Deadly Differences
Ionization vs Photoelectric Smoke Alarms

An In-Depth Look at US Fire Death Rate Statistics and the Performance of Photoelectric and Ionization Smoke Alarms in Residential Fatal Fires

CREIA Spring Conference April 25, 2012

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Skip Walker

- *ACI, ASHI Certied Inspector*
- *MCI, CREIA Master Inspector*
- *ICC Certified Residential Combination Inspector*
- *F.I.R.E. Service Certifed Inspector*
- *Published 18 Articles, 4 on Smoke Alarms and CO Issues*
- *Presented to California Association of Realtors (CAR), Risk Management/Consumer Safety Committee*
- *Presented to National Association of Realtors (NAR), Risk Management/Consumer Safety Committee*
- *Interviewed by SF Chronicle for Smoke Alarm Article*

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What We Will Talk About Today:

- *US Residential Fire Death and Injury Statistics 1960-2001*
- *Statistical Data, Trends and How to Interpet the Data*
- *A Brief History of Smoke Alarms*
- *The Types of Smoke Alarms Found In Residential Use*
- *Contrast the Performance of the Different Alarm Technologies in Residential Fatal Fires*

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Important:

All the Data Used Comes From Reputable Sources

All Data Is Published & Verifiable

- *NIST National Institute for Standards and Testing*
- *NFPA National Fire Protection Association*
- *CPSC Consumer Product Safety Commission*
- *FEMA Federal Emergency Management Agency*
- *UL Underwriters Labratory*
- *Texas A&M University*
- *NFA National Fire Administration*
- *NCHS National Center for Health Statistics*
- *NIFRS National Fire Incident Reporting System*

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Let's Look At the Death/Injury Statistics and the Data Sources:

NFPA, Fire Loss Survey's and Various Study's
- *-Survey of 3,000 Fire Departments Nationally – Mostly Larger*

NFIRS, National Fire Incident Reporting System
- *-Web Input System*
- *-Voluntary Participation – Currently About 18,960 Fire Departmants*
- *-Participation Varies By State*

NCHS, US Death Statistics Report
- *-National Records of Death Certicates*
- *-Cause of Death Classifications Limited*

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None of the Data is Perfect

They Are Estimates Only
– Not Absolutes

- Numbers Vary Between Each Source
- Year to Year
- Sometimes Significantly

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NFPA and NFIRS Data:

Participation is Voluntary
Statistical Reports Include Extrapolated Data
Unknown Fire or Death Causes Are Reaporioned to Other Other Causes
Methods Used Are Sometimes Inconsistent Between Years/ Reports
Fire/Death/Injury Rates Are Estimates Only – Not Absolutes
Data Set Is Large Enough To Have A Degree Of Confidentce In The Data

It Is Important to Understand the Limitations Of The Data

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NCHS, National Center for Health Statistics

US Death/Morbidity Statistics Report

The National Record of Death Certicates
Cause of Death Classifications Limited
I.e. Respitory Failure from Smoke Inhilation
Can Be Used To Fill In Blanks From NFPA, NFIRS Data

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Caution must be used with statistical systems that allow voluntary/self-selection of participants. There is inherent bias in the statistical data. Only those that choose to participate do. Example: With NFIRS, since it is web based, only fire departments with web access can participate, etc.

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The Goal Today Is Very Simple

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That You Clearly Understand……

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1) That There Are Very REAL Differences in How Different Smoke Alarms Types Perform in Real World Fatal Fires

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2) That This is a Very REAL Problem.

This Issue Directly Contributes to at Least 1,000 Fire Deaths Per Year – Probably More

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3) That This is an Old Problem.

We Have Known That These Alarms Were Not Providing Adequate Protection Since the Early 1980's and Even Earlier.

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4) That We Can Make a Difference.

As Professional Property Inspectors, We Are Uniquely Positioned to Have a Very Signifcant Impact on Public Awareness and Safety.

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"This issue has more impact on the life safety of your clients than just about anything. Actually, make that just plain anything."

Douglas Hansen

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It is Critical to Understand
One Other Important Fact.....

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There are *three* kinds of lies;
Lies, Damn Lies and ***Statistics***

- Benjamin Disraelli, British Prime Minister

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- From a fire perspective, the US is a Third World Country
- The NYC Fire Department responds to more calls per year than all fire departments in Japan
- US Fire Death Rate per Million Population = 12.3*
- Swiss Fire Death Rate per Million Population = 2.0*
- Singapore Fire Death Rate per Million Population = 2.3*

* *Source: FEMA International Death Rate Trends 1979-2007*

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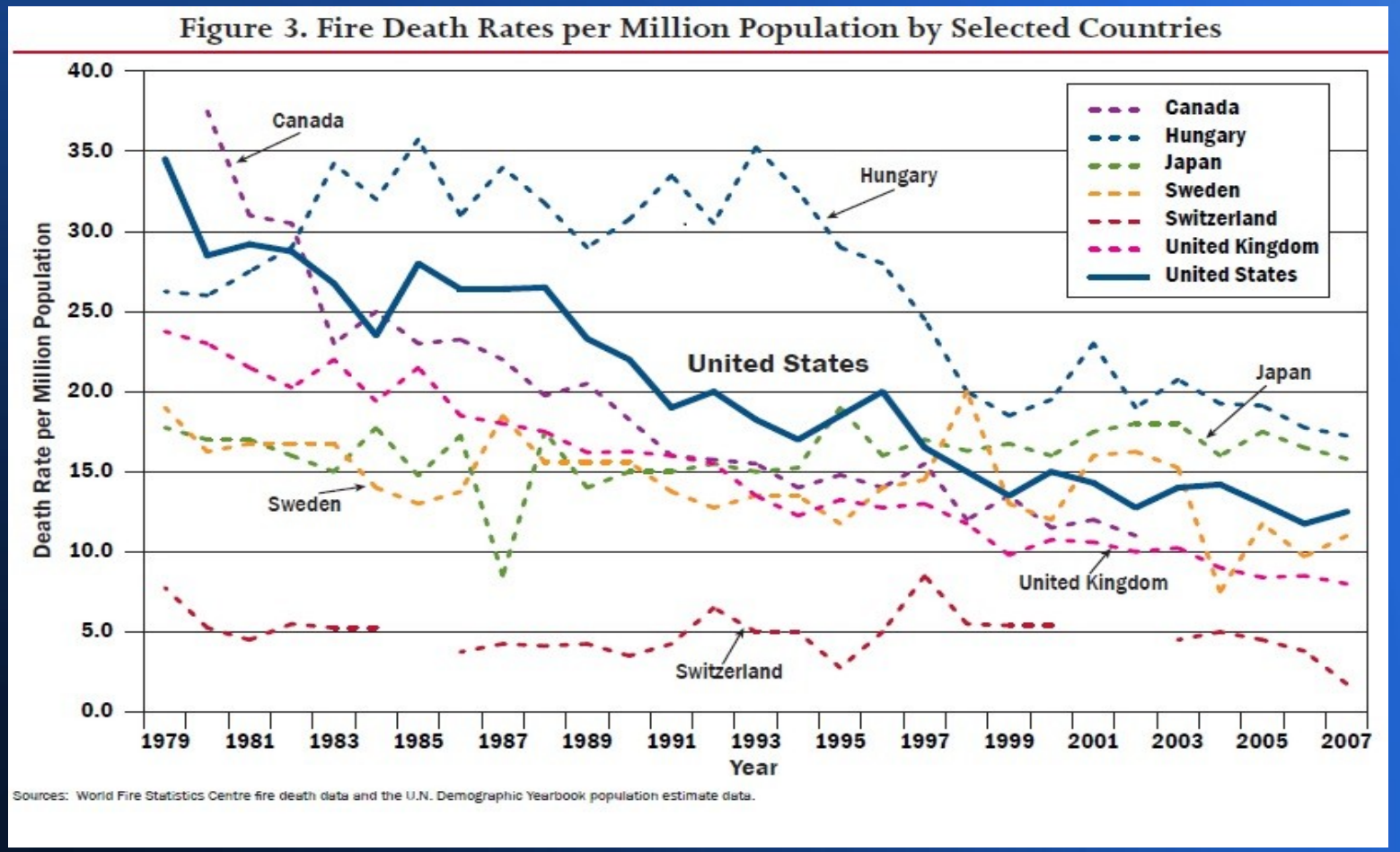

Source: FEMA Int Fire Trends 1979-2007

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Number of Households in The Us:

1960: 52 Million
1975: 72 Million
2007: 116 Million

Source: US Census Bureau, 2008

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Number of Households in The Us with Smoke Alarms:

1960: Almost Zero
1977: 18 Million/22%
2007: 111 Million/96%

Source: NFPA, Smoke Alarms in US Fires 2011

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Number of Households in The Us with Ionization Smoke Alarms:

Approximately 90%-95%
100-105 Million Homes

Source: Industry Sales Figures/Research Report Estimates

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According to estimates by the National Fire Protection Association and the U. S. Fire Administration, U. S. home usage of smoke alarms rose from less than 10 % in 1975 to at least 95 % in 2000, while the number of home fire deaths was cut nearly in half. ***Thus the home smoke alarm is credited as the greatest success story in fire safety in the last part of the 20th century, because it alone represented a highly effective fire safety technology with leverage on most of the fire death problem that went from only token usage to nearly universal usage in a remarkably short time.*** *Other highly effective fire safety technologies either affect a smaller share of the fire death problem (e.g., child-resistant lighter, cigarette-resistant mattress or upholstered furniture) or have yet to see more than token usage (e.g., home fire sprinkler, reduced ignition-strength cigarette).*

Performance of Home Smoke Alarms
NIST Technical Note 1455-1
February 2008 Revision

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*Thus the **home smoke alarm is credited as the greatest success story in fire safety in the last part of the 20th century**, because **it alone represented a highly effective fire safety technology** with leverage on most of the fire death problem that went from only token usage to nearly universal usage in a remarkably short time.*

Performance of Home Smoke Alarms
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In 1980:

"We put 50 million smoke detectors in buildings in America in a two year period and our fire loss and death rate goes up. ***We're having a little trouble explaining these things****."*

Gordon Vickery, former head of the US. Fire Administration

Source: Fire engineering magazine, ***September 1980***

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"I estimate that at least 10,000-15,000 people have died unnecessarily in smoldering house fires since 1990 because they relied on ionization detectors."

Jay Fleming, Deputy Fire Chief , Boston, MA.

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Let's Look Closer at Residential Fires,
Where They Start
When They Start
How They Start
And The Consequences

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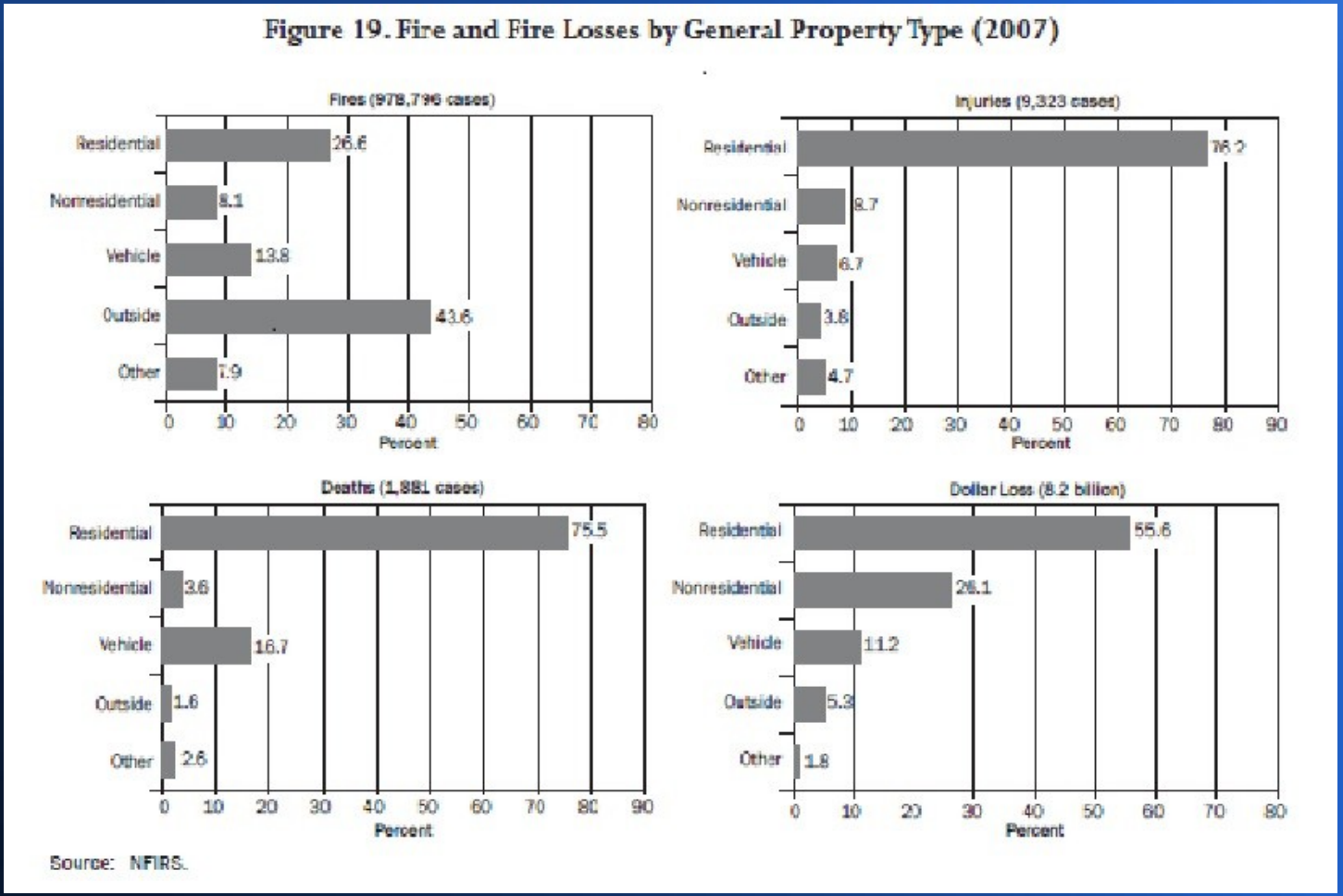

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- Most US Fire Deaths Occur at Home = 75.5%*
- Most US Fire Injuries Occur at Home = 76.2%*
- Most of Local Fire Prevention Budgets Are Spent on Commercial
  - Commercial = 99% (Estimate)
  - Residential = 1% (Estimate)

* *Source: NFIRS 2007*

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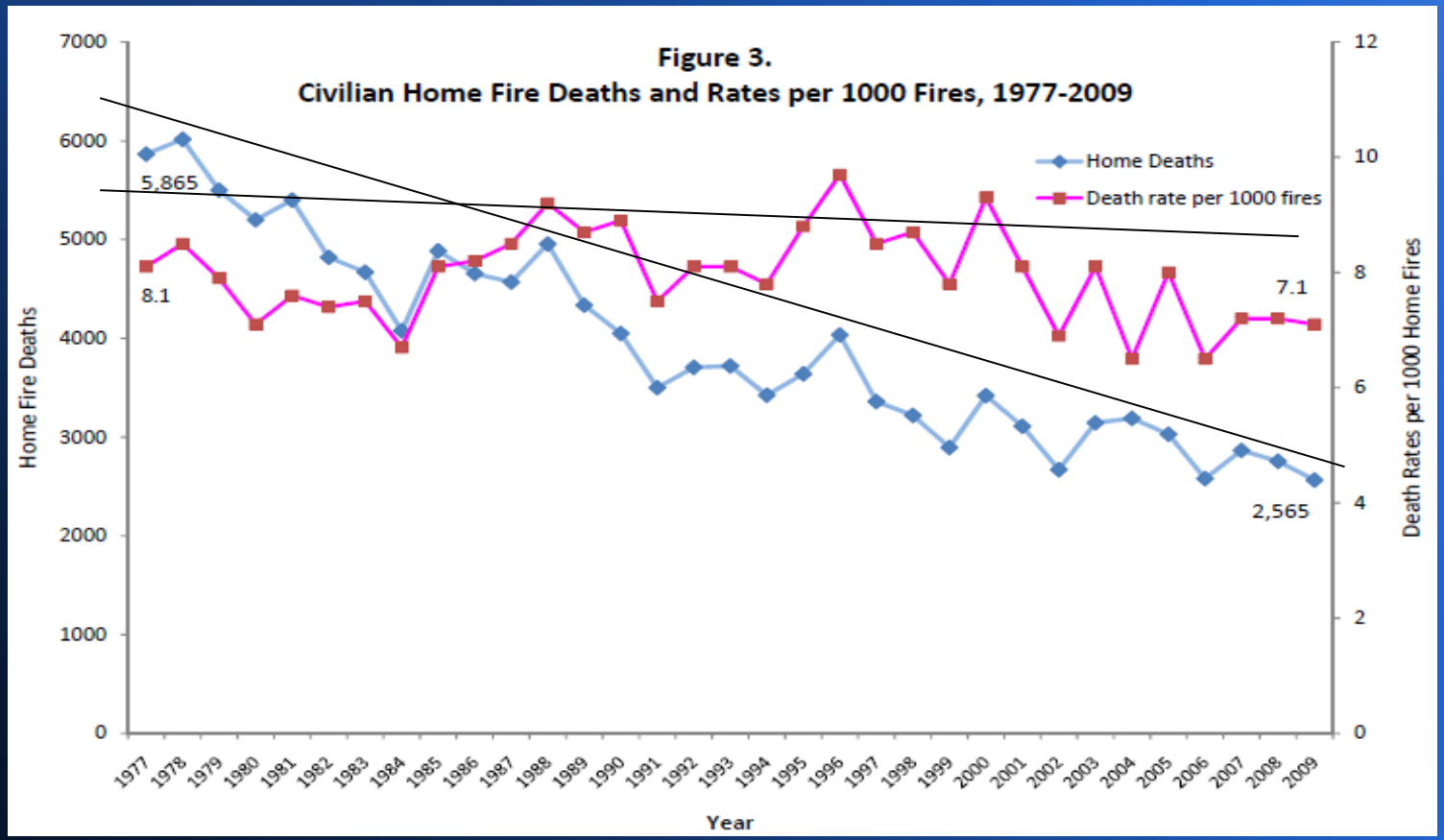
US Home Fire Deaths and Rate Per 1,000



Source: NFPA Fire Loss 2009

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Overall for the 1977-2009 period, the number of home fire deaths decreased from 5,865 in 1977 to 2,565 in 2009 for a decrease of 56%. The number of home fire incidents also declined steadily for an overall decrease of 50% for the same period. ***When the death rate per 1,000 home fire incidents is looked at (Figure 3), there is no steady decline, but rather the rate fluctuates considerably up and down. In fact, the death rate per 1,000 home fires was 8.1 in 1977 and 7.1 in 2009 for a decrease of 12%***. These results suggest that even though the number of home fires and home fire deaths declined similarly during the period, the death rate did not, and when there is a home fire, ***the fire death rate risk has not changed much for the period***.

Source: NFPA Fire Loss 2009 / Pg 7-8

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1977-2009 Fire deaths decreased from ***5,865*** to ***2,565*** a decrease of ***56%***

1977-2009 The number of home fire incidents decreased of ***50%***

There is a decline death rate per 1,000 home fire of 12% for same period from 8.1 to 7.1

"Even though the number of home fires and home fire deaths declined similarly during the period, the death rate did not"

Source: NFPA Fire Loss 2009

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When there is a home fire,
the fire death rate risk has not changed much for the period.

Source: NFPA Fire Loss 2009 / Pg 7-8

Yet *Between 1977 and 2009 Hundreds of Millions of Residential Smoke Alarms Were Installed in the US.*

In 1977, Around 22% of Homes Had At Least One Alarm
By 2009 Around 96% of Homes Have At Least One Alarm

Source: NFPA Fire Loss 2009/US Home Fires 2011

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- 1977: Fires: 5,865 / Deaths / 1,000: 8.1
- 2009: Fires: 2,565 / Deaths / 1,000: 7.1
- Variance in Deaths, Per 1,000 Over 1977-2009

High Approx 10
Low Approx 6.5

Source: NFPA Fire Loss 2009

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For Every One Residential Fire Death Approximately Five People Are Injured

- Many Injured Are Maimed/Scarred, Have Permanent Respiratory Damage, Etc
- Injuries In Apartment Fires Are Higher – Roughly Nine to Ten Injuries Per Death

Source: NFPA Fire Loss 2009

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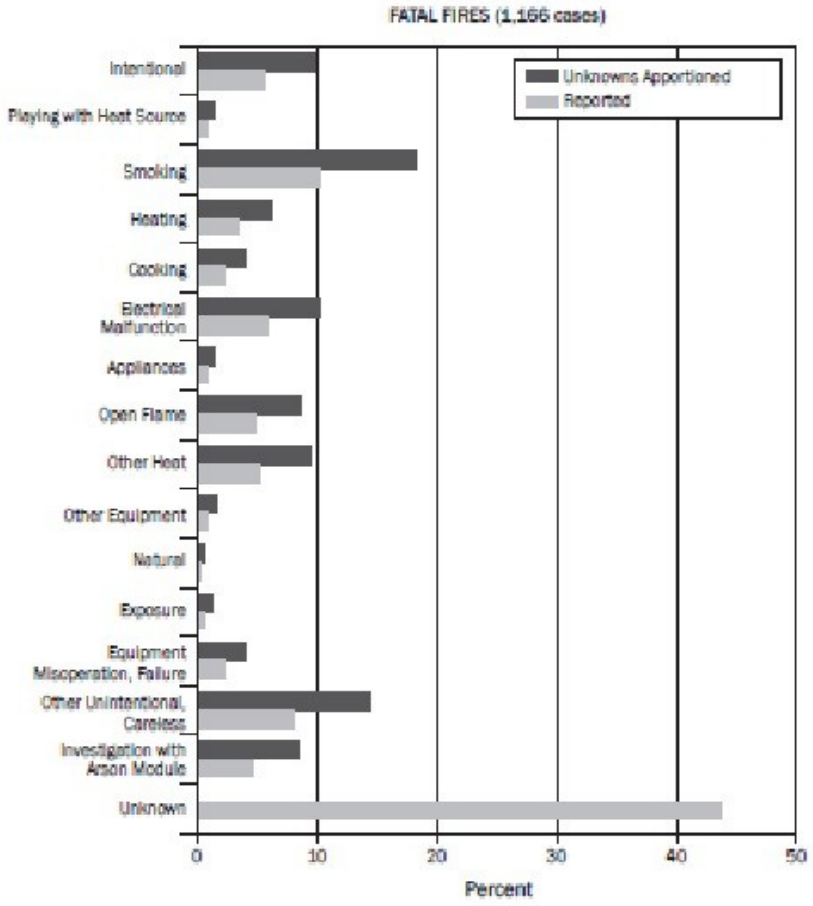
***Fatal** Fires By Source/Type from NFPA 2007 Fire Loss Study*



Cause	Reported	Unknowns Apportioned
Intentional	5.6	9.9
Playing with Heat Source	0.9	1.5
Smoking	10.3	18.2
Heating	3.5	6.2
Cooking	2.2	4.0
Electrical Malfunction	5.8	10.3
Appliances	0.8	1.4
Open Flame	4.9	8.7
Other Heat	5.3	9.4
Other Equipment	0.9	1.7
Natural	0.3	0.6
Exposure	0.7	1.2
Equipment Misoperation, Failure	2.3	4.1
Other Unintentional, Careless	8.1	14.4
Investigation with Arson Module	4.7	8.4
Unknown	43.6	0.0

Note: Dark Bar Is Unknown Fire Type - 43% Is Reapportioned to Know Types

Cooking/Open Flame Fires Estimated At 12.7%

Smoking Estimated at 18.2%

Heating & Other Heat ncludes Space Heaters At 15.6 %

Other Careless At 14.4%

Source: NFPA Fire Loss Study

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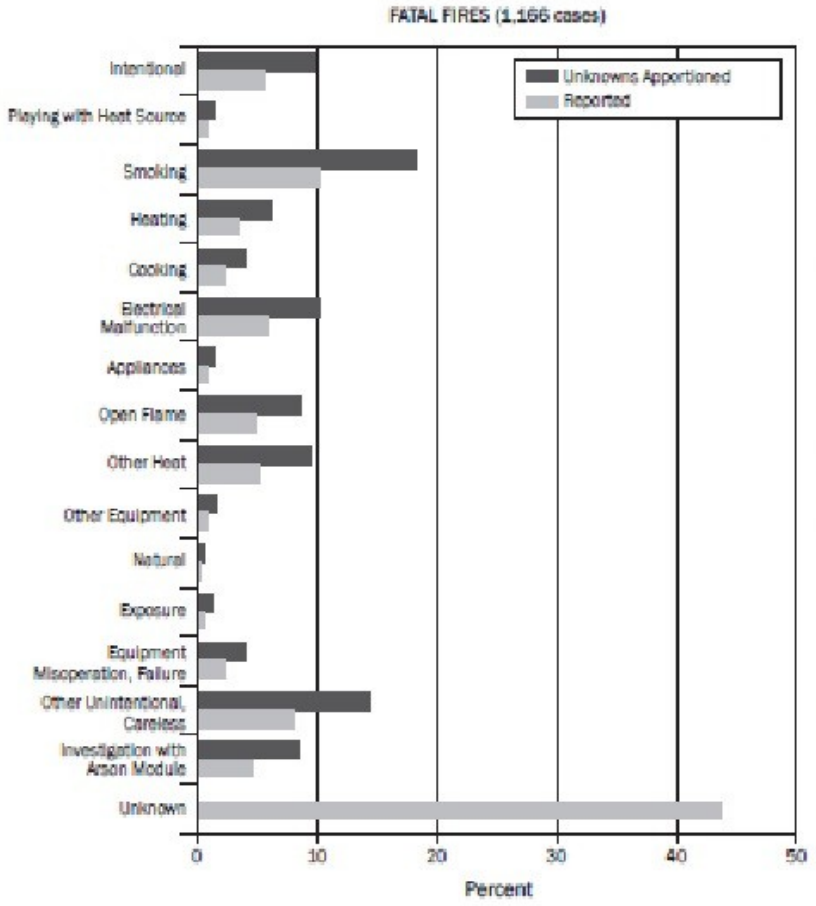
*Fire **Injuries** By Source/Type from NFPA 2007 Fire Loss Study*



Cause	Reported	Unknowns Apportioned
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Unknown	43.6	0.0

Note: Dark Bar Is Unknown Fire Type 43% Is Reapportioned to Know Types

Cooking/Open Flame Fires Estimated At 36.5%

Smoking Estimated at 7%

Heating & Other Heat ncludes Space Heaters At 11.9 %

Other Careless At 11.3%

Source: NFPA Fire Loss Study

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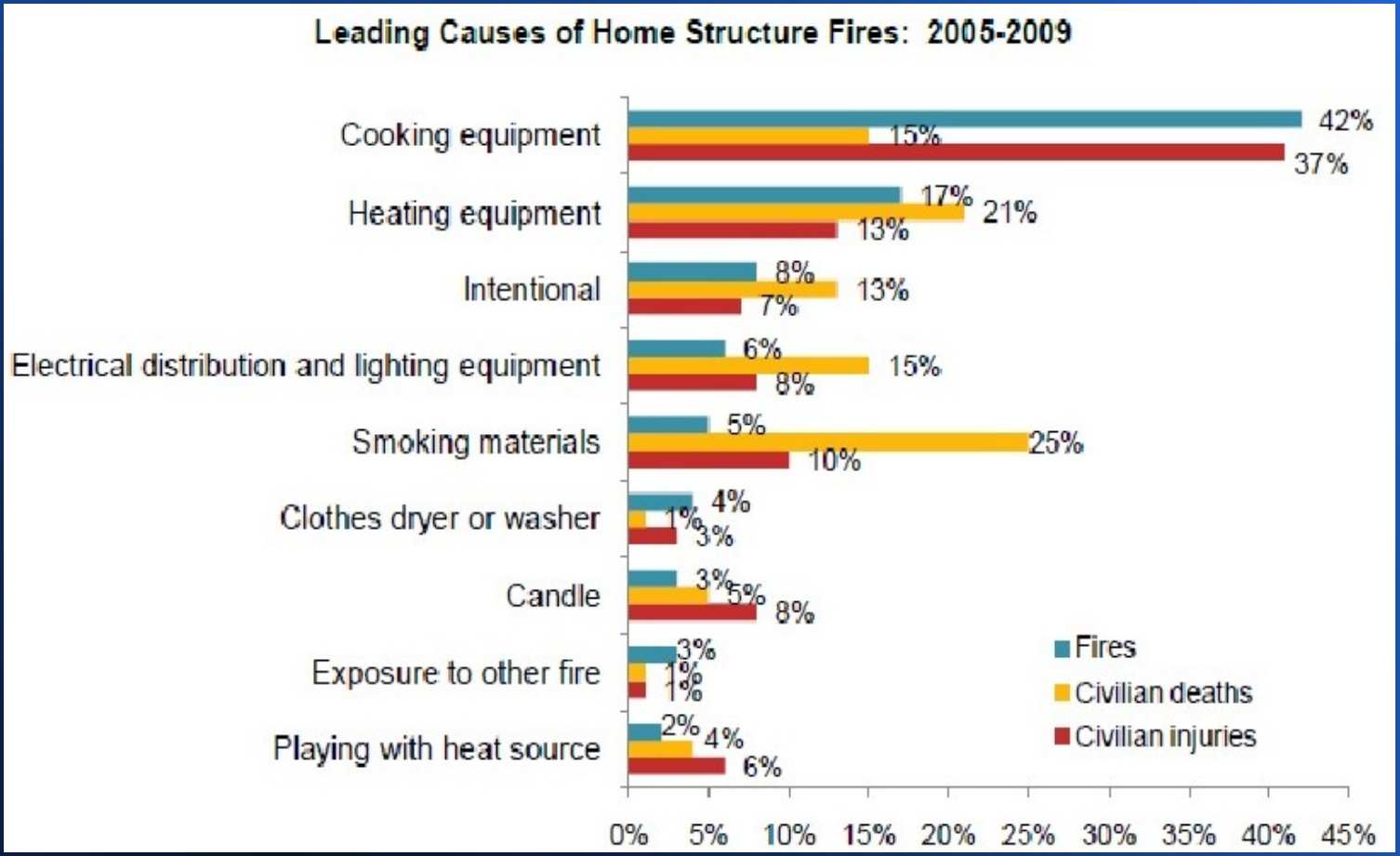

Cooking/Open Flame Fires Estimated At 42% of Fires/15% of Deaths/37% of Injury

Smoking Estimated at 5% of Fires/25% of Deaths/10% of Injuries

Heating & Other Heat includes Space Heaters At 12% of Fires/21% of Deaths/13% of Injuries

Electircal 6% of Fires/15% of Deaths/6% of Injuries

Source: NFPA Home Structure Fires 2011

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- Cooking Fires Generally Open Flame/Fast Flame Fires
- Account For Largest Portion of Injuries but a Smaller Portion of Deaths
- Injured Person Is Generally “Intimate” With Fire
  - Intimate = Present
- Injuries Related to Surpressing Fire or Grease Etc
- Some Argue That Smoke Alarms Offer No Protection Since You Don't Need It To Tell You That Your Stove Is On Fire If You Are Cooking

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- Smoking/Heater/Electrical Related Fires = Smoldering Fires
- Accounts For Largest Portion of Deaths and Smaller Portion of Injuries
- Injured Person Is Generally Unaware of Fire
- Injuries Related to Slow Exit, Smoke Inhilation, Return/Heroics, Etc

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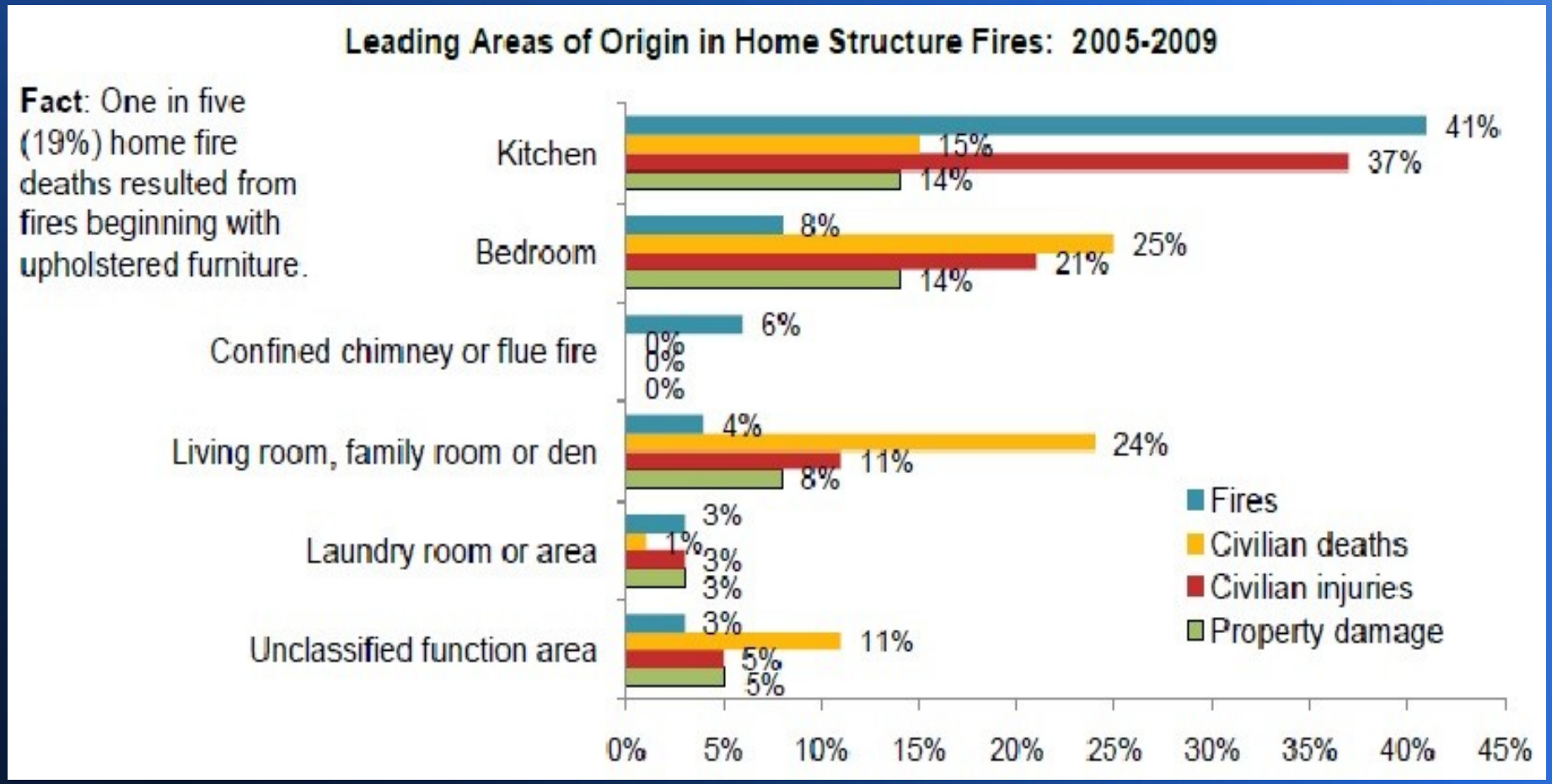

Source: NFPA Home Structure Fires 2011

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- Kitchen Fires Account For:
  - 41% of Fires
  - 15% of Deaths
  - 37% of Injuries

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- Living Room/Family Room/Den/Bedroom Fires Account For:
  - 12% of Fires
  - 49% of Deaths
  - 32% of Injuries

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Roughly 1 Out of Every 5 Deadly Fires Started in Upholstered Furniture

These Are Almost ALL Smoldering Fires

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Other Deadly Fire Criteria

- Smoking is Leading Fatal Fire Cause
- Time of Day Matters
- Age Plays a Strong Role
- Location – Death Rates Vary By State

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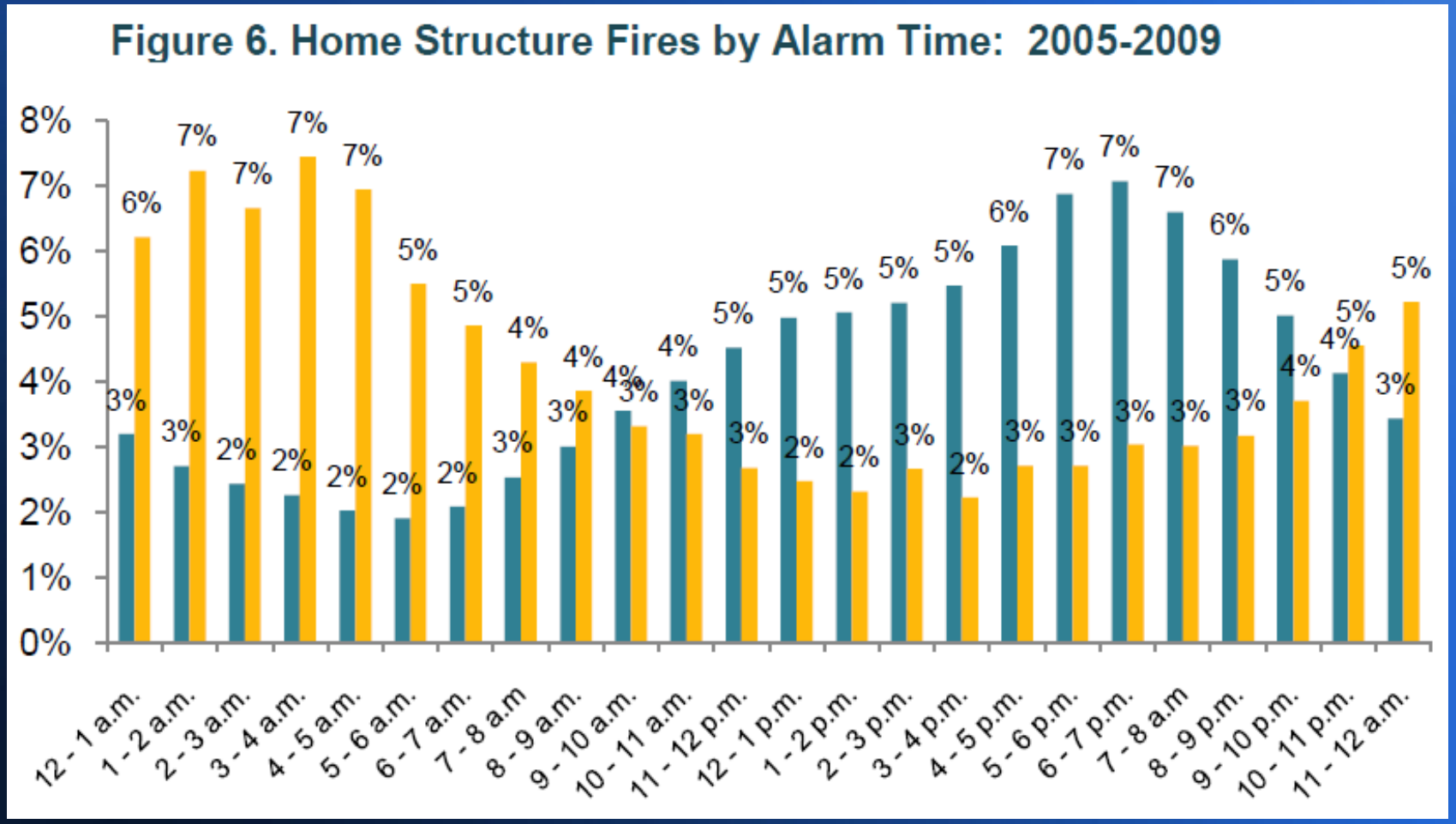

Source: NFPA Home Structure Fires 2011

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Time of Day Matters

- 37% of Fires Occur Between 8 PM & 8 AM
- 66% of Fire Deaths Occur Between 8 PM & 8 AM

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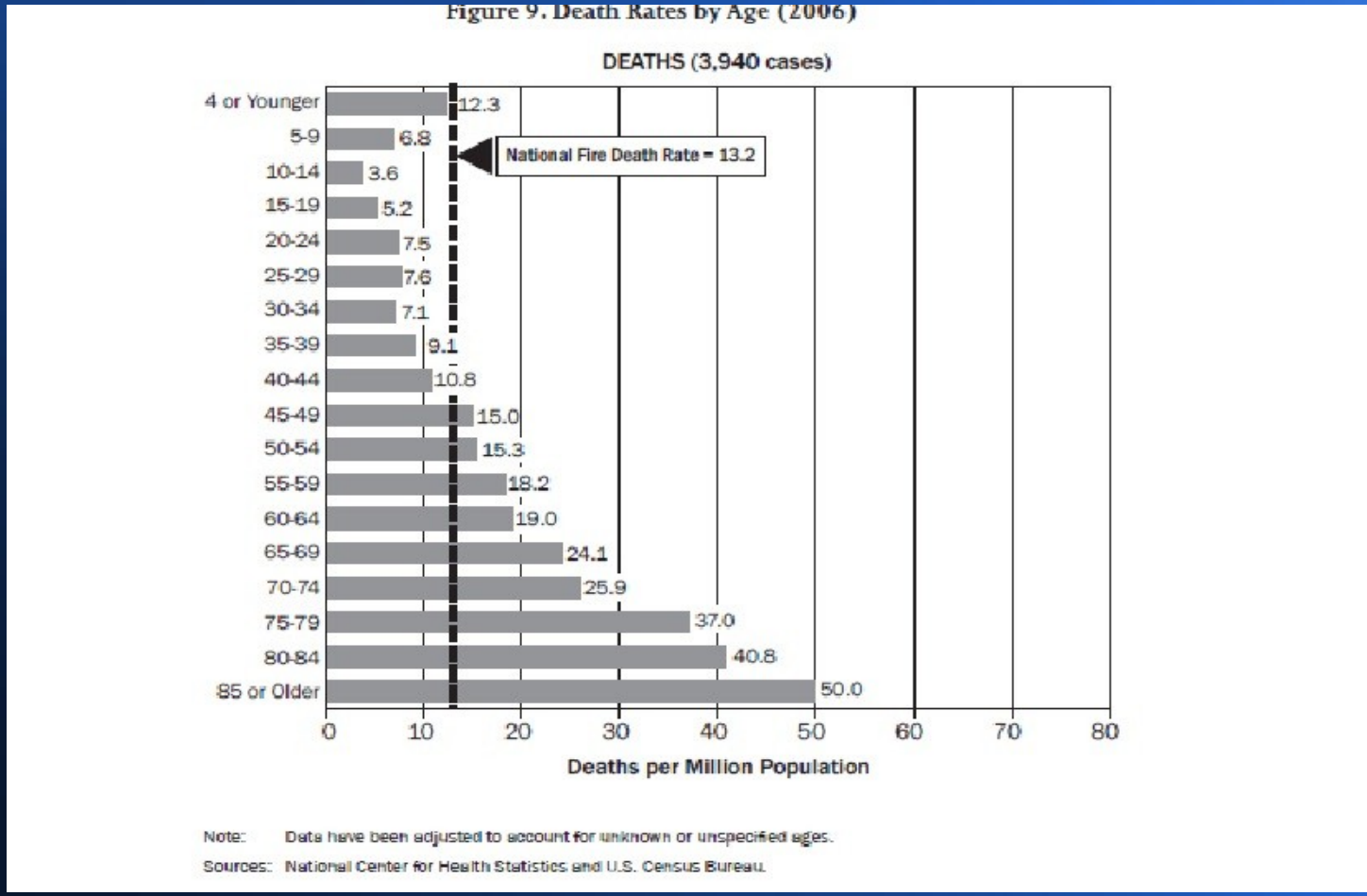

Source: NCHS/US Census Bureau

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Age Impacts Survival Rate

- National Average Death Rate = 13.2/Million
- Children 4 or Younger at Risk = 12.3/Million
  - That Is 2x-3x The Rate for 5-14 Years Old
- "Older" Folks = 65+ Highest Risk
  - 85+ Highest Risk = 50/Million

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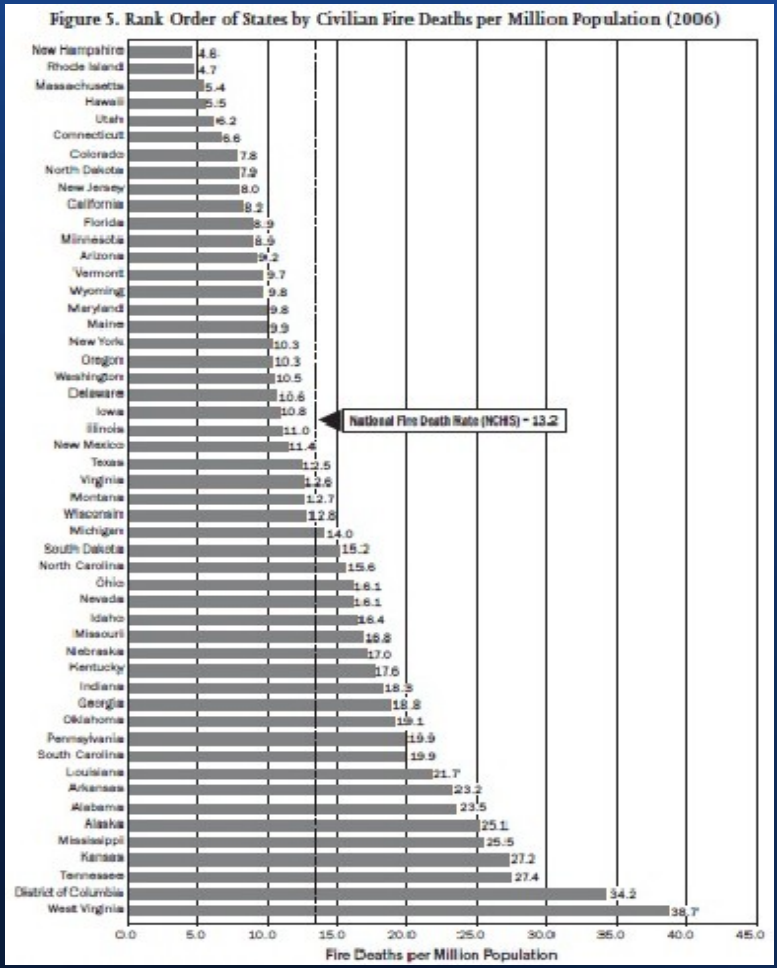

New Hampshire = 4.6 Frie Deaths Per Million
Rhode Island = 4.7 Frie Deaths Per Million

California = 8.2
Minnesota = 8.9

Illinois = 11.0

Wisconsin = 12.8

National Average = 13.2 Per NCHS

Beware:
District of Columbia = 34.2
West Virginia = 38.7

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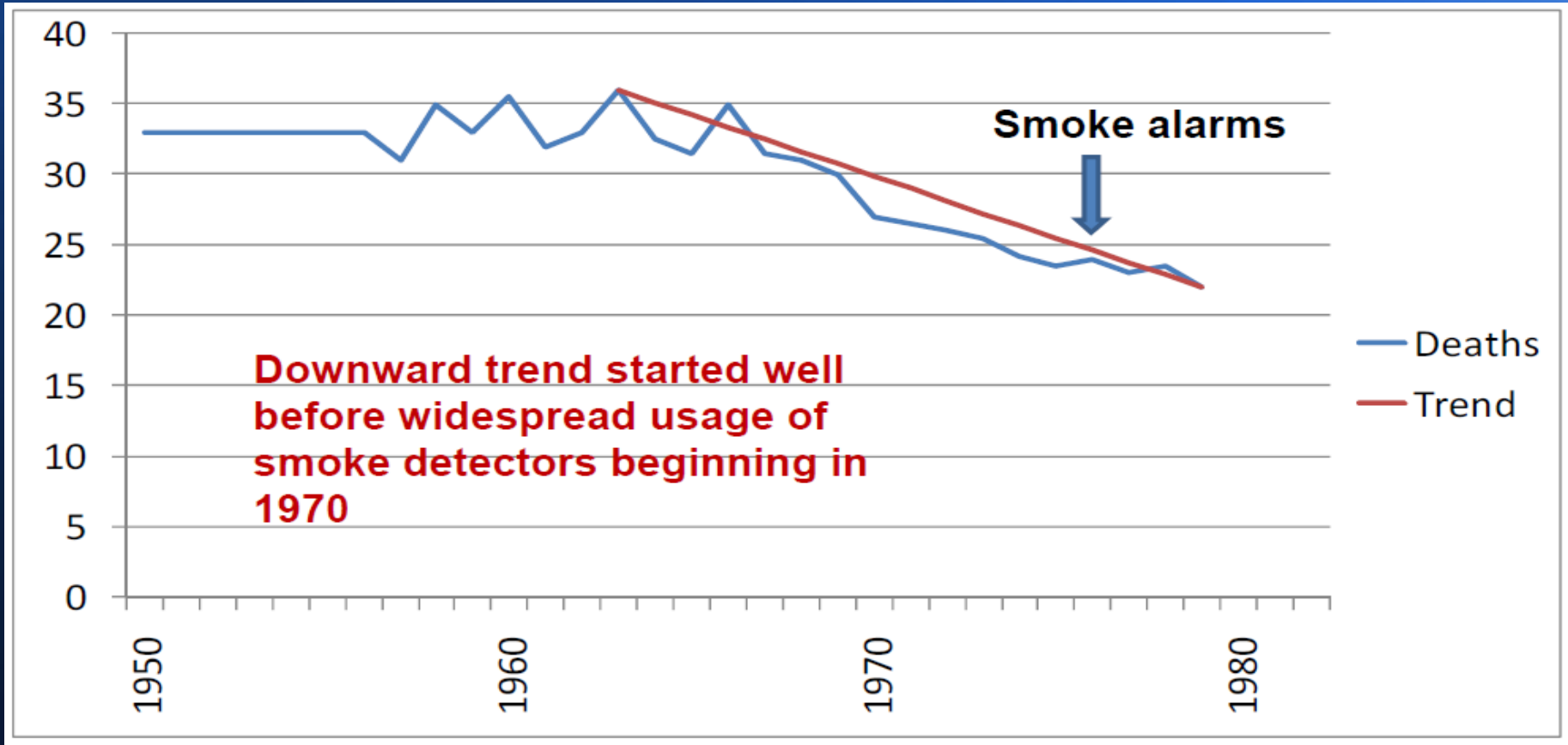
Fire Deaths Per Million Population 1950-1980



Source: National Safety Council

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The Bottom Line:

There Are Fewer Fire Deaths

Because There Are Fewer Fires.....

There Are *Many* Reasons For The Decline

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Factors Contributing to Reduction in Residential Fires:

- Significant reduction in people who smoke
- Fire retardants have been added to mattresses and furniture
- Building codes and inspections have improved
- Improvements in electrical wiring and fire related construction
- Home-heating deaths have decreased by over 70%
- Dramatic increase in full spectrum burn centers
- Firefighters Use of SCBA

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Significant Reduction in People That Smoke:

Smoking Population 1970 : 37.4%*

Versus

Smoking Population 2010: 19.3%*

Decrease of 48.4%

Sources: ** US Center for Desease Control **(CDC)***

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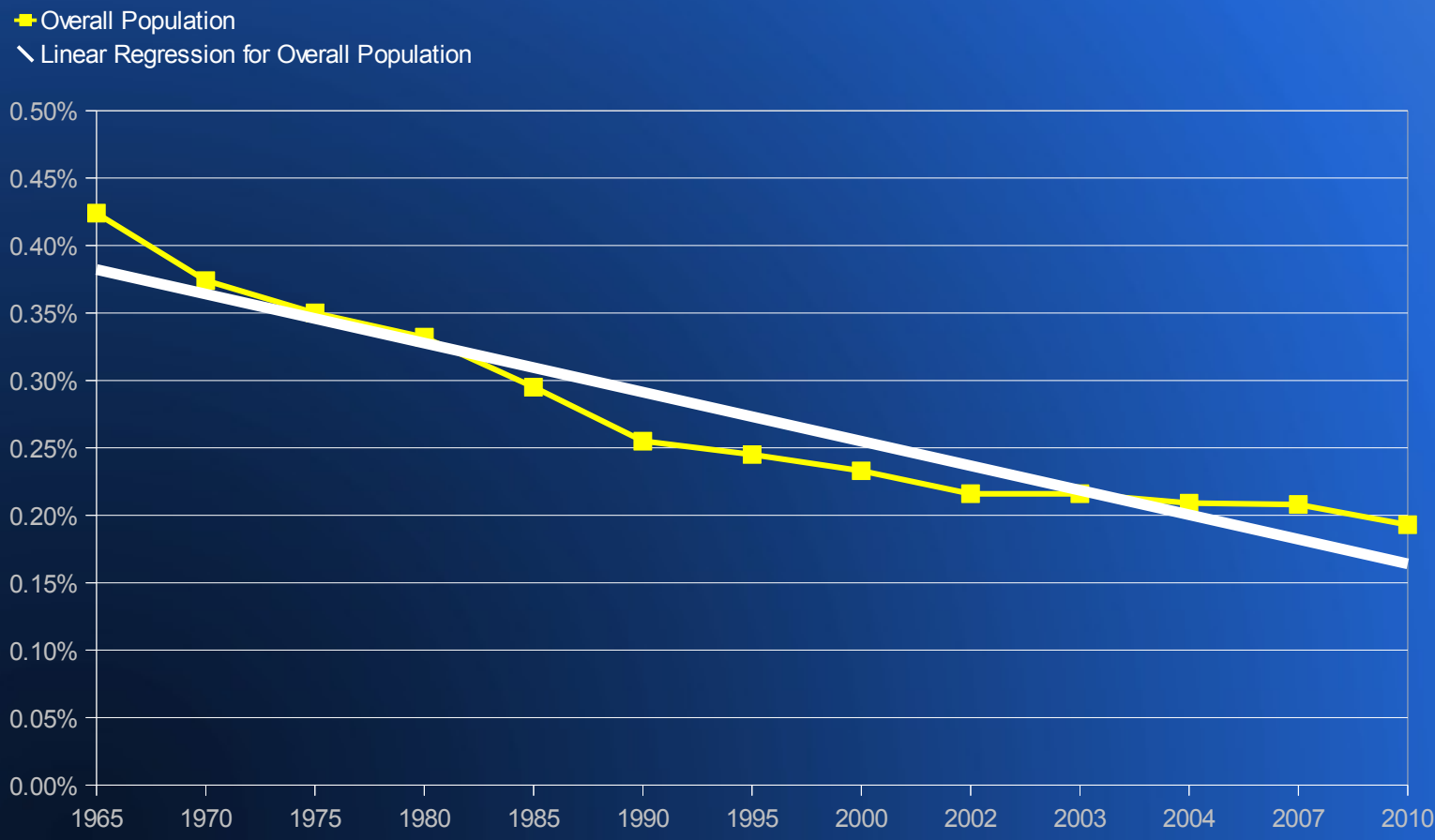
Estimated Smokers In US – Overall Population



Source: US Center for Desease Control

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Fires Invloving People That Smoke:

Smoking Related Fire Victims Are 3x More Likely to Be Intimate with Fire

- Proximity to Fire Means Less Likely to Be Saved By Smoke Alarms, Etc
- Most Smoking Fires and 2/3's of Deaths Invlove Trash, Matresses, Bedding, Upholstered Furniture
- In Smoking Fires – 25% of Victims Were Not The Smoker
- 34% of Other Victims Were Children
- 25% Were Neighbors (From Adjecent Units) or Friends
- 14% Were Spouses

Sources: US Fire Administration "Behavoiral Mitigation of Smoking Related Fires" FA-302 Feb 2006

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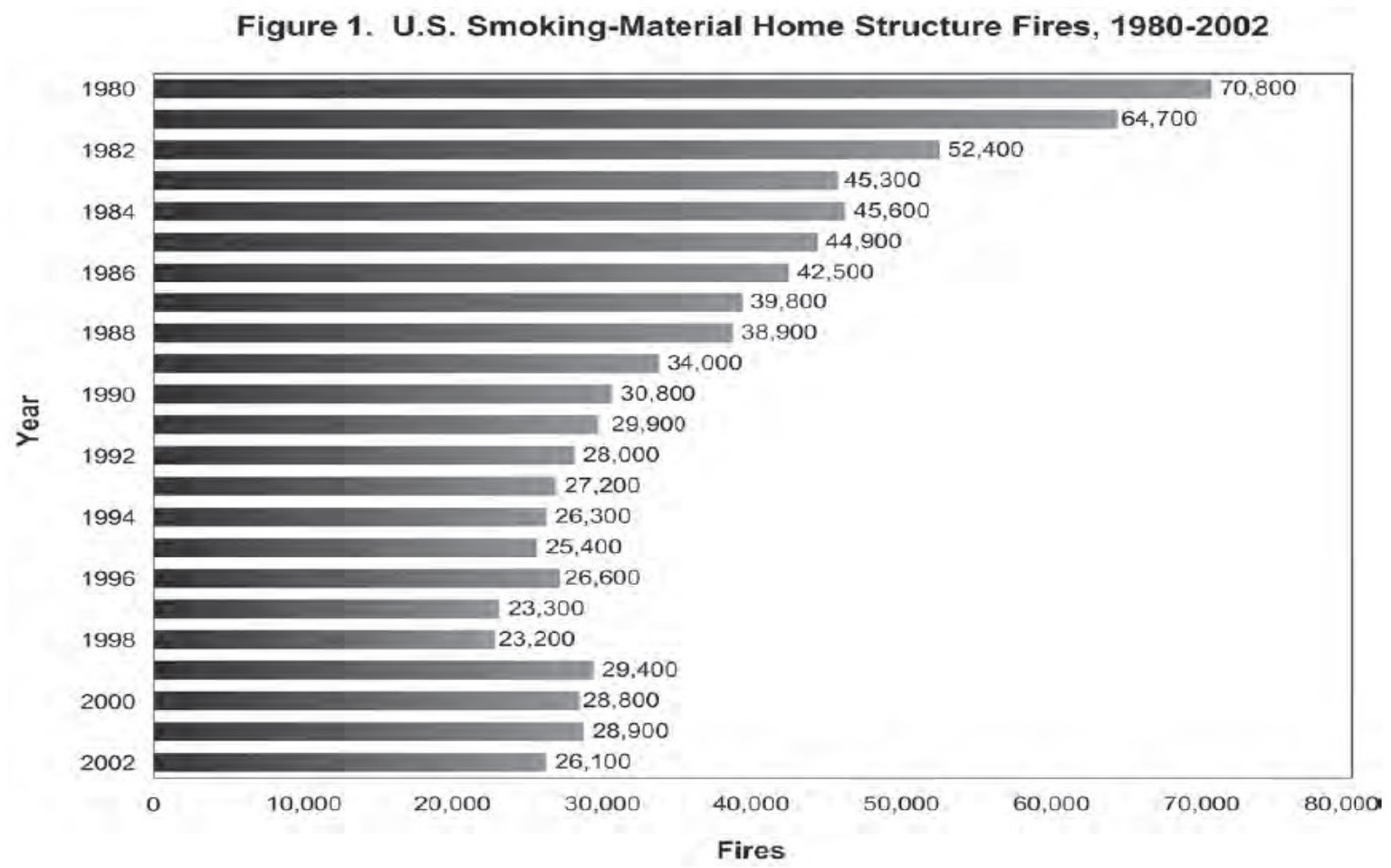

Sources: US Fire Administration "Behavoiral Mitigation of Smoking Related Fires" FA-302 Feb 2006

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Fire Retardants Added to Mattresses, Furniture. Etc:

Long-Term Impact Fire Retardants Seen in Rising Number of Fires Begining with Ignition Other than Upholstered Furniture, Mattresses, or Bedding

Fatal Smoking Fires NOT Starting in Upholstered Furniture, Mattresses, or Bedding:

- 15% of Total in 1980
- 20% of Total in 1990
- 29% of Total in 2000

Sources: US Fire Administration "Behavoiral Mitigation of Smoking Related Fires" FA-302 Feb 2006

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Improved Building Codes and Inspections:

- Additional Requirements for Fire-Blocking, Draft-Stopping
- Separation Requirements Between Heavy Fire Load Areas and Living Spaces
- Generally More Sophisticated Inspectors

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Improvements in Electrical Wiring & Fire Related Construction:

- 90% of Electrical Fires Occur in Homes That Are 10 Years Old or Older (NFPA 73)
- Better Understanding of Fire Progression

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Home-heating deaths have decreased by over 70%:

- Safer Gas and Electric Heat Appliances
- Safety Devices on Portable Electric Heaters, etc

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Dramatic Increase in Full Spectrum Burn Centers:

1975: 12 Full Spectrum Burn Care Units in US

1999: 100 Burn Care Units with 25 Full Spectrum Burn Care Units

"On a yearly basis, deaths, once the victim has been placed into the burn care system, have decreased from around 4,000 to 1,000."

Source: FEMA: America Burning: Recommisioned, May 2000

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Firefighters Use of SCBA:

"It has been my personal experience that Fire Fighters SCBA has made a significant contribution to victims survival rate."

**SCBA = Self Contained Breathing Apparatus*

Source: Photoelectric & Ionization Smoke Alarms Re-Visited
Jay Fleming, Deputy Fire Chief, Boston MA, Dec 2010

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Let's Look At Smoke Alarms

Skip Walker, MCI, ACI

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Brief History of Smoke Alarms:*

1929: Walter Kidde Obtains First UL Listing for Shipboard Smoke Detector

1955: First Fire Alarms – Uses Heat Cue

1960's-1970's: Studies Determine That Smoke Sensors More Effective Than Heat

1965: First Single-Station Smoke Alarm – 120 VAC Photoelectric

1967: NFPA Founded

1970: First 9 Volt Powered Single Station Alarm Invented – Ionization Type

Mid-1970's: Smoke Alarm Sales Acelerate

1976: NFPA 101 – Life Safety Code Requires Smoke Alarms in Single Family Homes

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Brief History of Smoke Alarms:*

1973-1979: Model Codes Require Smoke Alarms in 1 & 2 Unit Dwellings

Mid-1970's: FHA/VA Require Smoke Alarms to Qualify for Funding

1976: UL 217 Smoke Alarm Test Developed

1977: Indiana Dunes Smoke Alarm Tests Conducted

1978: NFPA 74 Requires Every Level Coverage

1980: Half of US Homes Have at Least One Smoke Alarm

1982: Two-Thirds of US Homes Have at Least One Smoke Alarm

1984: Three-Quarters of US Homes Have at Least One Smoke Alarm

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Brief History of Smoke Alarms:*

1984: Model Codes Require One Alarm Per Level

1985: UL 217 Sensitivity Level Lowered to Reduce Nuisance Tripping

1988: Model Codes Begin Requiring Smoke Alarms in Bedrooms and Interconnected in New Construction

1989: NFPA 74 Requires Smoke Alarms to Be Interconnected in New Construction

1993: NFPA 72 Requires Smoke Alarms in Bedrooms in New Construction

1995: 10 Year Lithium Battery Smoke Alarm Introduced

1999: NFPA 72 Requires Replacement of Smoke Alarms After 10 Years

2009: Homes with at Least One Smoke Alarm - Approximately 95%

**Primary Source: White Paper, Priviate/Public Fire Safety Council, April 2006*

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Smoke Alarms/Detectors in Residential Construction

Smoke Detector:

Sensor Only, Connected to a Central System with Separate Announciator/Horn

Smoke Alarm:

Single Station, Sensor and Announciator/Horn in Single Package

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Smoke Alarms/Detectors in Residential Construction

In Residential Construction, The Two Smoke Alarm Sensor Technology Types Most Commonly Found Are:

Ionization

Photoelectirc

Skip Walker, MCI, ACI

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Ionization Alarms:

Most Prevalent Alarm Sensor Type in US Market

Approximately 95% of Single Station Alarm Installations

Uses a Small Amount of Radioactive Material to Charge Air, Particles in Air Disrupt Currrent Flow and Set Off Alarm

Detects Small Particle Sizes Well, .3 Micron and Less

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Ionization Alarms:

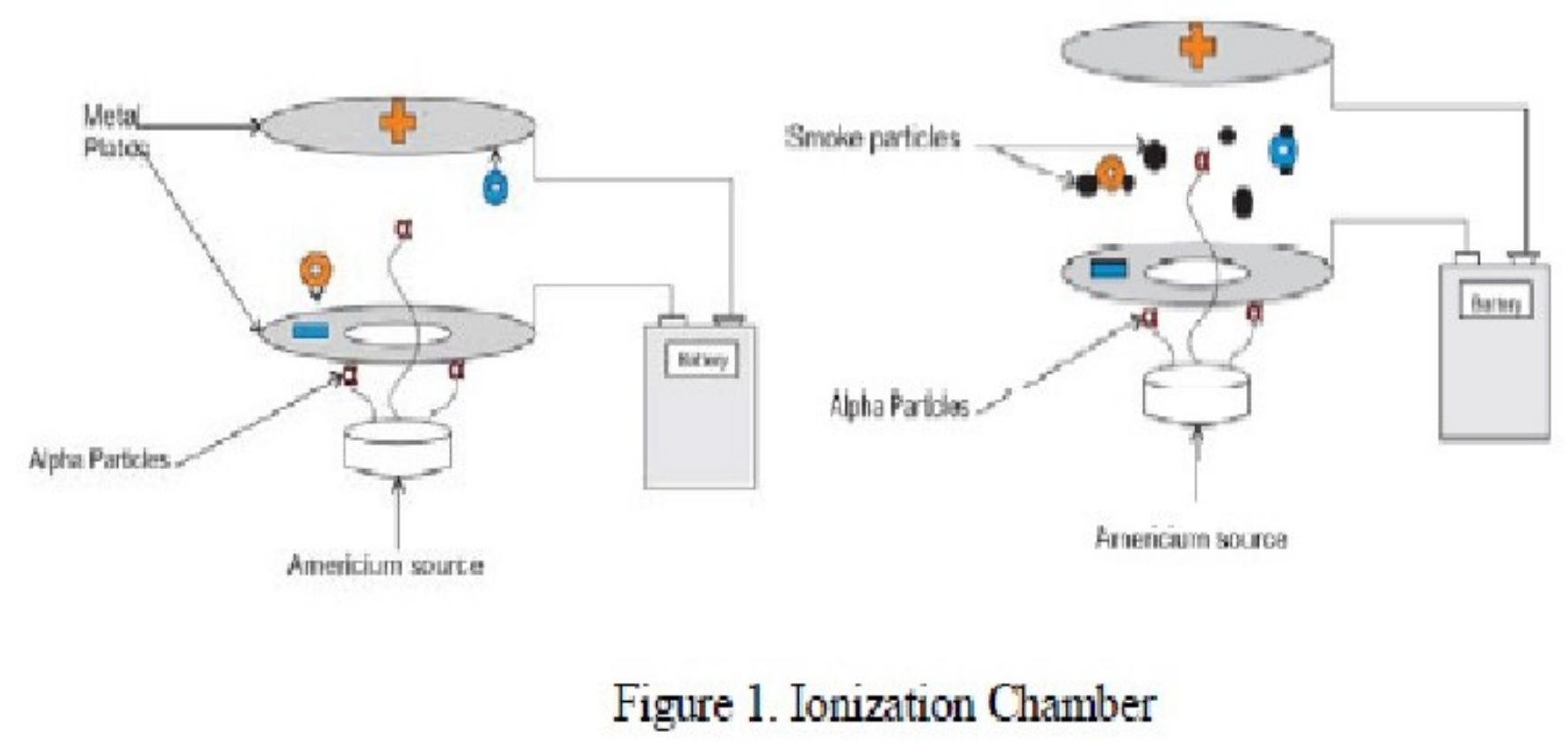


Figure 1. Ionization Chamber

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Photoelectric Smoke Alarms:

In US Market, Low Market Share

Approximately 5% (Estimate) of Single Station Alarms

Uses an LED Light Source and Sensor

Smoke Particles in Air Scatter Light onto Sensor and Set Off Alarm

Detects Larger Particles Best, .5 Micron and Up

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Photoelectric Smoke Alarms:

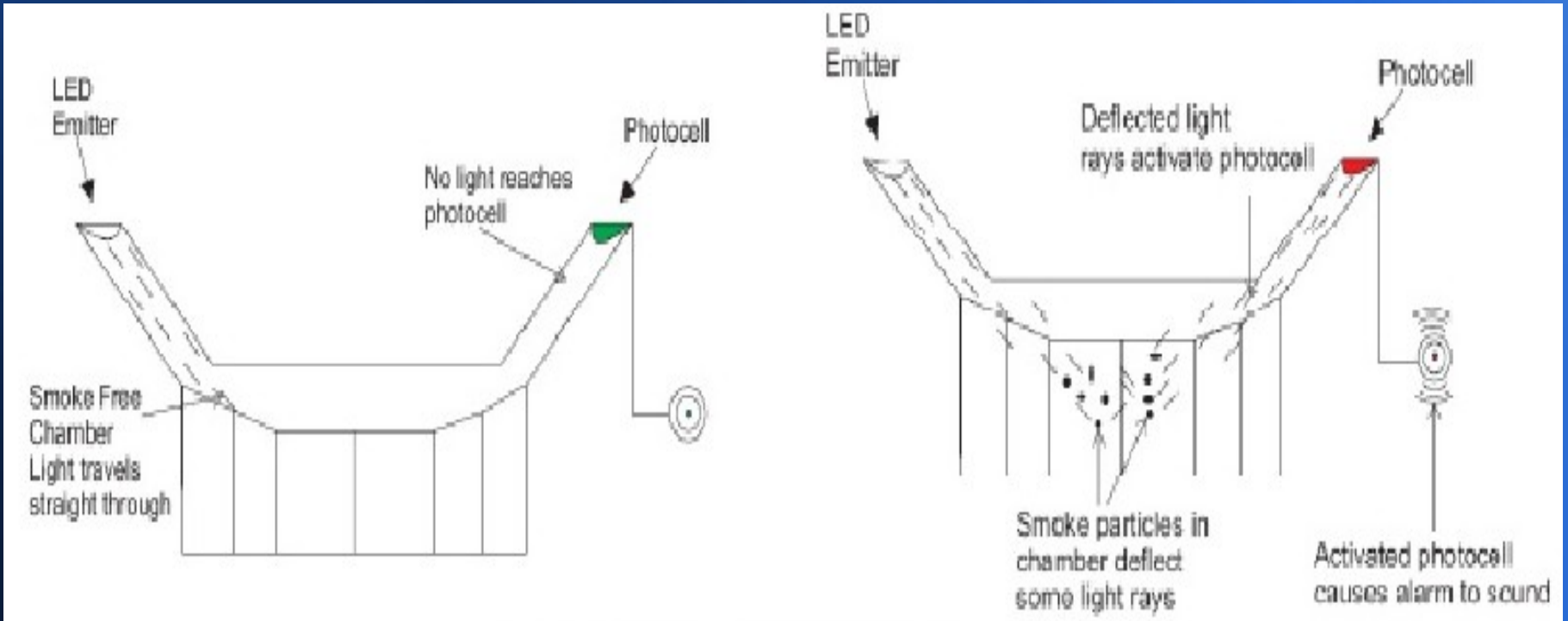


Figure 2. Photoelectric Chamber

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Differences Between Alarm Sensor Types:

Ionization:

Detects Small, Fast Moving Particles Best

Poor at Detecting Large, Slow Moving Particles

Color and Density – Realatively Insensitive

Nuisance Tripping: High

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Differences Between Alarm Sensor Types:

Photoelectric:

Detects Medium/Large Particles Best

Less Sensitive to Small Fast Moving Particles

Color and Density – Insensitive to Colorless, Low Sensitivity to Black Particles, Detects Smoke Density Well

Nuisance Tripping: Low

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Fire Types:

Fast Flame Fires:

Flames Visible, Short Duration

Found in Cooking Fires, Accelerant Based Fires, Last Stage Smoldering Fires

Generates Small Fast Moving Particles

Alarm Test Used: UL 217

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Fire Types:

Smoldering Fires:

No Flames Visible, Long Duration

Found in Smoking Fires, Electrical Fires, Heating Fires, Upholstered Furniture

Generates Medium/Large Slow Moving Particles

Alarm Test Used: UL 268

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Tenability Criteria:

Tenability, An Estimate of When the Environment Becomes Too Hazardous to Safely Allow Egress

NIST Smoke Alarm Tests Used the Following Criteria for Tenability:

Temperature: Greater Than 88° C/190° F

CO Gas Concentration: Range: .02%-.03%

Smoke Obscuration: O.D.* Less Than/Equal to .25/M

**O.D. = Optical Density*

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Some Terms/Acronyms Used in Test Results:

ASET = Available Safe Egress Time

RSET = Remaining Safe Egress Time

Untenable = Condition Will Not Support Life Without Special Equipment

Flashover = Simultaineous Ignition of Combustile Materials In an Enclosed Area

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Now Let's Take Look at A Number of NIST/NFPA/UL/University/Canadian/UK/Norwegian Tests and Results Comparing the Performance of Ionization and Photoelectric Alarms Under Various Fire Conditions

This is Where the Rubber Hits the Road.....

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

20+ Studies/TestsArticles over a 30 year period

All Published and Available for Review

Reputable Sources

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Important Facts to Keep in Mind:

Cooking/Fast Flame Fires Account for:

42% of Fires, **37%** of Injuries and **15% of Deaths**

Smoldering Fires Account for:

23% of Fires, 29% of Injuries and **61% of Deaths**

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Important Facts to Keep in Mind:

Nearly Two-Thirds of All Residential Fatalities Occur In Homes With Either No Alarm or Non-Functional Alarms

US Homes with No Smoke Alarm Installed – About 4%

That Means That 96% of No Functional Alarm Fire Deaths Occur in Homes with Smoke Alarms That Are Not Functional

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

<u>Important Facts to Keep in Mind:</u>

<u>UL 217 Flaming Test:</u>

Alarm Must Trigger at .5%-4.0%/ft O.D.

Alarm Must Trigger Within 240 sec

Induced Air Flow Across Alarm at 32/fpm – 1.6M/s

<u>UL 268 Non-Flaming Test:</u>

Alarm Must Trigger at .5%-10.0%/ft O.D.

Note: O.D. = Optical Density

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Test/Study:

Agency:	***LA Fire Department***
Year:	*1960*
Used Synthetic Material:	*No*
Duration of Smoldering Test:	*N/A*

Comments: Test comparing Heat Detectors to Older Photoelectric Technology

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Test/Study:

Agency: ***National Research Council of Canada***

Year: *1963*

Used Synthetic Material: *N/A*

Duration of Smoldering Test: *N/A*

Comments: Study with no testing. Used judgement to estimate potential effectiveness of detectors

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Test/Study:

Agency:	***Bloomington Mn Fire Depart***
Year:	*1969*
Used Synthetic Material:	*No*
Duration of Smoldering Test:	*N/A*

Comments: Remote Smoke Detectors Better than Heat Detectors. Used Older Technology

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Test/Study:

Agency: ***Japan Housing Corp***

Year: *1974*

Used Synthetic Material: *Unknown*

Duration of Smoldering Test: *Unknown*

Comments: Smoke Detectors Better than Heat Detectors. Used New Photo Technology

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Test/Study:

Agency:	***Factory Mutual Study (Heskestad)***
Year:	*1974*
Used Synthetic Material:	*Yes*
Duration of Smoldering Test:	*> 30 Mins*
Comments:	*Ion Good for Flaming/Bad for Smoldering* *Photo Good for Smoldering/Bad for Flaming*

Ion Flaws Inherent/Not Fixable

Photo Flaw Fixable by Correcting Smoke Entry Issues – Was Fixed in Early 80's

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Test/Study:

Agency: ***Indiana Dunes Test***

Year: *1976*

Used Synthetic Material: *No*

Duration of Smoldering Test: *> 30 Mins*

Comments: *Smoke Detectors Better Than Heat Detectors, One Per Level Desirable*

Note: Dunes Test Was Actually Three Separate Tests

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Test/Study:

Agency: ***Massachusets Analysis of Dunes Test***

Year: *1976*

Used Synthetic Material: *N/A*

Duration of Smoldering Test: *N/A*

Comments: *Anaysis of Dunes Data Only - A Detector Per Level Will Provide 3 Min Escape Time 89% of Time*

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Test/Study:

Agency:	***Edmonton Fire Dept Test***
Year:	*1976*
Used Synthetic Material:	*Unknown*
Duration of Smoldering Test:	*> 60 Mins*

Comments: Both Ion and Photo improve life safety/survival rates

In smoldering fires, Ion's may go off too late

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Test/Study:

Agency: ***Minneapolis Fire Dept Test***

Year: *1978*

Used Synthetic Material: *Yes*

Duration of Smoldering Test: *< 10 Mins*

Comments: Both Ion and Photo's gave good early warning if smoke could reach detector

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Test/Study:

Agency:	***Cal Chiefs/LA Fire Dept Test***
Year:	*1978*
Used Synthetic Material:	*Yes – Modern Furniture Used*
Duration of Smoldering Test:	*> 30 Mins*

Comments: Smoke Detectors More Reliable than Heat Detectors. NIST Concluded Both Adequate. LAFD & IAFC Favored Photo's Based on Results

Note: IAFC = International Association of Fire Chiefs

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Test/Study:

Agency:	***UK Fire Res Station Test***
Year:	*1978*
Used Synthetic Material:	*Yes*
Duration of Smoldering Test:	*> 30 Mins*

Comments: Both Ion & Photo Smoke Detectors Respond Rapidly to Flaming Fires. Ion's Were Not Adequate in Smoldering Fires

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Test/Study:

Agency: ***Australian Dept of Housing & Construction Test***

Year: *1979*

Used Synthetic Material: *Unkown*

Duration of Smoldering Test: *Flaming Fire*

Comments: *All Smoke Detectors Better than Heat Detectors in Flaming Fires*

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Test/Study:

Agency: ***Australian Smoldering Test – Pub in Fire Tech Mag***

Year: *1986*

Used Synthetic Material: *Yes*

Duration of Smoldering Test: *< 10 Mins*

Comments: *Photo's Provide Adequate Escape Times in Most Fires. Ion's Generally Inadequate Escape Times*

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Test/Study:

Agency:	***Norwegian Fire Research Lab Study***
Year:	*1993*
Used Synthetic Material:	*Yes*
Duration of Smoldering Test:	*> 30 Mins*

Comments: Reasons to Indequate Ion's Are Inadequate for Smoldering Fires. Ion's Only 15-20 Sec Better Than Photo's in Flaming Fires. Advantage Only Benefical in Extraordinary Circumstances

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Test/Study:

Agency: ***Texas A&M Risk Anaysis of Res Fire Detector Performance***

Year: *1995*

Used Synthetic Material: *N/A – Analysis of Prior Data*

Comments: Took Previous Major Studies plus Texas A&M 2 1/2 Year Fire Simulation Study. Built a Risk Model to Estimate Failure to Alarm Rates Based on Fire Incident Reports/Types and Smoke Alarm Types

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Texas A&M Risk Anaysis of
Residential Fire Detector Performance

Final Texas A&M Report Conclusions:

Ionization Alarm Smoldering Fatality Rates: 55.80%

Photoelectric Alarm Smoldering Fatality Rates: 4.06%

Meaning About 45% in Homes with Ionzation Alarms Survive

While 96% in Homes with Photoelectric Alarms Survive

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Texas A&M Risk Anaysis of
Residential Fire Detector Performance

Final Texas A&M Report Conclusions:

Ionization Alarm Flaming Failure Rates: 19.80%

Photoelectric Alarm Flaming Failure Rates: 3.99%

Meaning About 80.2% in Homes with Ionzation Alarms Survive

While 96% in Homes with Photoelectric Alarms Survive

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Test/Study:

Agency:	***UK Smoke Alarms in Typ Dwelling – Part I***
Year:	*1997*
Used Synthetic Material:	*Yes*
Duration of Smoldering Test:	*> 30 Mins*

Comments: Ion's Cannot Be Guaranteed to Detect Smoldering Fires. Ion's Better Than Photo's in Flaming Fires. Advantage Could be Critical

Note: Fires Smoldered > 30 Mins

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Test/Study:

Agency: ***UK Practical Comparison of Smoke Alarms – Part II***

Year: *1997*

Used Synthetic Material: *Yes*

Duration of Smoldering Test: *< 15 Mins*

Comments: Both Ion's and Photo' Adequate.

Note: Fires Smoldered < 15 Mins. There Was an Unexplained Change in Way Researchers Ignited Fires

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Test/Study:

Agency:	***Simplex Study***
Year:	*2001*
Used Synthetic Material:	*UL 268 Test*
Duration of Smoldering Test:	*UL 268 Test*

Comments: Ion's Slightly Better in Flaming Fires. Photo's Provide Clear Advantage in Smoldeirg Fires.

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Test/Study:

Agency:	***Kermano Fire Study***
Year:	*2003*
Used Synthetic Material:	*Yes*
Duration of Smoldering Test:	*< 15 Mins*

Comments: Combination Alarms Worked Best. Ion's Best for Flaming Fires. Photo's Best for Smoldering Fires. All Gave Adequate Evacuation Times.

Note: Alarms Used Were UL-Canada – ULC Standard Is Different than US Standard I.e. More Sensitive

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Test/Study:

Agency:	***NIST Fire Study***
Year:	*2003*
Used Synthetic Material:	*Yes*
Duration of Smoldering Test:	*N/A – Variety of Scenarios*

Comments: "Both common residential smoke alarm technologies (ionization and photoelectric) provided positive escape times in most fire scenarios".

Note: Ion Alarms Provided a -43 sec and a +16 Escape Time in Two of the Deadliest Fire Scenarios. Positive Escape Time Does Not Equal Enough Time to Escape

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

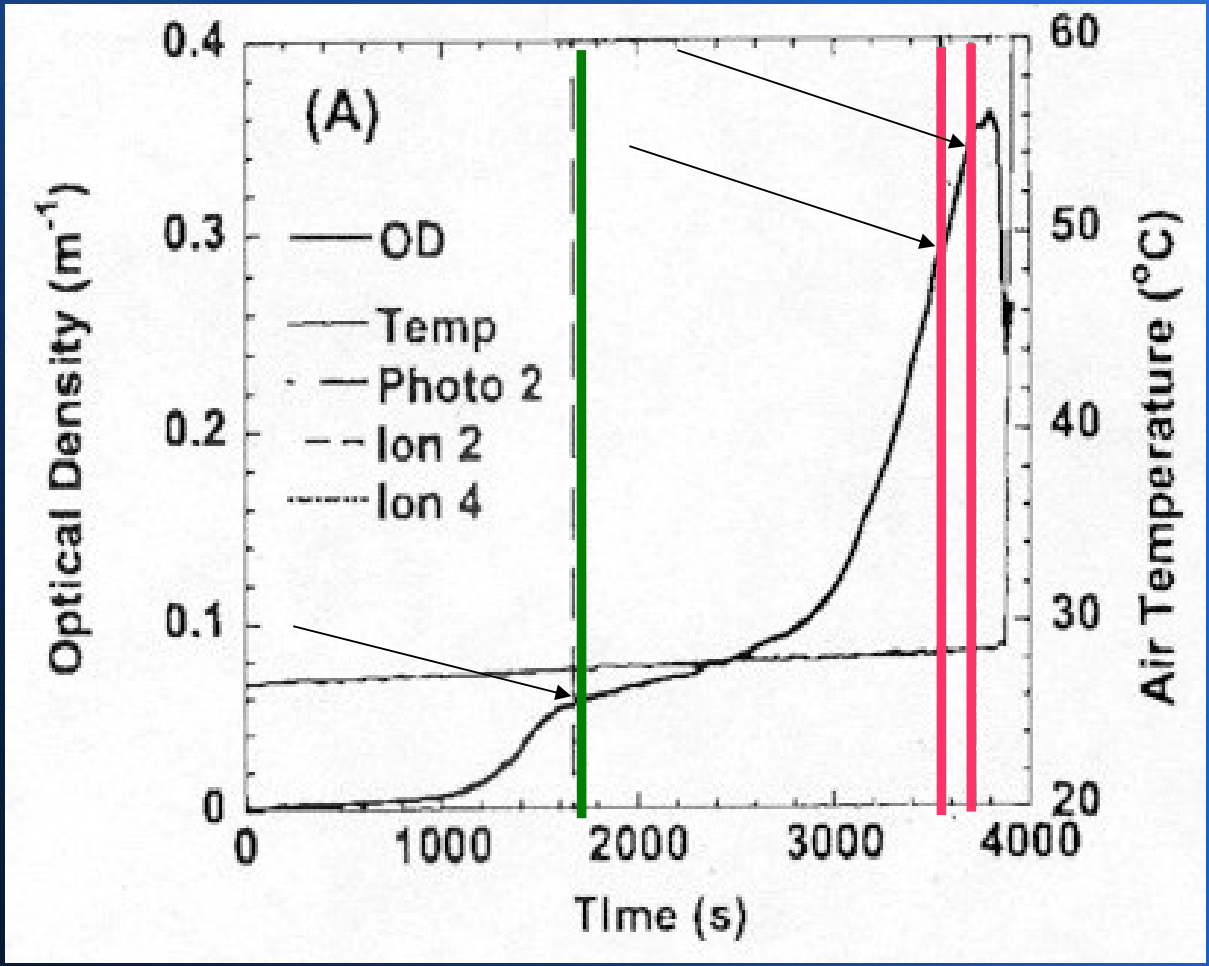
NIST 2003:

Fig 1: Test 34

Smoldering Fire

In Living Room

Note: This is one of the deadliest fire scenarios



Deadly Differences
Ionization vs Photoelectric Smoke Alarms

NIST 2003:

Data for Previous Slide – Note Ion Response Far Exceeds UL Required Upper Response Threshold of 10% O.D

TABLE 3 – RESPONSE CHARACTERISTICS (TEST 34)

DETECTOR TYPE	RESPONSE TIME	%OBSCURATION AT RESPONSE
Photoelectric	1600 secs	3-4% obsc/ft
Ionization	3550 secs	17-19% obsc/ft
Ionization	3700 secs	20-22% obsc/ft

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

NIST 2003:

TABLE 1 - AVAILABLE SAFE EGRESS TIME (PAGE 242)
(Manufactured Home)

	Photoelectric	Ionization
Flaming		
Living Room	85	142
Bedroom	58	93
Bedroom (Door Closed)	451	898
Smoldering		
Living Room	172	-43
Bedroom	1091	82
Cooking		
Kitchen	575	821

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

NIST 2003:

TABLE 2 - AVAILABLE SAFE EGRESS TIME (PAGE 243)
(Two-Story Home)

	Photoelectric	Ionization
Flaming		
Living Room	108	152
Living Room(Replicate)	134	172
Living Room(Fully Furnished)	144	172
Bedroom	---	374
Bedroom (Door Closed)	3416	3438
Smoldering		
Living Room	3298	16 ⟸
Living Room (Air Conditioned)	2772	-54 ⟸
Bedroom	135	135
Cooking		
Kitchen	952	278

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Test/Study:

Agency: ***NIST Fire Study***

Year: *2008*

Used Synthetic Material: *Variety of Materials Flame/Smol*

Comments: All Alarms Responded in Flame Tests within Stds.

Wood Smolder Test: Photoelectric alarms reached thresholds earlier and at more locations than ionization alarms

Polyurethane Foam Smolder Test: The propensity was for photoelectric alarms to reach threshold values during smoldering, and all alarms to reach thresholds after transition to flaming.

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Test/Study:

Agency: ***FEMA Smoke Alarm White Paper***

Year: *2006*

Used Synthetic Material: *N/A – Limited Field Test Only*

Comments: 24% of US Households Surveyed Had Either No Alarm or Non-Functional Alarm – Accounts for 2/3's of Fire Deaths

- *50% of Households with Non-Functional Alarms Cited Nuisance Trips as Reason for Disabling*
  Also Looked at Age, Race, Income Levels vs Risk

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

UL Smoke Characterization Project:

Fire Protection Research Foundation/UL, April 2007

The Report Cannot Be Used In Part, To Download a Copy:

http://ul.com/global/documents/corporate/newsroom/storyideas/smokecharacterizationstudy/SmokeStudyTechnicalReport.pdf

It is important to refer to Page 109, Table 25

This UL Study examines smoke characteristics for the materials used in the UL 217/268 tests plus various synthetic materials

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

UL Smoke Characterization Project:

The Study Collected Data on Smoke Characteristics such as:

Particle Size, Particle Color, Heat Generation, Gas Generation
Under UL Test Conditions

Table 25 Summarizes the Results of Residential Ionization and Photoelectric Alarm Response Times to the Materials Tested in Non-Flaming/Smoldering Conditions (UL 268)

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Test/Study:

Agency:	***UL Smoke Characterization Study***
Year:	*2007*
Used Synthetic Material:	*UL 217/UL 268 plus Synthetics*
Duration of Smoldering Test:	*Flaming/Smoldering per UL Stds*

Comments: ***See Page 109, Table 25***

Ion's Responded Best to Burnt Toast

Failed in 1 of 4 UL 217 Material Tests

Did Not Repspond to Any Synthetic Materials Within Test Requirements

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

UL Smoke Characterization Project:

Neither Alarm Type Responded to:

Polyisocyanurate Insulation, 150x150x200mm Test Pieces

Or

Smaller Test Pieces of Polyurethane Foam, 150x150x50mm Test Pieces

Above Tests Apparently Did Not Generate Sufficient Smoke Density to Trigger

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

UL Smoke Characterization Project:

Other Smoldering Fire Results:

Smoldering Ponderosa Pine, a UL 217 Test Material:

Photoelectric Alarms - 2.3% Faster (Basically the Same)

Ionization Alarms Did Not Respond in 1 of 4 UL Test Materials
A 25% No Alarm Rate

Bread/Toaster: Ionization Alarms 22% Faster Response

In ALL Other Smoldering Test Synthetic Material Scenarios:

NONE of the Ionization Alarms Triggered Within Test Parameters

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Test/Study:

Agency:	***CPSC Nuisance Trip Study***
Year:	*2010*
Used Synthetic Material:	*N/A - Cooking in Real Homes*
Duration of Smoldering Test:	*N/A*

Comments: Limited Test – 9 Home Test
8 Homes for 30 Days
1 Home for 60 Days
Combination Ion/Photo Twice as Likely to Nuisance Trip at 5 Feet Than Either Ion/Photo Only

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Other Issues Impacting Safe Egress Times

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Deadly Differences
Ionization vs Photoelectric Smoke Alarms

The Use of Modern Engineered Wood and Synthetic Materials Have Reduced Escape Times:

Engineered Wood Framing Burns to Strcutural Failure Significantly Faster Than Dimesional Lumber

Source: Fire Engineering Magazine, Toomey, May 2008

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Figure 1. Collapse Time for Assemblies

Structural Element – Ceiling Finish	Type of Construction	Ceiling Materials	Floor/Roof Subfloor/Finish	Collapse Time (min:sec)
2 x 10 Joist Floor – Without Ceiling	Legacy	None	1 x 6 and Hardwood	18:45
2 x 10 Joist Floor – With Ceiling	Legacy	Gypsum Board	OSB and Carpet	44:45
2 x 10 Joist Floor – With Ceiling	Legacy	Lath and Plaster	1 x 6 and Hardwood	79:45
12-inch Wood I-Joist Floor – Without Ceiling	Modern Lightweight	None	OSB and Carpet	6:03
12-inch Wood I-Joist Floor – With Ceiling	Modern Lightweight	Gypsum Board	OSB and Carpet	26:45
14-inch Finger Joint Truss Floor – Without Ceiling	Modern Lightweight	None	OSB and Carpet	13:06
14-inch Finger Joint Truss Floor – With Ceiling	Modern Lightweight	Gypsum Board	OSB and Carpet	26:45
14-inch Metal Gusset Truss Floor w/ Cord Splices and Framed Stair Opening – Without Ceiling	Modern Lightweight	None	OSB and Carpet	13:20
14-inch Metal Gusset Truss Floor – With Ceiling	Modern Lightweight	Gypsum Board	OSB and Carpet	29:15
14-inch Metal Gusset Truss Floor w/ Cord Splices, Recessed Lights and Ducts With Ceiling	Modern Lightweight	Gypsum Board	OSB and Carpet	30:08
Metal Gusset Truss Roof – With Ceiling	Modern Lightweight	Gypsum Board	OSB and Shingles	13:06
2 x 6 Joist and Rafter Roof – With Ceiling	Legacy	Gypsum Board	1 x 6 and Shingles	40:00

Floor Colapse In as Little as 6 Minutes.

Engineered wood floor assemblies have the potential to collapse very quickly under well-ventilated fire conditions. When it comes to lightweight construction, there is no margin of safety. There is less wood to burn and, therefore, potentially less time to collapse.

Source: Structural Collapse: The Hidden Dangers of Residential Fires, Fire Engineering, May 2008

Dalton, Backstrom, and Kerber , UL & City of Chicago

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Floor Colapse In as Little as 6 Minutes.

Skip Walker, MCI, ACI

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

The Use of Modern Engineered Wood and Synthetic Materials Have Reduced Escape Times:

The Time From Ignition to Flashover Has Fallen Significantly Due Primarily to Modern Synthetic and Composite Wood Materials

Skip Walker, MCI, ACI

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

"Both rooms were ignited by placing a lit stick candle on the right side of the sofa. The fires were allowed to grow until flashover. The legacy room transitioned to flashover in 29 minutes and 30 seconds whereas the modern room transitioned in just 3 minutes and 30 seconds."

Source: Smoke Alarms and the Modern Residence Fire – UP May 2011

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

"The National Institute of Standards and Technology (NIST) compared escape times from house fires before and after the increase of synthetic materials in home furnishings. The study found that escape time in 1975 averaged 17 minutes. By 2003, that average had dropped to just three minutes."

Source: ICC Residential Fire Sprinkler Systems book

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Examples of Real Word Fires:

Hilton Hotel Fire, Houston 1982

Room Fire, Room Had Ion Alarm

First Alarm to Operate was a Photoelectric Alarm 4 Floors Above in a Corridor

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Examples of Real Word Fires:

Prudential Building Fire, Boston 1986

Fire on Floor 14 of 52

Alarms Were Ion's at Each Elevator Lobby

Most Alarms on Upper Floors Never Activated During 2 1/2 Hour Event – Even Though Smoke Reached Them Within 4 Minutes

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Examples of Real Word Fires:

Andrea Dennis, Kyle Raulin, Al Schlessman, Erin DeMarco, and Christine Wilson These five students died at Ohio State University on April 13, 2003

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Examples of Real Word Fires:

Julie Turnbull, Kate Welling & Steve Smith died in this house on April 10th, 2005 at Miami University

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Examples of Real Word Fires:

Between the Dennis, Ohio State and Turnbull Miami University there were an estimated 22 Smoke Alarms.

Most Were Ionization Alarms and Believed Functional.

None Sounded.

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Now Live Via Skype From Ohio

Welcome
Dean Dennis

Father of Andrea Dennis
and
Co-Founder of Fathers for Fire Safety

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

June 12, 2008
Chairman Nancy Nord
US Consumer Product Safety Commission
4330 East-West Highway
Room 419
Bethesda, MD 20814

Dear Chairman Nord:

I am writing as a follow-up to a letter sent to the Consumer Product Safety Commission (CPSC) by Deputy Fire Chief Joseph Fleming of the Boston Fire Department on March 12, 2008 regarding the safety of smoke alarms. It is my understanding that there are multiple unresolved issues concerning ionization detectors' inability to detect smoke or sound an alarm. In fact, it is my understanding that the CPSC expressed serious concerns regarding ionization detectors as early as 1995. These concerns mirror those put forward by Chief Fleming, an outspoken advocate for removing ionization detectors from the marketplace. Yet, the CPSC still has not acted to remove the alarms from the market, nor has the CPSC warned consumers as to the potential drawbacks of ionized detectors.

The issues that appear to be the most prescient and that were addressed by Mr. Fleming in his letter to you, still remain unsettled. I ask that you address, the questions in Chief Fleming's letter in detail, and respond to the following concerns:

1. The National Institute for Standards and Technology (NIST) has found that, on average, a photoelectric detector is 30 minutes faster in detecting a smoldering fire than an ionized detector. The highest percentage of deaths caused by smoldering fires occurs while people are sleeping, when the operation of a smoke detector is critical. In fact, this percentage may be as high as 100 percent. Four years ago NIST reached the conclusion that ionization detectors sometimes fail to alarm in smoldering fires, even when visibility is significantly degraded by smoke.

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

2. While ionized detectors alarm sooner in "ultra-fast" flaming fires by an average of 50 seconds, those seconds appear to be negligible considering that most people are awake when flaming fires occur. In addition, in what appears to be the most common type of flaming fires (i.e. cooking fires) the photoelectric detector was providing more than enough time for an occupant to escape.

3. Several studies show that the ionization smoke detector is many times more likely to be disabled than photoelectric detectors.

4. The ionization smoke detector is being used by the vast majority of Americans. The ionization smoke alarms susceptibility to nuisance alarms (leading to disablement) and inadequate response to smoldering fires could be responsible for hundreds of needless deaths each year.

Recently, due to the efforts of Chief Fleming of the Boston Fire Department to educate the authorities to these facts, the states of Massachusetts and Vermont have taken steps to restrict the use of ionization smoke detectors in residential occupancies. In response to the available evidence that suggests the inherent danger of ionization detectors, I ask that you promptly investigate the issues raised by Chief Fleming, and that you respond to his letter of March 12, 2008.

Fire safety and the use of working fire alarms are vital to the protection of our children, seniors, adults and families around the United States. I strongly urge you to provide a timely response to the above concerns and to consider the potential loss of life should it become clear that a large percentage of Americans are using inadequate smoke detectors.

I appreciate your attention to this matter. Please feel free to contact me if you have any questions.

Sincerely,

John F. Kerry

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Adrian Butler is a Former Fire Fighter
He Started a Smoke Alarm Manufacturing Company
Adrian Noticed that He Was Recieiving a Number of Complaints About His Alarms Not Going Off in Fires...
So He Started Digging

Skip Walker, MCI, ACI

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

What He Found Made Him Get Out of the Smoke Alarm Business

and

Co-Found the World Fire Saftey Foundation

Skip Walker, MCI, ACI

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Adrian Butler

Chairman, World Fire Saftey Foundation

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

CREIA Spring Conference April 25, 2012

Skip Walker, MCI, ACI

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

Canadian Television – Channel 5 Report
Exerpts Including

Texas A& M Video

Note: Canadian UL (ULC) Standards Are More Strict Than US Standards
Canada = Max OB Level 6% / US = Max OB Level 10%

Skip Walker, MCI, ACI

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

CREIA Spring Conference April 25, 2012

Skip Walker, MCI, ACI

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

What Is Being Done?

Skip Walker, MCI, ACI

Deadly Differences
Ionization vs Photoelectric Smoke Alarms

In the US, Photoelectric Technology Laws In Place In:

Massachusetts

Vermont

Maine

Iowa

Under Revew In Several Other States

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In the CA, Photoelectric Technology Laws Are In Place In:

Palo Alto
City of Albany
Sebastopol
City of Orange

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International Association of Fire Fighters:

Official Position Calling for Photoelectric Only Technology
Specifically States, No Combination Detectors

Union Represents 290,000 US & Canadian Fire Fighters

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California Real Estate Inspection Association

Official Position Calling for Photoelectric Only Technology
Specifically States, No Combination Detectors

Mirrors IAFF Position, First HI Organization in The World to Take a Stand

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California Real Estate Inspection Association
Standards of Practice
Modified to State:

Inspector is Not Required to Determine Type of Alarm
CREIA Legal Counsel Feels No Additional Liabilty with Position

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<u>What Can We Do as Inspectors?</u>

Tell Your Agents...Your Clients...

Your Family...Neighbors...Friends, Etc!

As a group, make public awareness a Priority and Support the official position of CREIA and IAFF.

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The Goal Today Is Was Simple

I Want Each Of You To Have
A Thorough Understanding of the Issues
A Strong Position On This Issue
and
The Confidence To Voice it

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Was I Successful?

Questions and Comments!

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