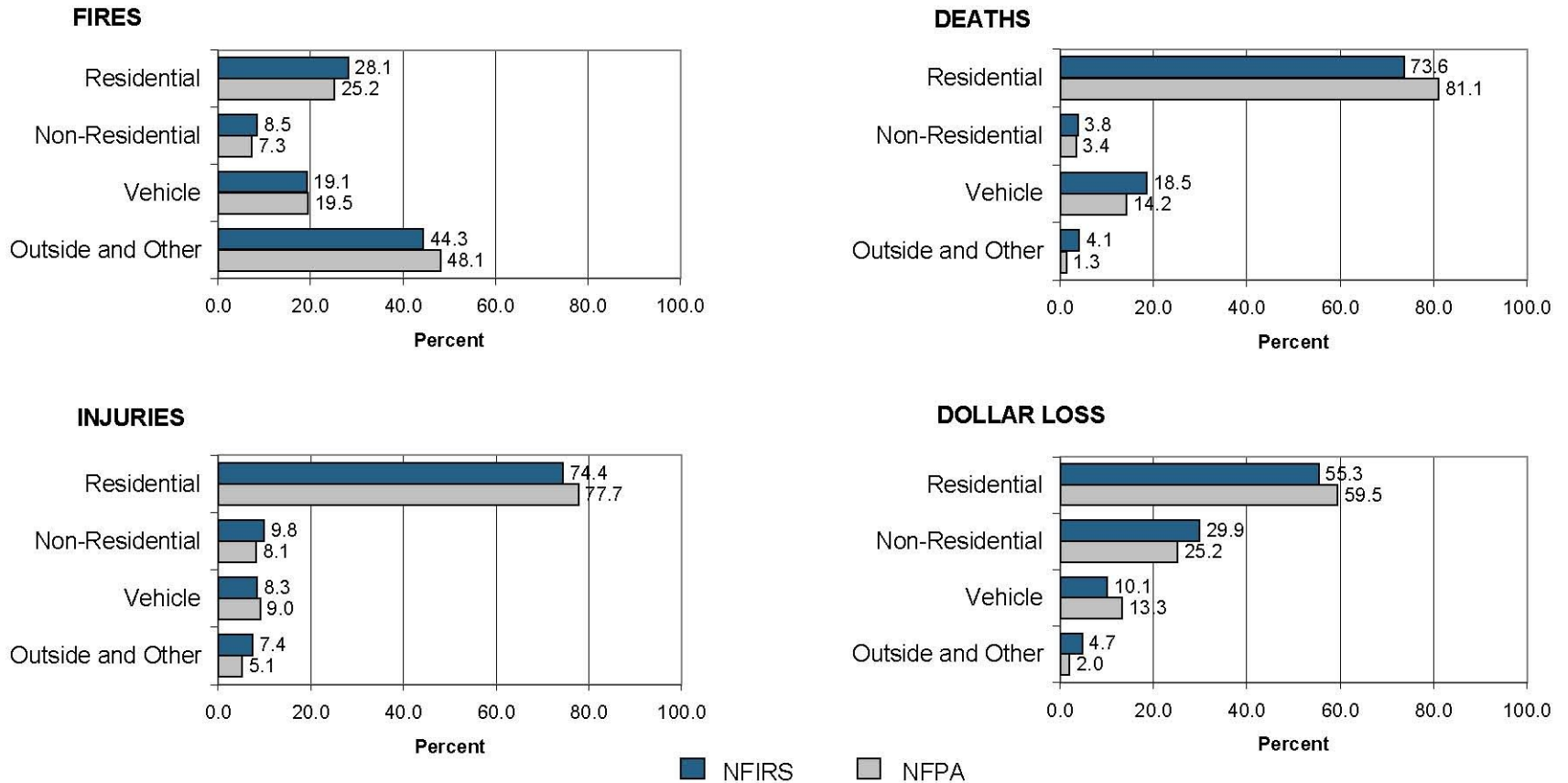
Graphically:





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Figure 3: Comparison of NFIRS Data with NFPA Estimates by General Property Type (3-year average)



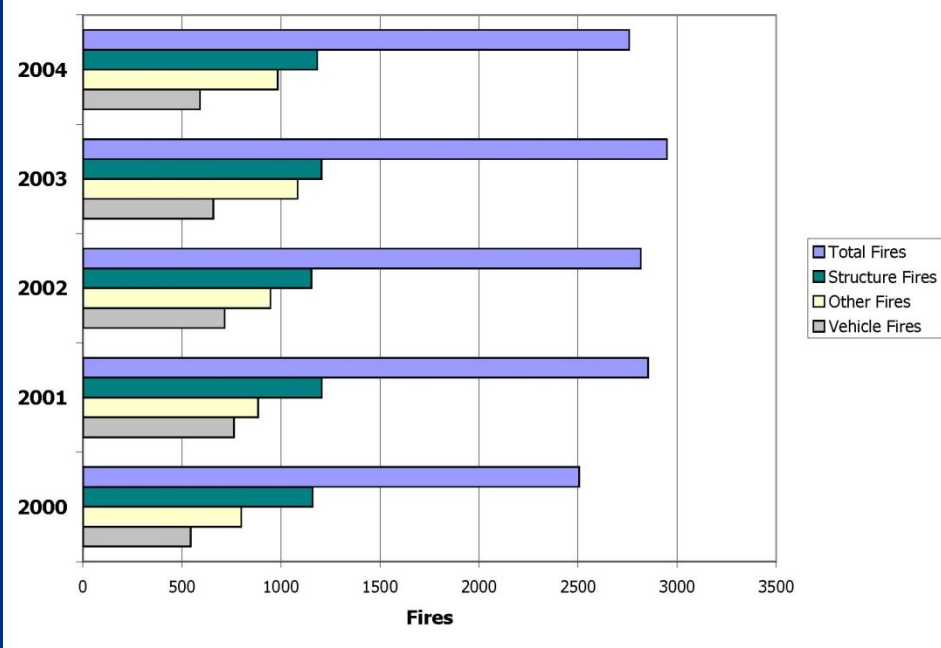
Sources: 2002-2004 NFIRS 5.0
2002-2004 NFPA

Or, use a table:

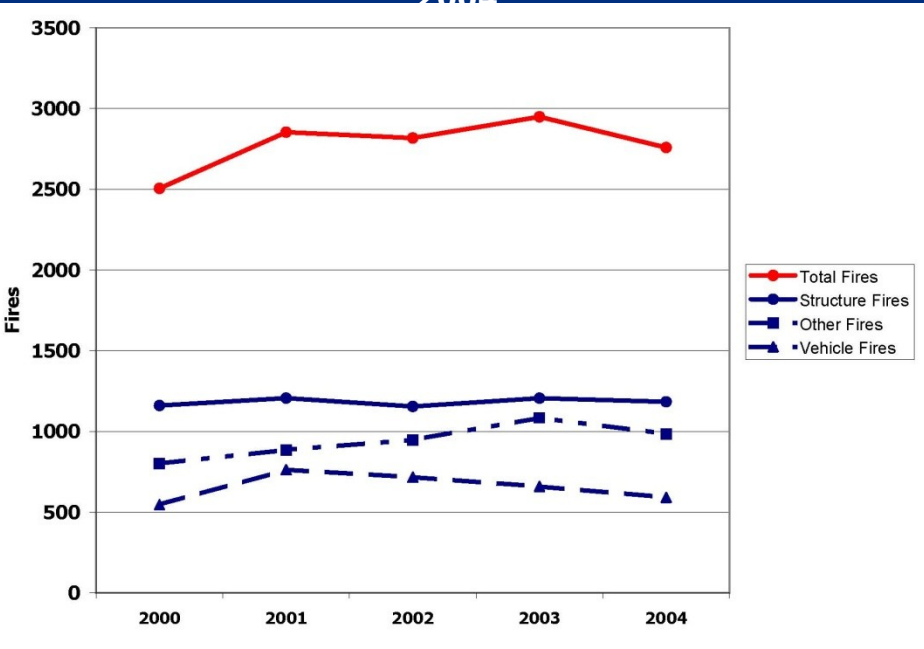
| Year | Total Fires | Structure Fires | Vehicle Fires | Other Fires |
|-------------|--------------------|------------------------|----------------------|--------------------|
| 2004 | 2,758 | 1,183 | 591 | 984 |
| 2003 | 2,949 | 1,205 | 658 | 1,086 |
| 2002 | 2,817 | 1,154 | 716 | 947 |
| 2001 | 2,853 | 1,206 | 762 | 885 |
| 2000 | 2,505 | 1,160 | 545 | 800 |

Total Fires and Fires by Major Incident Type 2000-2004

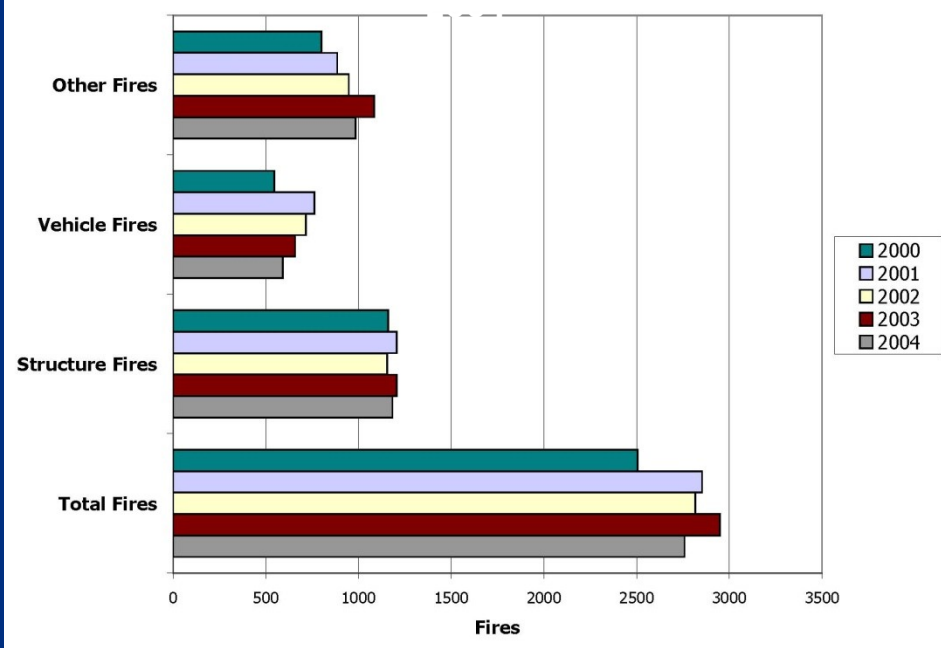
| Year | Total Fires | Structure Fires | Vehicle Fires | Other Fires |
|------|-------------|-----------------|---------------|-------------|
| 2004 | 2,758 | 1,183 | 591 | 984 |
| 2003 | 2,949 | 1,205 | 658 | 1,086 |
| 2002 | 2,817 | 1,154 | 716 | 947 |
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Total Fires and Fires by Major Incident Type 2000-2004



Total Fires and Fires by Major Incident Type 2000-2004





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Temporal Analyses: When Do Fires Occur?

Month/Season

Day of Week

Year

Time of Day

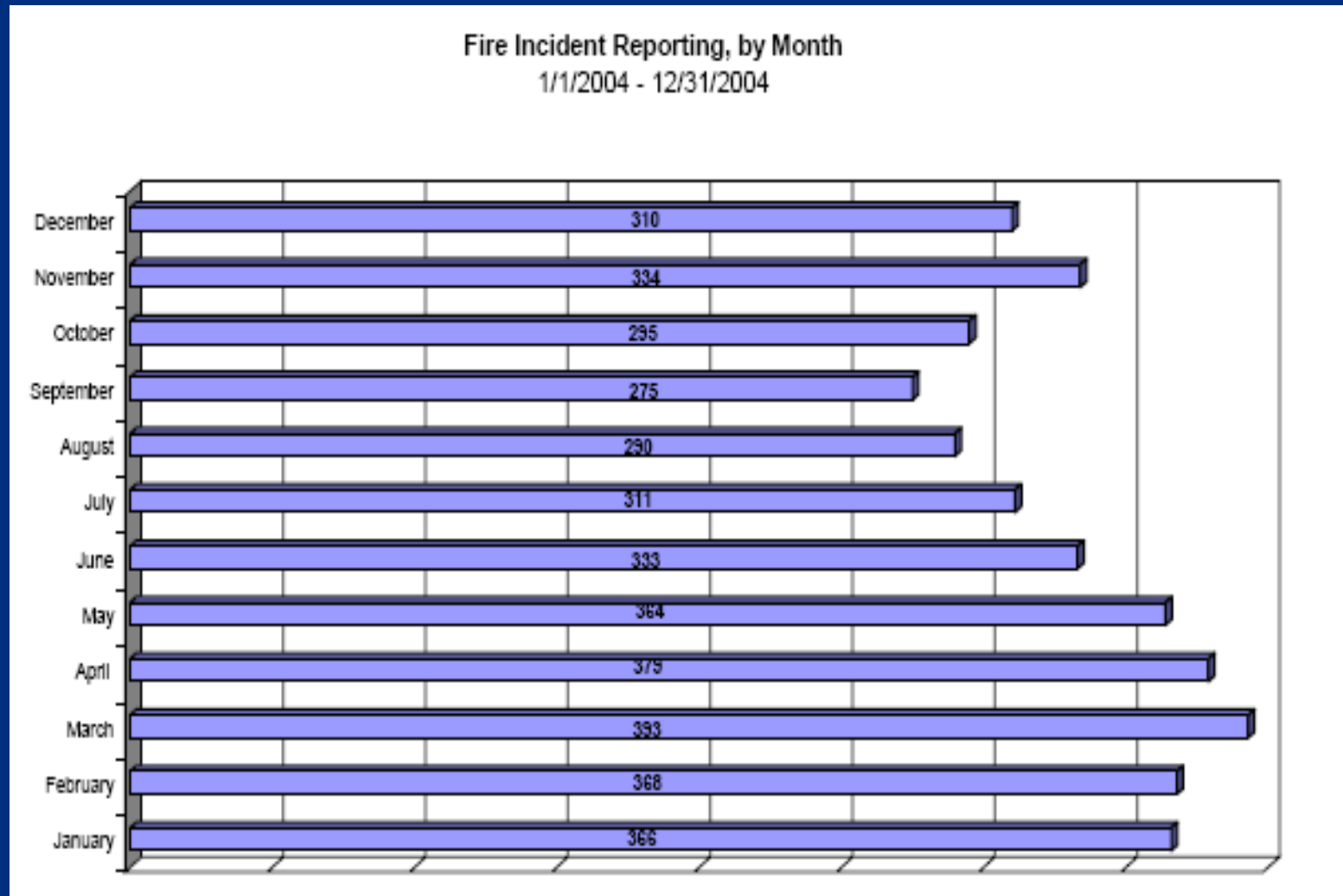


How to Define When Fires Occur Using NFIRS

- **From the NFIRS basic module**
 - Version = 5.0
 - Exclude mutual aid incidents (i.e., where AID \neq 3 and AID \neq 4)
 - Define fires (based on INC_TYPE)
 - Incident date (INC_DATE)
 - Alarm time (ALARM)
- **Month:** Characters 1-2 of the incident date field
- **Day:** Characters 3-4 of the incident date field
- **Year:** Characters 5-8 of the incident date field
- **Time:** Characters 9-12 of the alarm time field

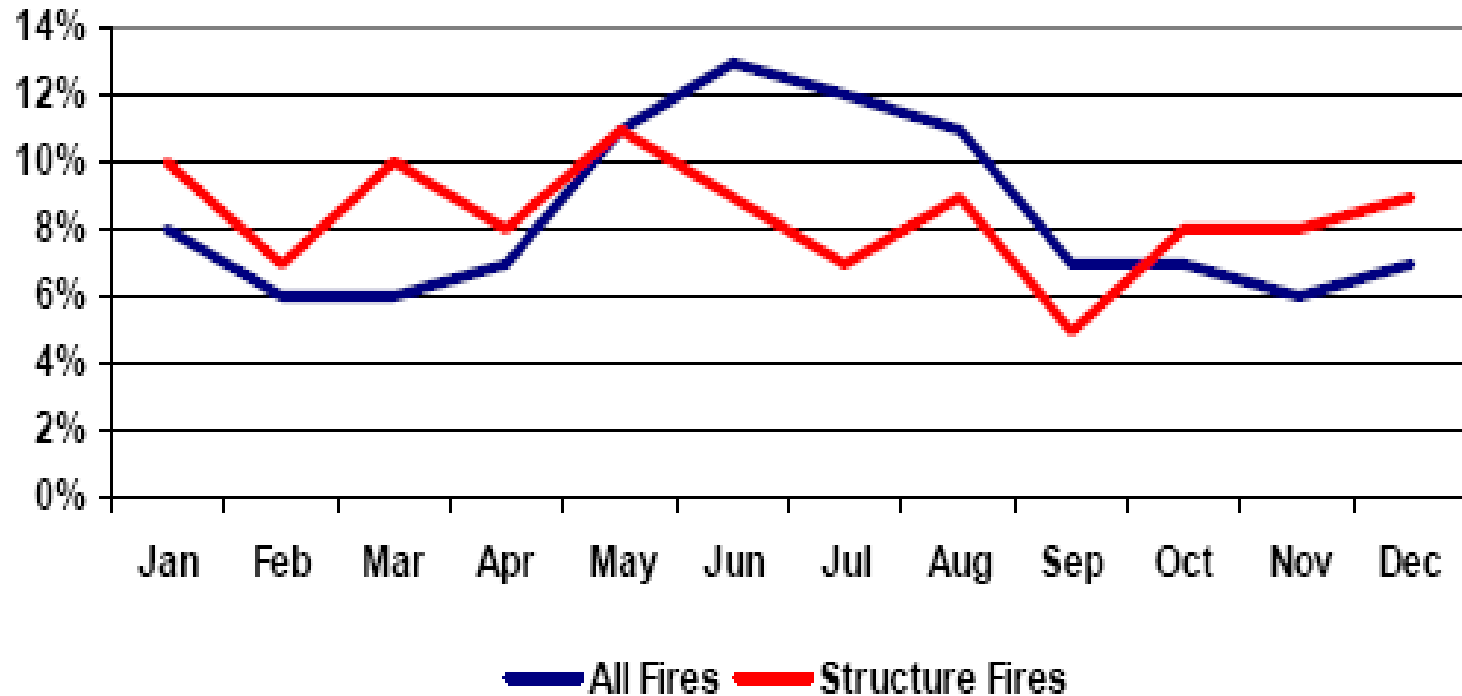


Examples: When Fires Occur



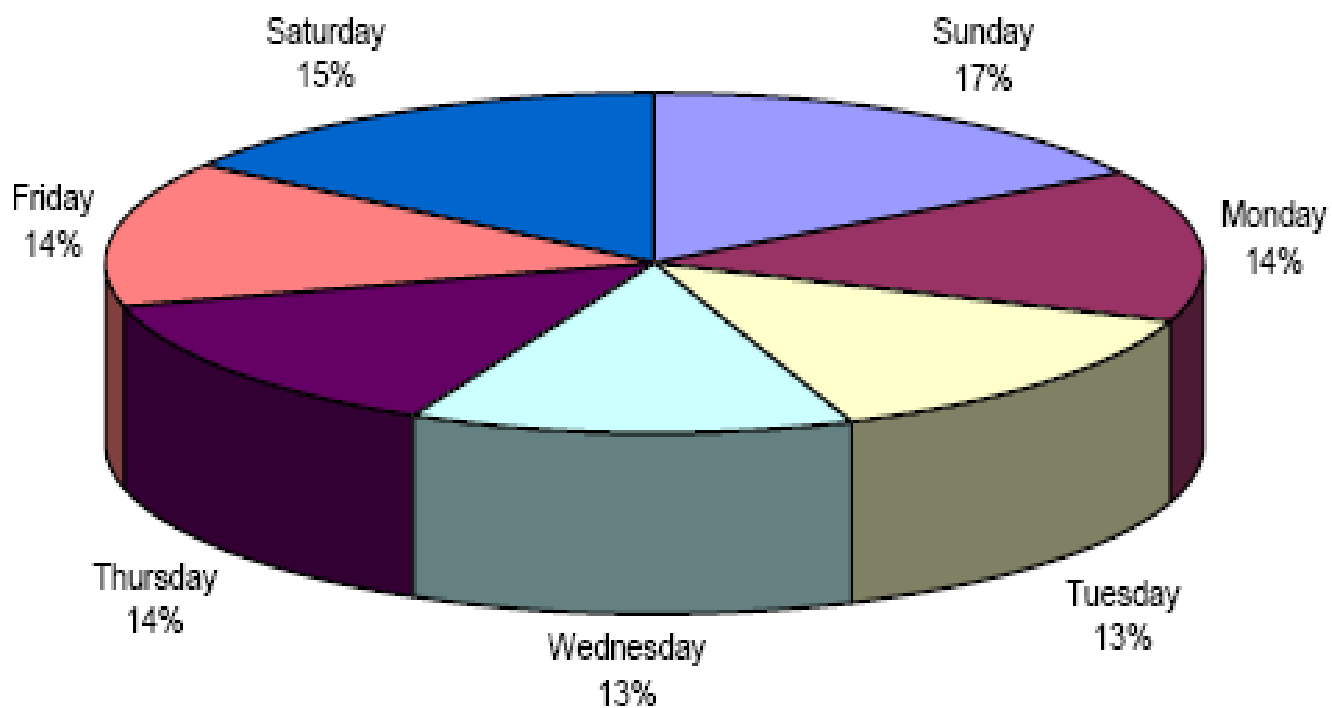


Residential Structure Fires by Month

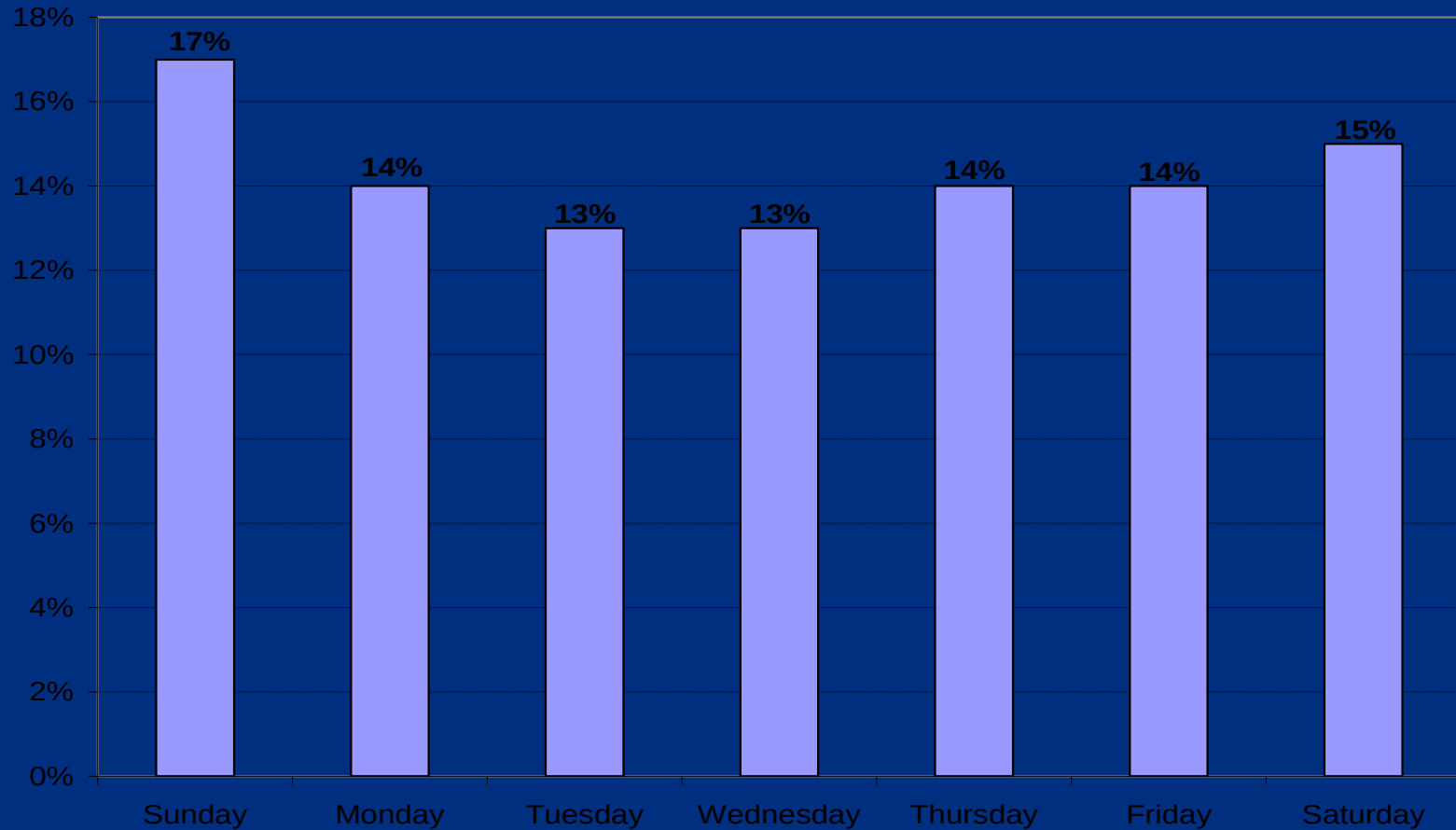


Fire Incident Reporting, by Day of the Week

1/1/2004 - 12/31/2004

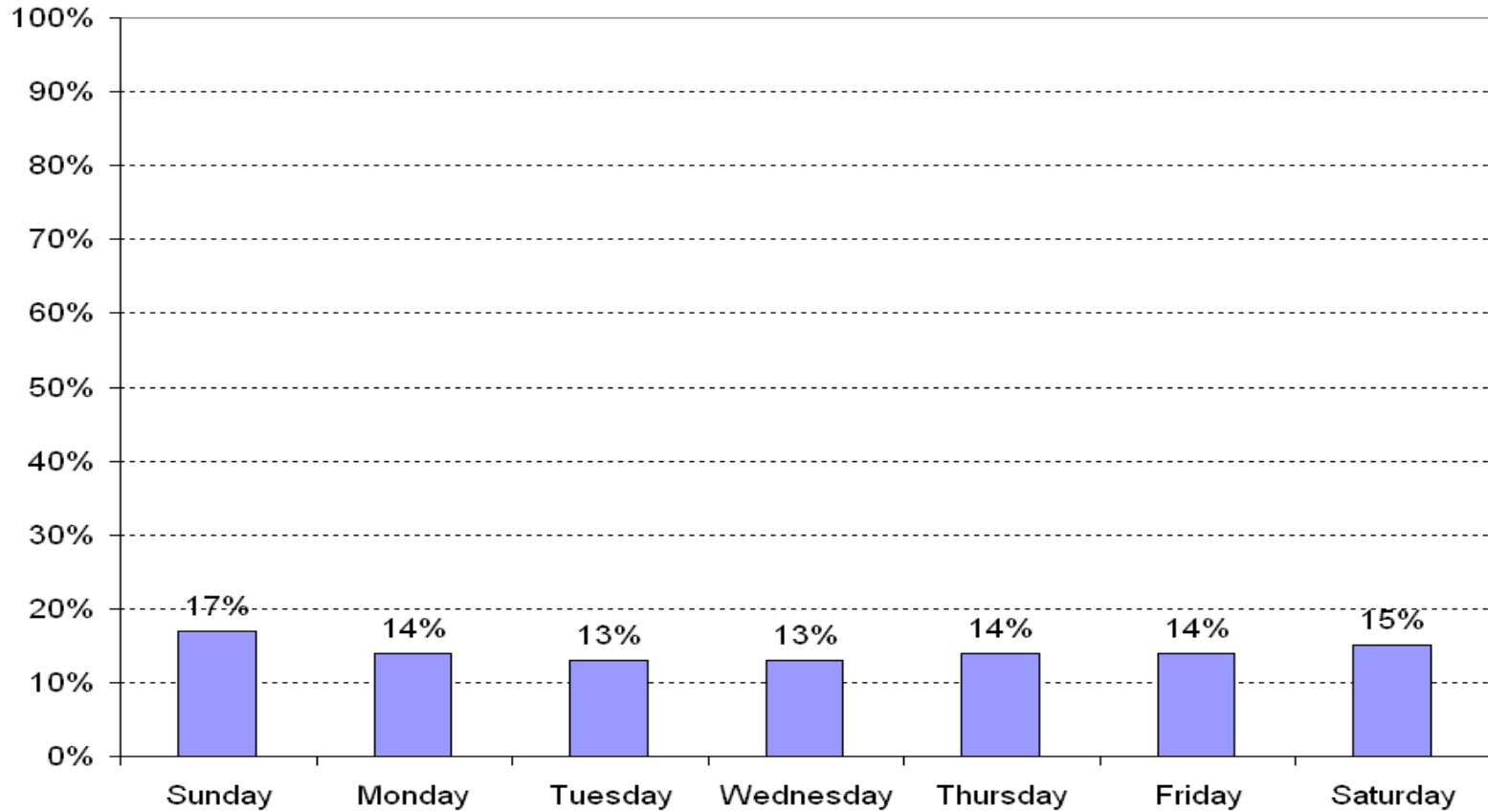


Fire Incident Reporting by Day of the Week 2004

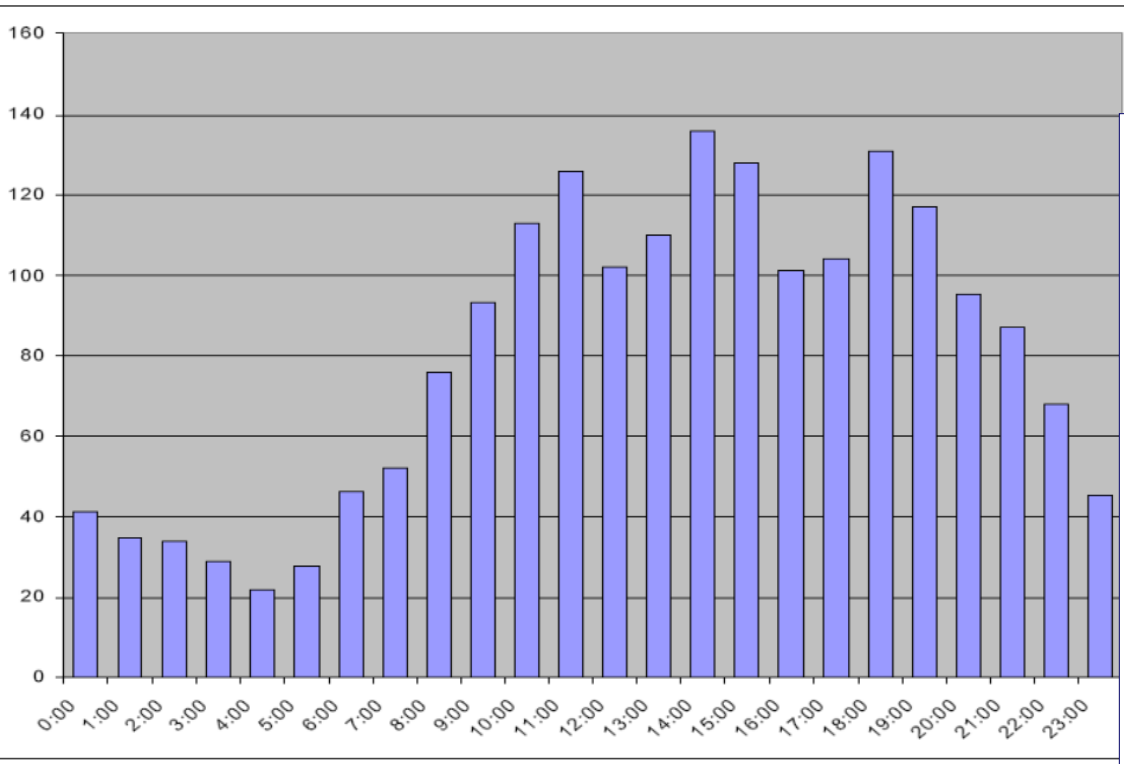


Source: 2004 (etc...)

Fire Incident Reporting by Day of the Week 2004

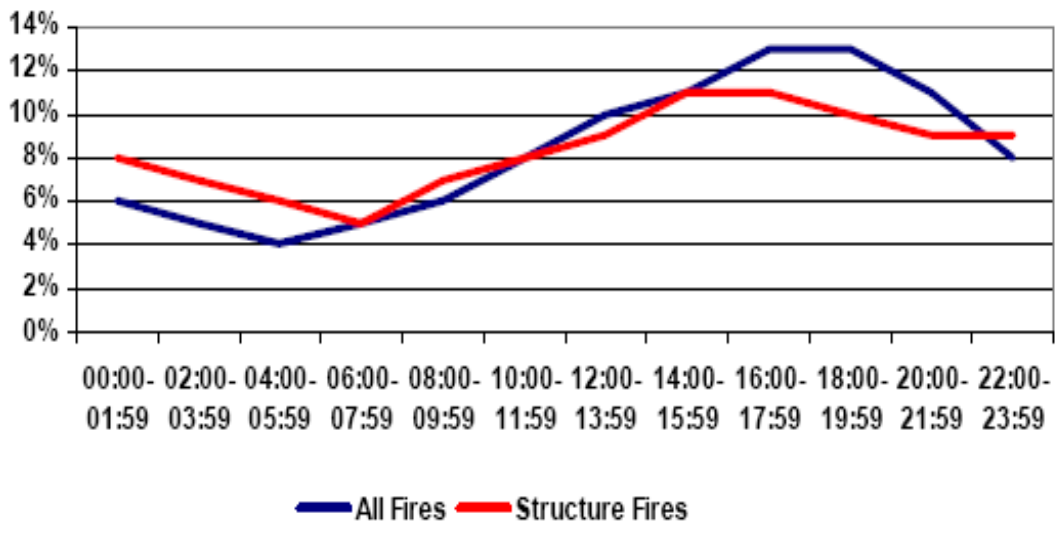


Source: 2004 (etc...)



| A.M. | | P.M. | |
|---------------|-----|---------------|-----|
| 12 AM - 00:59 | 41 | 12 PM - 12:59 | 102 |
| 01:00 - 01:59 | 35 | 13:00 - 13:59 | 110 |
| 02:00 - 02:59 | 34 | 14:00 - 14:59 | 136 |
| 03:00 - 03:59 | 29 | 15:00 - 15:59 | 128 |
| 04:00 - 04:59 | 22 | 16:00 - 16:59 | 101 |
| 05:00 - 05:59 | 28 | 17:00 - 17:59 | 104 |
| 06:00 - 06:59 | 46 | 18:00 - 18:59 | 131 |
| 07:00 - 07:59 | 52 | 19:00 - 19:59 | 117 |
| 08:00 - 08:59 | 76 | 20:00 - 20:59 | 95 |
| 09:00 - 09:59 | 93 | 21:00 - 21:59 | 87 |
| 10:00 - 10:59 | 113 | 22:00 - 22:59 | 68 |
| 11:00 - 11:59 | 126 | 23:00 - 23:59 | 45 |

Residential Structure Fires by Time of Day

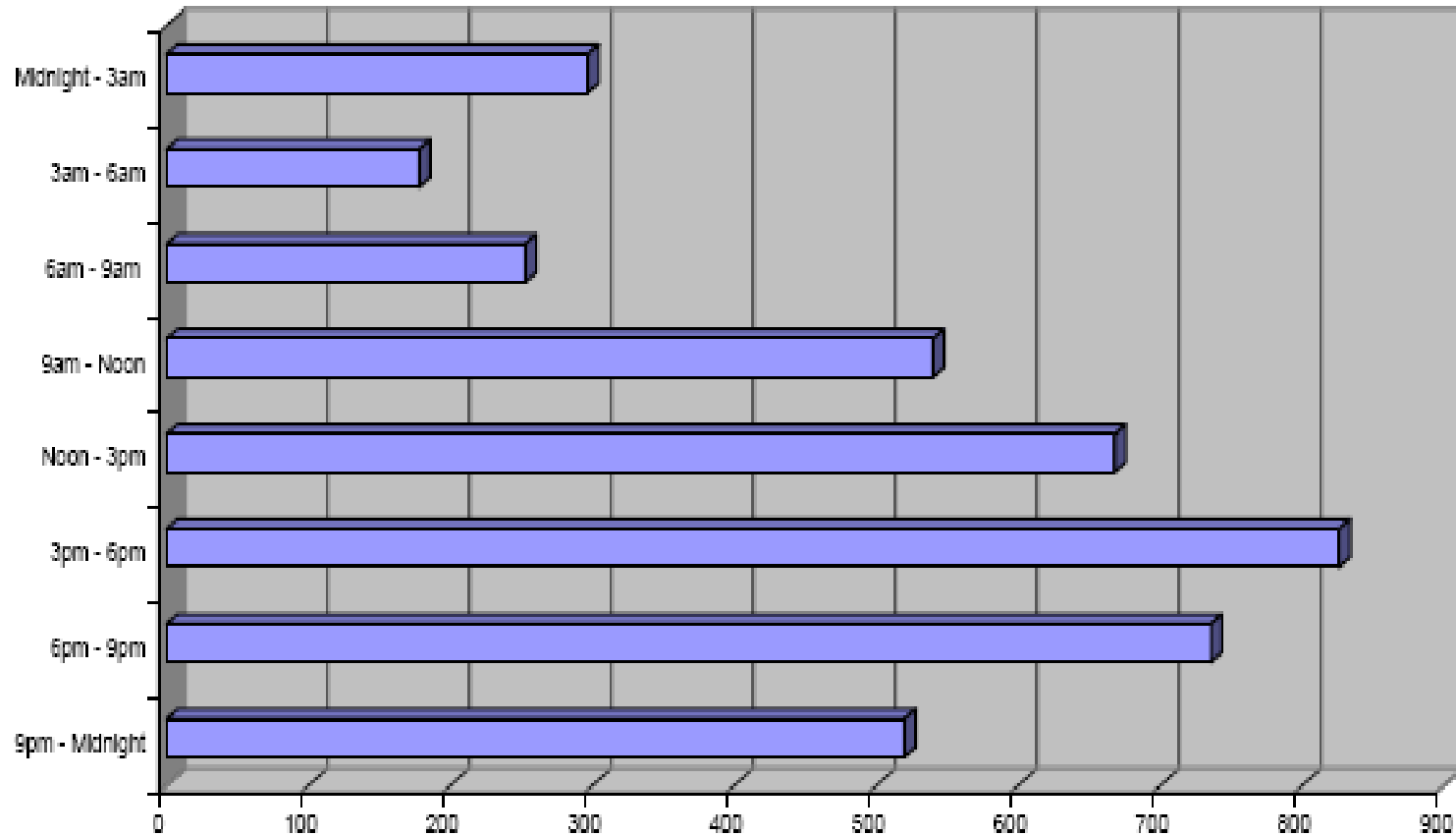


TOTAL RUNS CALCULATED: 1919



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Fire Incident Reporting, by Hour of the Day
1/1/2004 - 12/31/2004





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Where do fires occur?

Property Use

Area of Fire Origin

Geographic Location



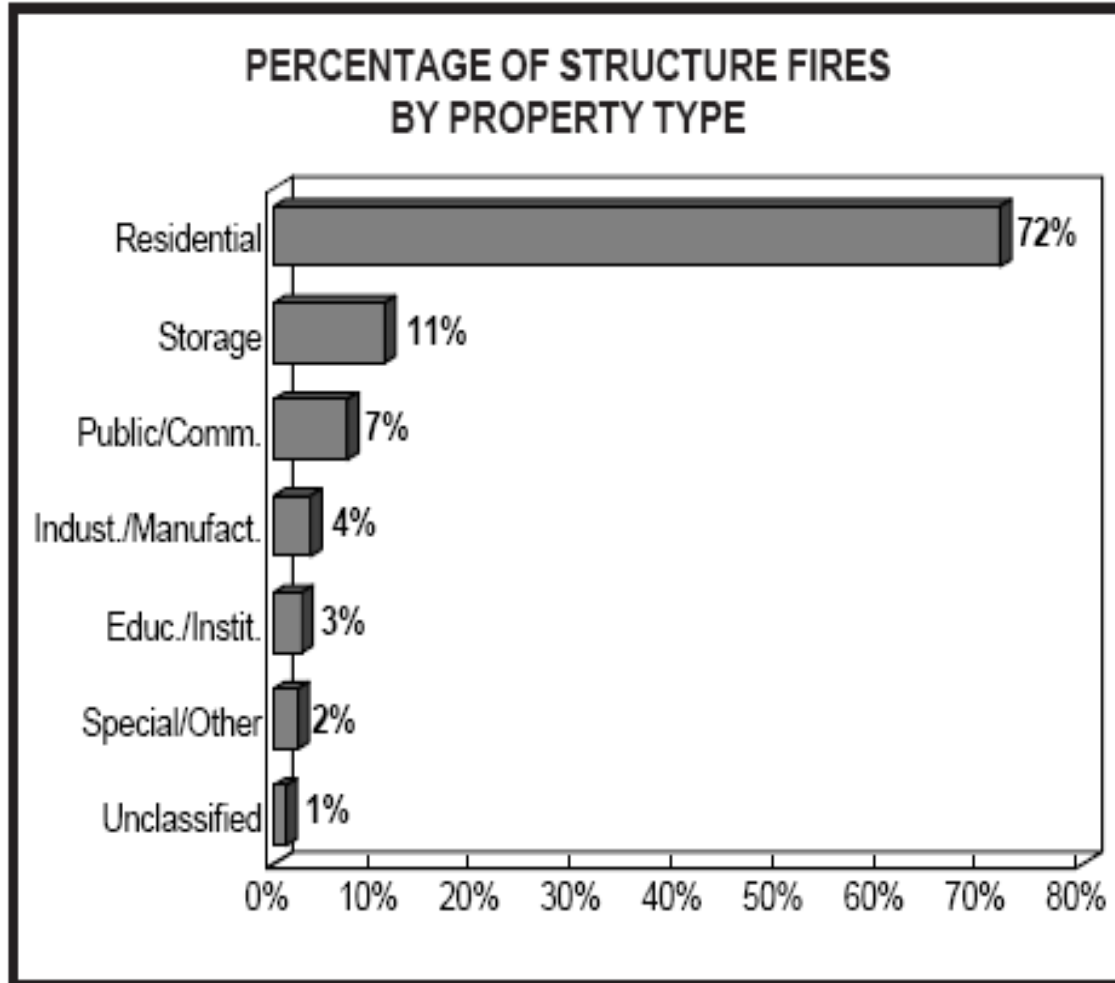
- **From the NFIRS basic module**
 - Version = 5.0
 - Exclude mutual aid incidents (i.e., where AID \neq 3 and AID \neq 4)
 - Define fires (based on INC_TYPE)
 - Property use (PROP_USE)
 - State (STATE)
- **From the NFIRS header module**
 - County (FD_FIP_CTY)
- **From the NFIRS fire module**
 - Area of fire origin (AREA_ORIG)



- **Assembly**
-PROP_USE: 100-199
- **Educational**
-PROP_USE: 200-299
- **Health Care, Detention and Correction**
-PROP_USE: 300-399
- **Residential**
-PROP_USE: 400-499
- **Mercantile, Business**
-PROP_USE: 500-599
- **Industry**
-PROP_USE: 600-699
- **Manufacturing**
-PROP_USE: 700
- **Storage**
-PROP_USE: 800-899
- **Outside or Special Property**
-PROP_USE: 900-999
- **Property Use, Other**
-PROP_USE: 000
- **None**
-PROP_USE: NNN
- **Undetermined**
-PROP_USE: UUU
- **Null or Missing Values**
-PROP_USE: blank



Examples: Where Fires Occur Property Types





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Structure Fires by Property Type 2001 - 2005

| | <u>2001</u> | <u>2002</u> | <u>2003</u> | <u>2004</u> | <u>2005</u> | <u>% Increase (Decrease) 2004-2005</u> |
|--|--------------|--------------|--------------|--------------|--------------|--|
| Residential | 3,912 | 4,698 | 4,858 | 4,973 | 5,043 | 1% |
| Educational/ Institutional | 183 | 245 | 216 | 202 | 195 | (3%) |
| Public Assembly/ Commercial | 409 | 454 | 433 | 443 | 512 | 16% |
| Industrial/ Manufacturing | 271 | 253 | 261 | 257 | 256 | (<1%) |
| Storage | 771 | 799 | 847 | 822 | 769 | (6%) |
| Special/Other | 170 | 220 | 234 | 199 | 167 | (16%) |
| Unclassified | 84 | 91 | 102 | 80 | 84 | 5% |
| TOTAL | 5,800 | 6,760 | 6,951 | 6,976 | 7,026 | 1% |



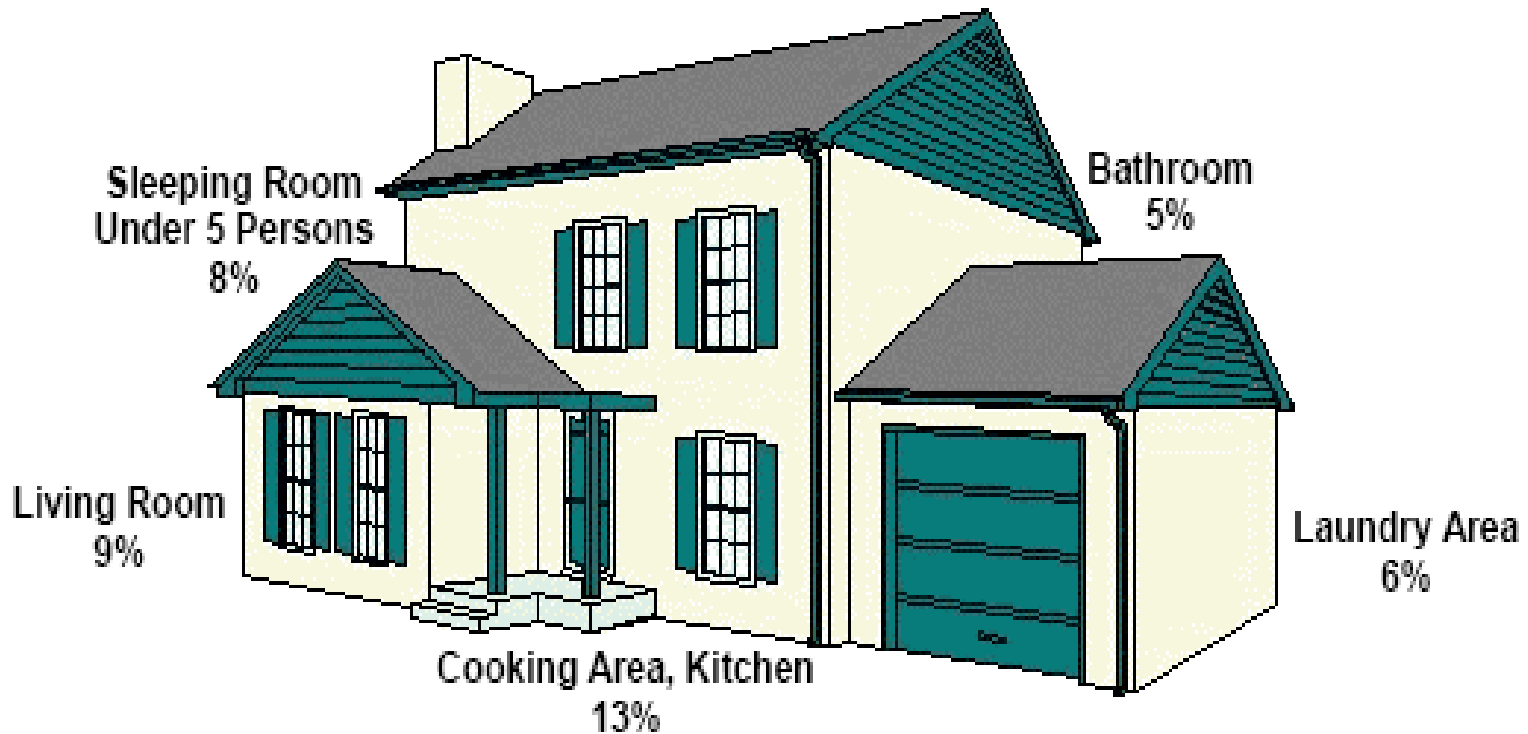
Area of Fire Origin

- **Means of Egress**
 - AREA_ORIG: 01-09
- **Assembly or Sales Areas**
 - AREA_ORIG: 10-17
- **Function Areas**
 - AREA_ORIG: 20-28
- **Technical Processing Areas**
 - AREA_ORIG: 30-38
- **Storage Areas**
 - AREA_ORIG: 40-47
- **Service Areas**
 - AREA_ORIG: 50-58
- **Service or Equipment Areas**
 - AREA_ORIG: 60-68
- **Structural Areas**
 - AREA_ORIG: 70-78
- **Transportation, Vehicle Areas**
 - AREA_ORIG: 80-86
- **Outside Areas**
 - AREA_ORIG: 90-98
- **Area of Fire Origin, Other**
 - AREA_ORIG: 00
- **Undetermined**
 - AREA_ORIG: UU



Examples: Where Fires Occur Area of Fire Origin

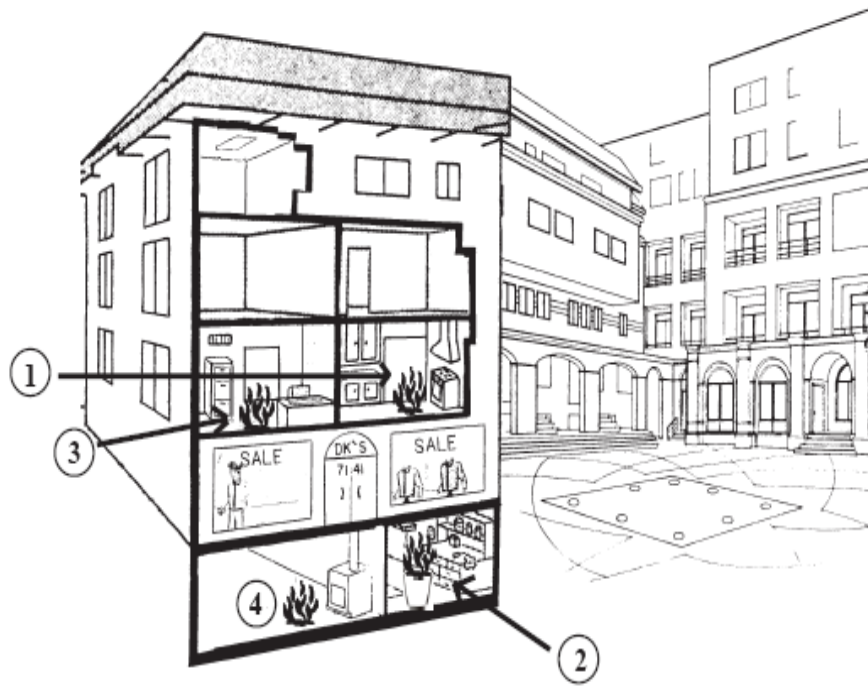
Top Five Area of Fire Origin





STORE AND OFFICE PROPERTY

(Retail Shopping, Business Offices, Service Stations)

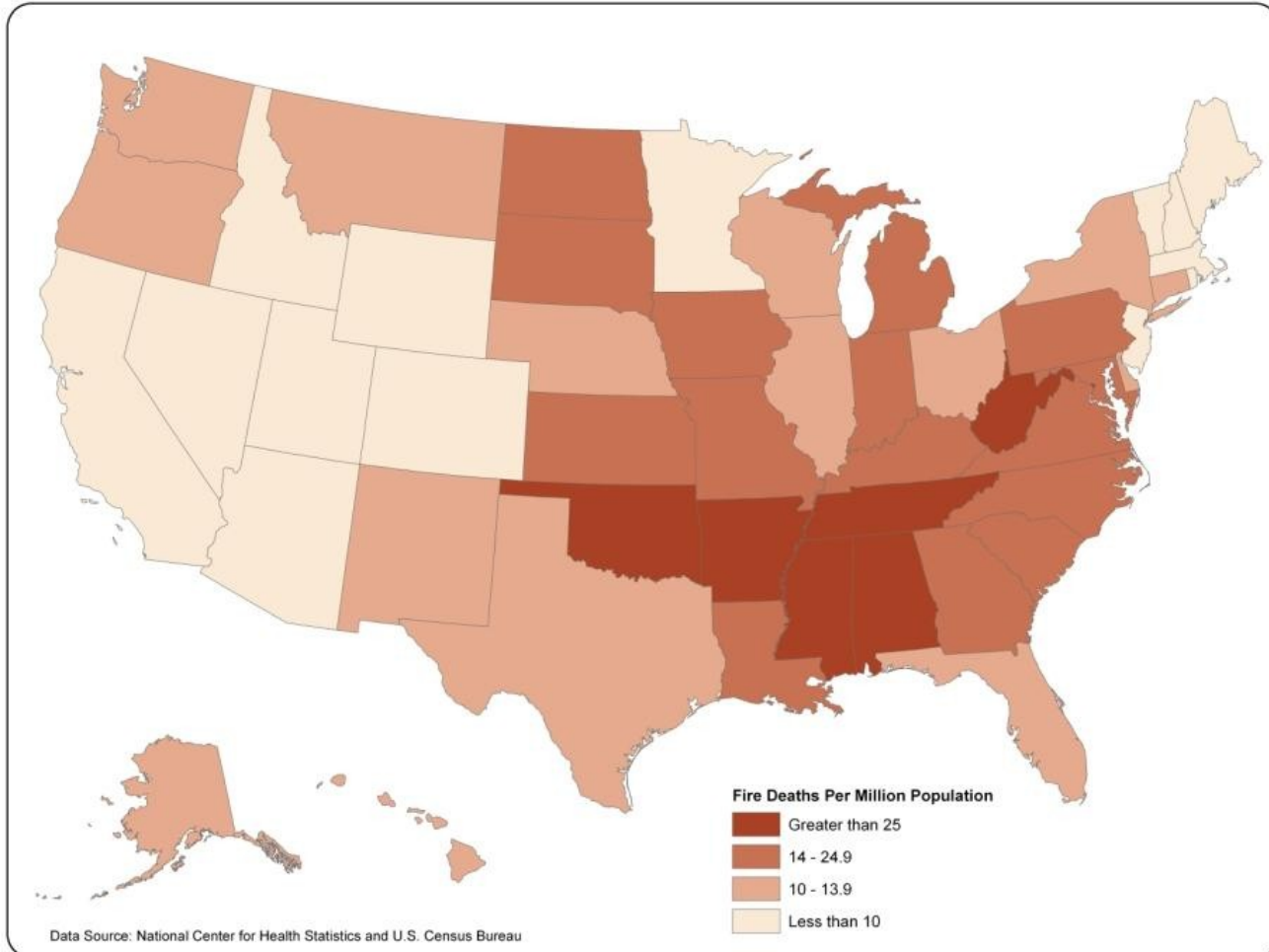


AREA OF FIRE ORIGIN

| | |
|----------------------------------|-----|
| 1. Kitchen/Cooking Area | 14% |
| 2. Trash Chute/Container | 9% |
| 3. Office | 6% |
| 4. Heating Room/Area | 5% |
| Other Areas of Fire Origin | 66% |



Example: Where Fires Occur Geographic Location (Spatial Analyses)





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How Much Loss Occurs?

Deaths

Injuries

Contents Loss

Property Loss

Fire Spread



How to Define Losses Using NFIRS

- **From the NFIRS basic module**
 - Version = 5.0
 - Exclude mutual aid incidents (i.e., where AID \neq 3 and AID \neq 4)
 - Define fires (based on INC_TYPE)
 - Deaths (OTH_DEATH)
 - Injuries (OTH_INJ)
 - Total dollar loss = Contents loss (CONT_LOSS) + Property loss (PROP_LOSS)
- **From the NFIRS structure fire module**
 - Fire Spread (FIRE_SPRD)



- **Confined fires, by definition, are confined to the object of origin (FIRE_SPRD=1)**
 - Confined Fires = INC_TYPE 113 to 118
- **Abbreviated reporting may limit the number of confined fires with fire spread entries**
- **Confined fires with no (or NULL) fire spread entries then need to be counted in with FIRE_SPRD=1**



Examples: Fire Spread

**Table 2. Dollar Loss per Clothes Dryer Fire by Fire Spread
[Residential Buildings, 3-year Average (2002-2004)]**

| Measure | Flame Spread Confined to: | | | | |
|-----------------------------|------------------------------|----------------------------|-----------------------------|--------------------------------|---------------------------|
| | Confined to object of origin | Confined to room of origin | Confined to floor of origin | Confined to building of origin | Beyond building of origin |
| Clothes Dryer Loss per fire | \$2,420 | \$4,742 | \$28,971 | \$63,822 | \$65,665 |
| Percent of Fires | 61.8% | 26.5% | 3.8% | 7.4% | .5% |

Source: NFIRS 5.0 data only; Loss per fire is computed for only those fires where loss information was provided.



What causes the fire?

- At USFA, fire cause for structures is **determined** by information gathered from several data fields from different NFIRS modules.
 - Cause is mutually exclusive - one and only one cause is assigned to each incident
 - The cause hierarchy is designed for structure fires, but currently is applied to all fires.
 - Separate cause hierarchies are under development for vehicles and outside/other fires.
- What does this mean for you?**



How to Define Cause Using NFIRS

- **Option: Implement USFA cause methodology**
- **Option: Cause-related fields from the NFIRS fire module**
 - Cause of ignition (CAUSE_IGN)
 - Equipment involved in ignition (EQUIP_INV)
 - Factors contributing to ignition (FACT_IGN_1, FACT_IGN_2)
 - Human factors contributing to ignition (HUM_FACT1, ... , HUM_FACT8)
 - Heat source (HEAT_SOURC)

None of these NFIRS variables individually defines fire cause



- **Cause is a complex chain of events**
- **Hierarchy of definitions**
 - Assign fire to highest category – if it does not fit in the top category, then consider the second; if not that one, then the third, etc.
- **Three level process**
 - Priority cause – Initial hierarchy, 34 categories
 - Cause – 34 priority groupings condensed into 16 major groups.
 - General Cause – 16 causes condensed into 7 general causes



Cause Hierarchy Components

- **Primary Variables Used**
 - Cause of ignition (CAUSE_IGN)
 - Equipment involved in ignition (EQUIP_INV)
 - Factors contributing to ignition (FACT_IGN_1, FACT_IGN_2)
 - Heat source (HEAT_SOURC)
 - Human factors contributing to ignition (HUM_FACT1, ... , HUM_FACT8)
 - Area of Origin (AREA_ORIG)
- **Secondary Variables**
 - Age, Equipment power source (EQ_POWER), Mobile property involved (MOB_INVOL)



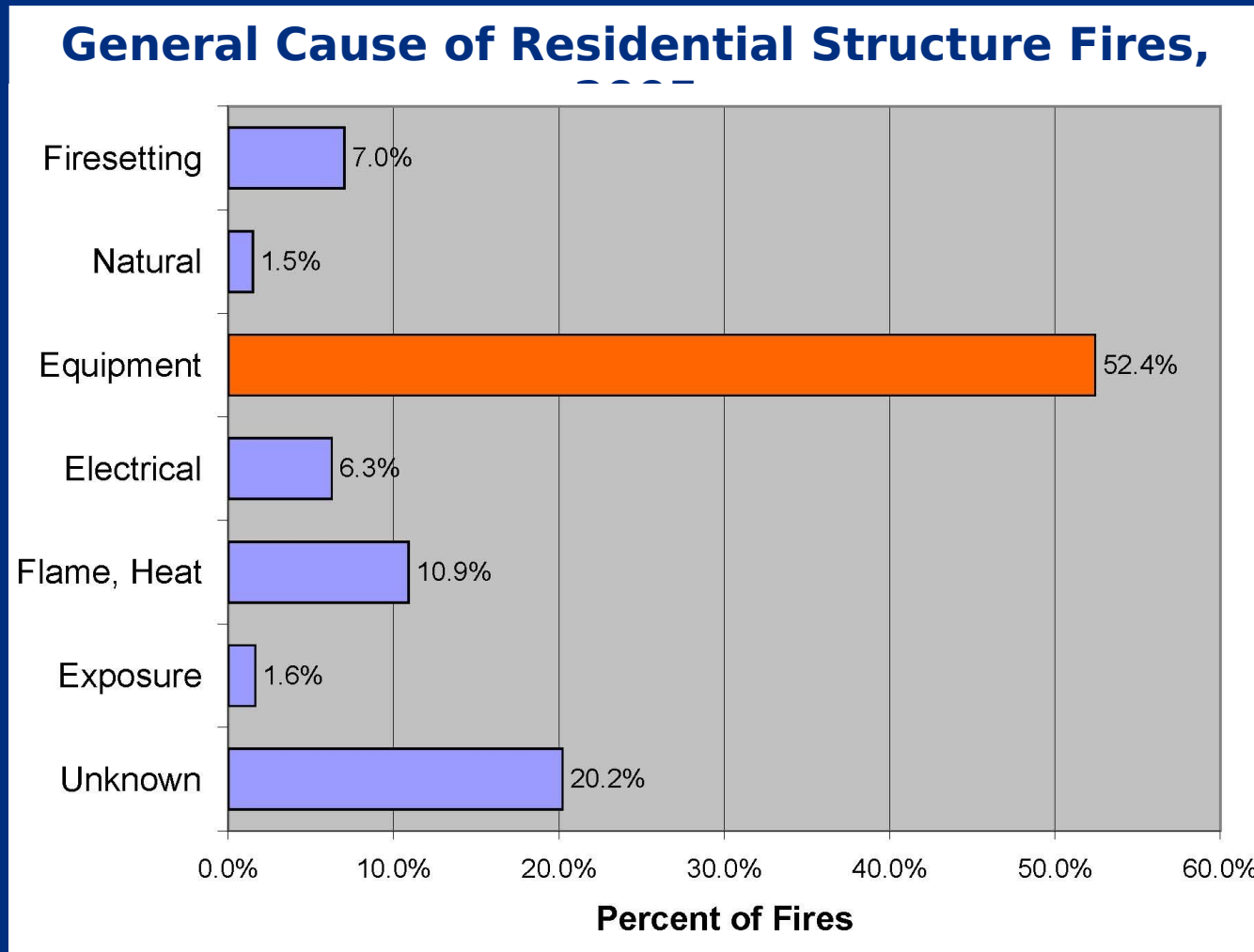
Hierarchy Matrix

- **Cause Category Methodology Matrix:**
http://www.nfirs.fema.gov/jsps/nfirsdownload.jsp?url=/_download/50causematrix01012004.xls

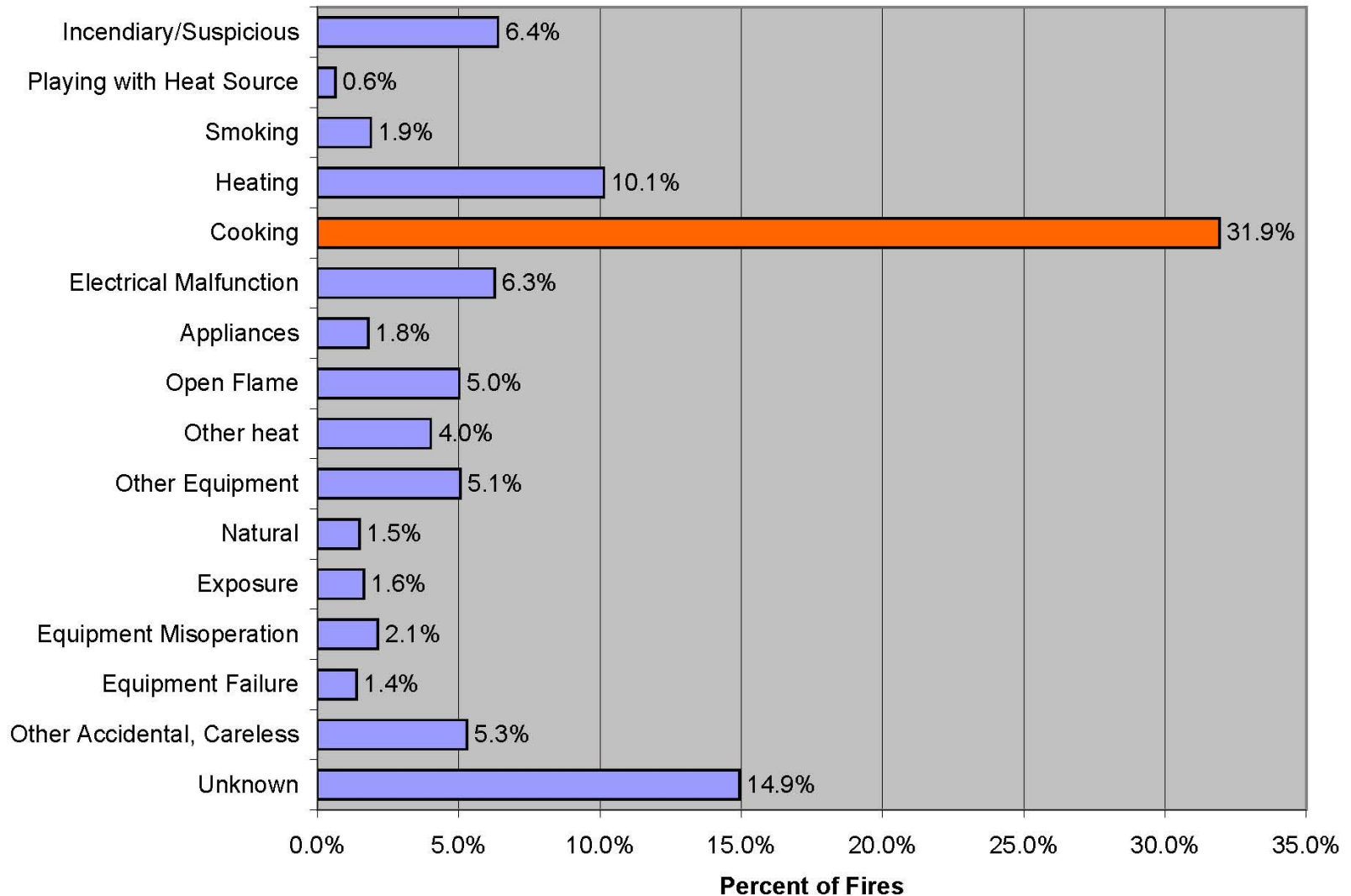
| Code | Priority Cause Description | Code | Cause Description | Code | General Cause Description |
|------|---|------|----------------------------|------|---------------------------|
| 04 | Incendiary | 01 | Incendiary/Suspicious | 01 | Firesetting |
| 04 | Suspicious | | | | |
| 05 | Children Playing | 02 | Playing with Heat Source | | |
| 05 | Children Playing | | | | |
| 05 | Children Playing | | | | |
| 36 | Other Playing | | | | |
| 06 | Natural | 11 | Natural | 02 | Natural |
| 06 | Natural 2 | | | | |
| 11 | Heating | 04 | Heating | 03 | Equipment |
| 12 | Cooking | 05 | Cooking | | |
| 13 | Air Conditioning | 07 | Appliances | | |
| 15 | Appliances | | | | |
| 16 | Special Equip. | 10 | Other Equipment | | |
| 16 | Special Equip. | | | | |
| 17 | Processing Equip. | | | | |
| 19 | Service Equip. | | | | |
| 20 | Vehicle, Engine | | | | |
| 25 | Unclassified fuel powered equip. | | | | |
| 25 | Unclassified equip. w/ other or unknown fuel source | | | | |
| 22 | Equipment Operation Deficiency | 14 | Equipment Misoperation | | |
| 23 | Equipment Failure, Malfunction | 15 | Equipment Failure | | |
| 14 | Electrical Dist. | 06 | Electrical Malfunction | 04 | Electrical |
| 26 | Unclassified elec malfunction | | | | |
| 07 | Fireworks | 09 | Other heat | 05 | Flame, Heat |
| 08 | Explosives | 03 | Smoking | | |
| 09 | Smoking | | | | |
| 18 | Torches | 08 | Open Flame | | |
| 27 | Matches, Candles | | | | |
| 28 | Open fire | | | | |
| 31 | Ember, rekindle | | | | |
| 29 | Other open flame, spark | 09 | Other heat | | |
| 30 | Friction, hot material | | | | |
| 32 | Other hot object | | | | |
| 03 | Exposure | 12 | Exposure | 06 | Exposure |
| 33 | Exposure 2 | | | | |
| 24 | Other Unintentional | 16 | Other Accidental, Careless | 07 | Unknown |
| 21 | Heat Source or Product Misuse | | | | |
| 34 | Unknown 1 | 13 | Unknown | | |
| 35 | Unknown 2 | | | | |
| 37 | Trash, rubbish | | | | |



Examples: Fire Cause



Cause of Residential Structure Fires, 2005



Source: 2005 NFIRS 5.0 Data

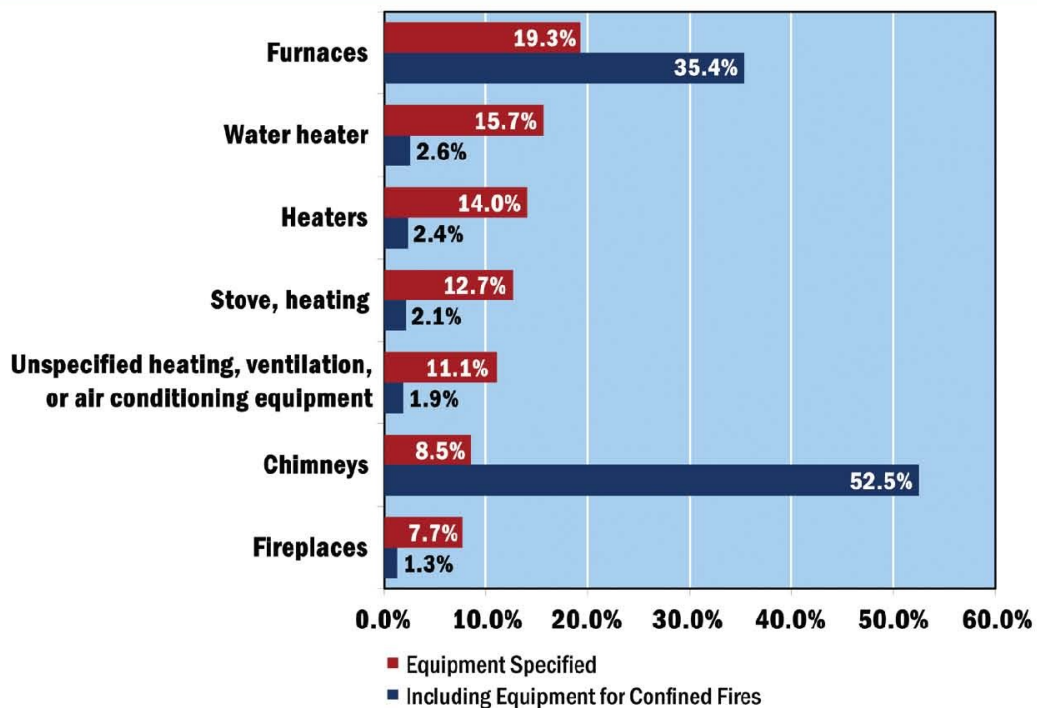


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HEATING FIRES IN RESIDENTIAL PROPERTIES ONLY

| <u>Equipment</u> | <u>No. of Fire Incidents</u> | <u>% of Total</u> | <u>Dollar Loss</u> | <u>% of Total</u> |
|-----------------------|------------------------------|-------------------|--------------------|-------------------|
| Fireplace/Chimney | 240 | 62% | \$1,472,550 | 47% |
| Fixed Heating Units | 65 | 17% | 762,925 | 24% |
| Central Heating Units | 61 | 16% | 169,200 | 5% |
| Water Heaters | 12 | 3% | 208,000 | 7% |
| Portable Heaters | 9 | 2% | 464,000 | 15% |
| Other | 3 | 1% | 40,080 | 1% |
| Total | 390 | 100% | \$3,116,755 | 100% |

Figure 4: Leading Equipment Involved in Ignition of Residential Building Heating Fires
(residential buildings, 3-year average (2002-2004) NFIRS 5.0 data)



Note: Adjustments were made for heating stoves: NFIRS 5.0 data on item first ignited (cooking materials) suggested the equipment involved in ignition was a cooking stove. These 558 incidents were excluded from this analysis.

Source: 2002-2004 NFIRS 5.0 data



A Last Word: NFIRS Unknown Values and Missing Data

- **Unreported data**
- **Data reported as “unknown” or “undetermined”**
- **Adjusting for unknown data - adjusted percentages computed using only those incidents for which data were provided**



- **Decide focus**
- **Identify audience**
- **Determine data needs**
- **Determine appropriate analysis tools**
- **Determine appropriate data presentation**
- **Write clearly, keep focused**



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