

Changing Building Contents – Safety and Health Implications for the Fire Service



November 14, 2013

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NIOSH - CDC

Outline

- **Safety (Injury) Issues**
 - Fatal
 - Non-fatal
- **Health Issues**
 - Heart Disease
 - Cancer

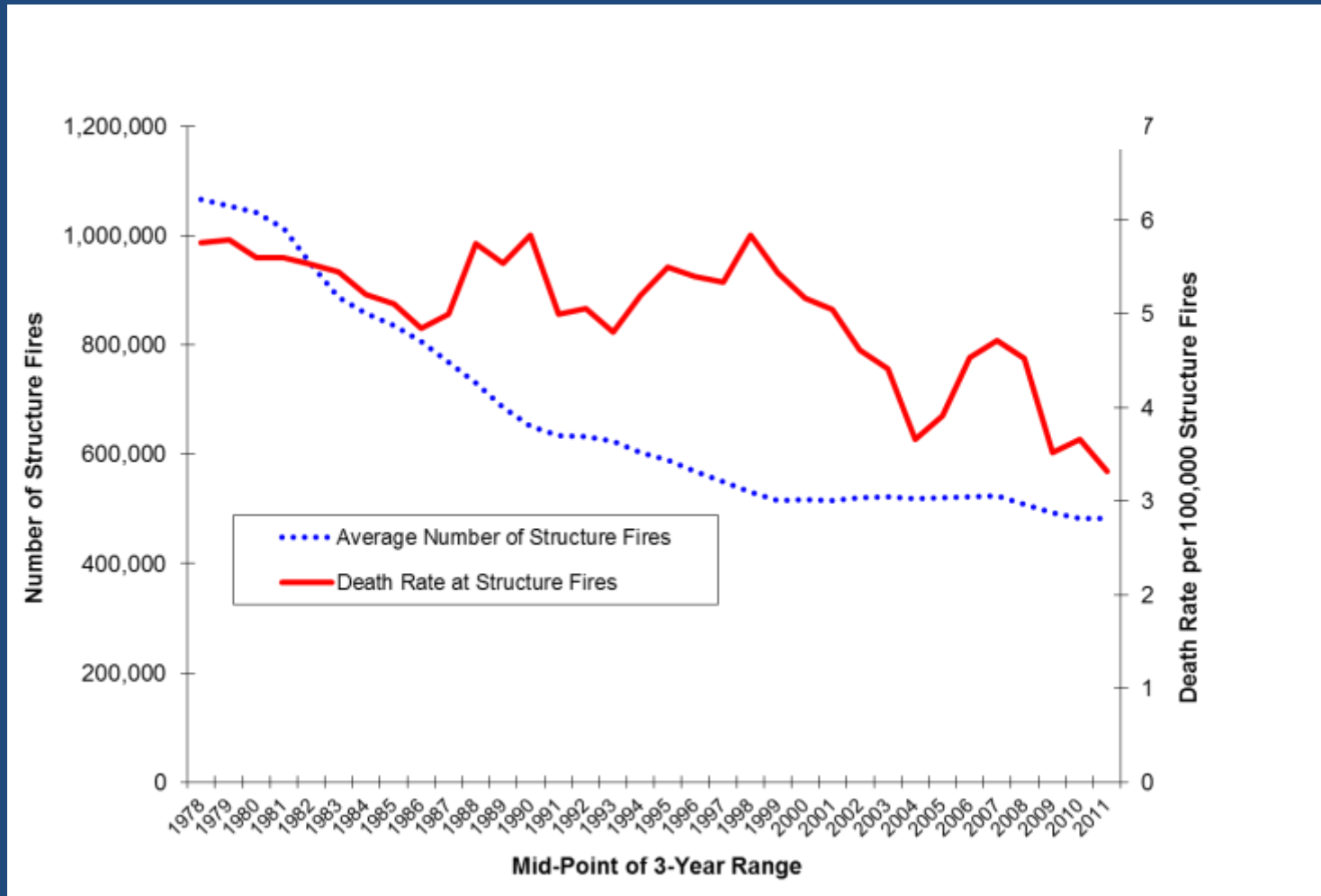


UL Research - 2009

- **Modern room contents:**
 - Burn Faster
 - Burn Hotter
 - Faster to full involvement
 - Quicker to flashover
- **Has this translated into:**
 - ↑FF Fatalities?
 - ↑FF Injuries?
 - ↑FF Health Issues?

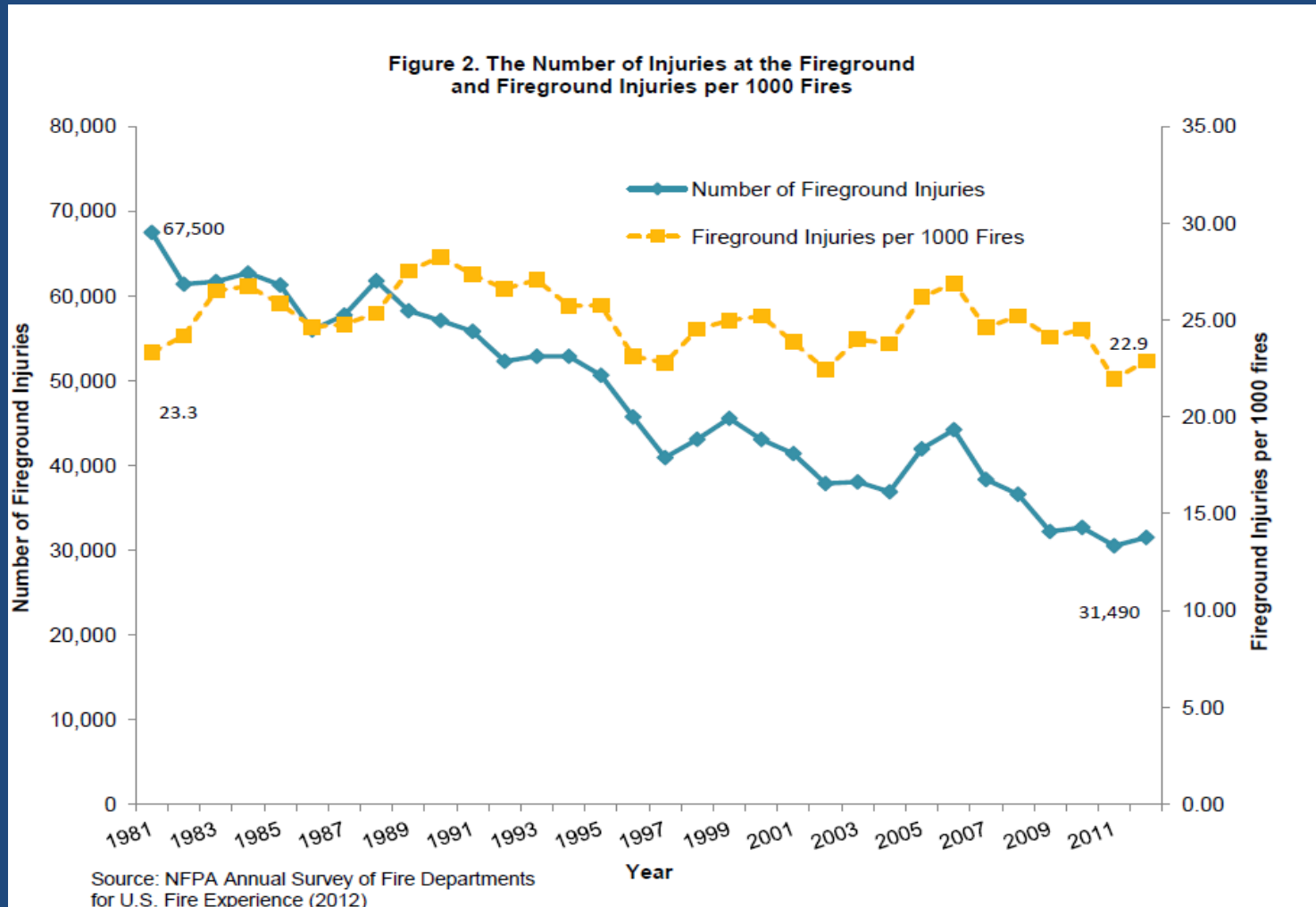


Structure Fires and On-duty FF Death at Structure Fires, 1978-2011



Source: Fahy [2013]. Personal communication, NFPA

Fireground Injuries, 1981-2011

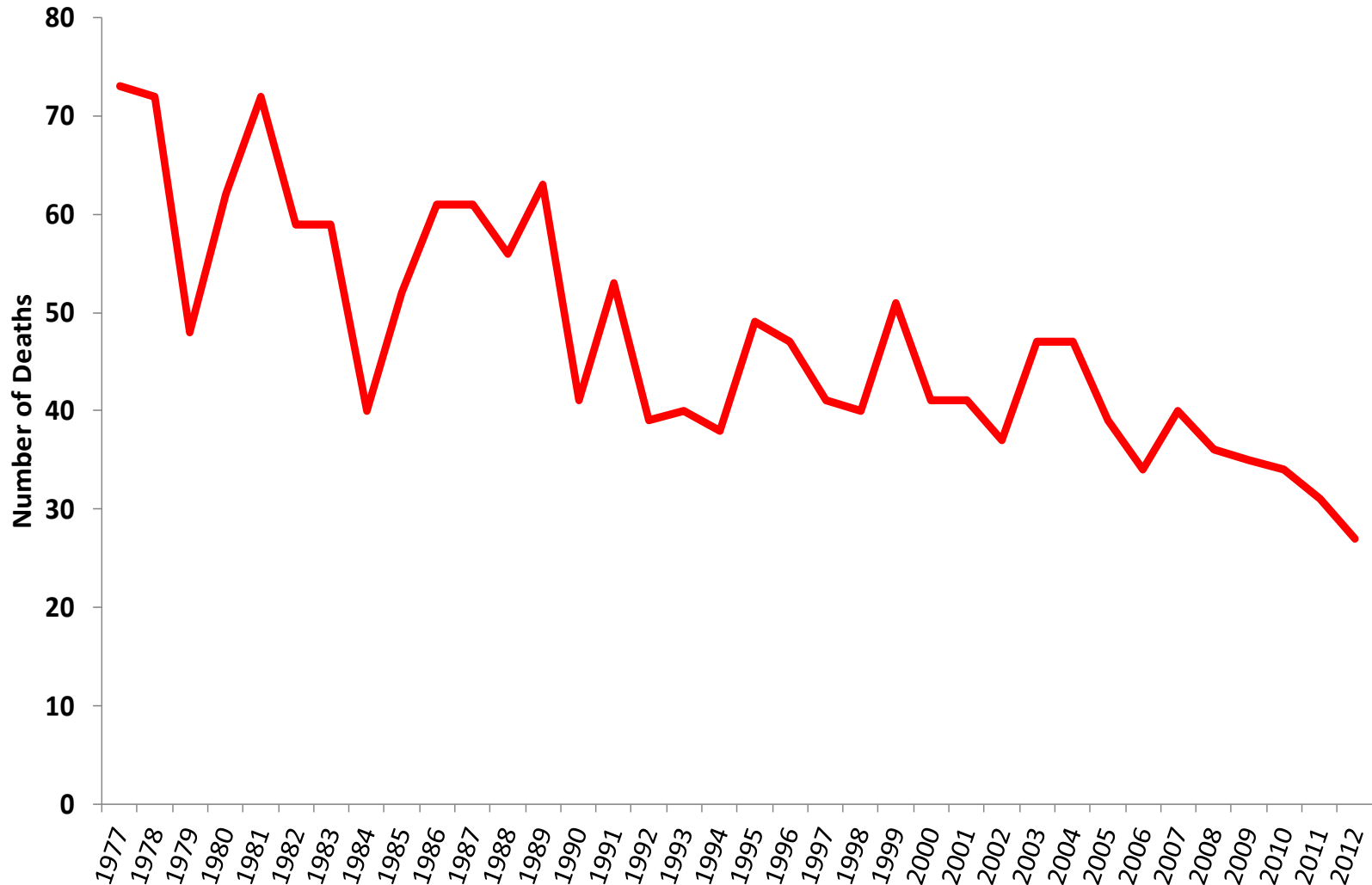


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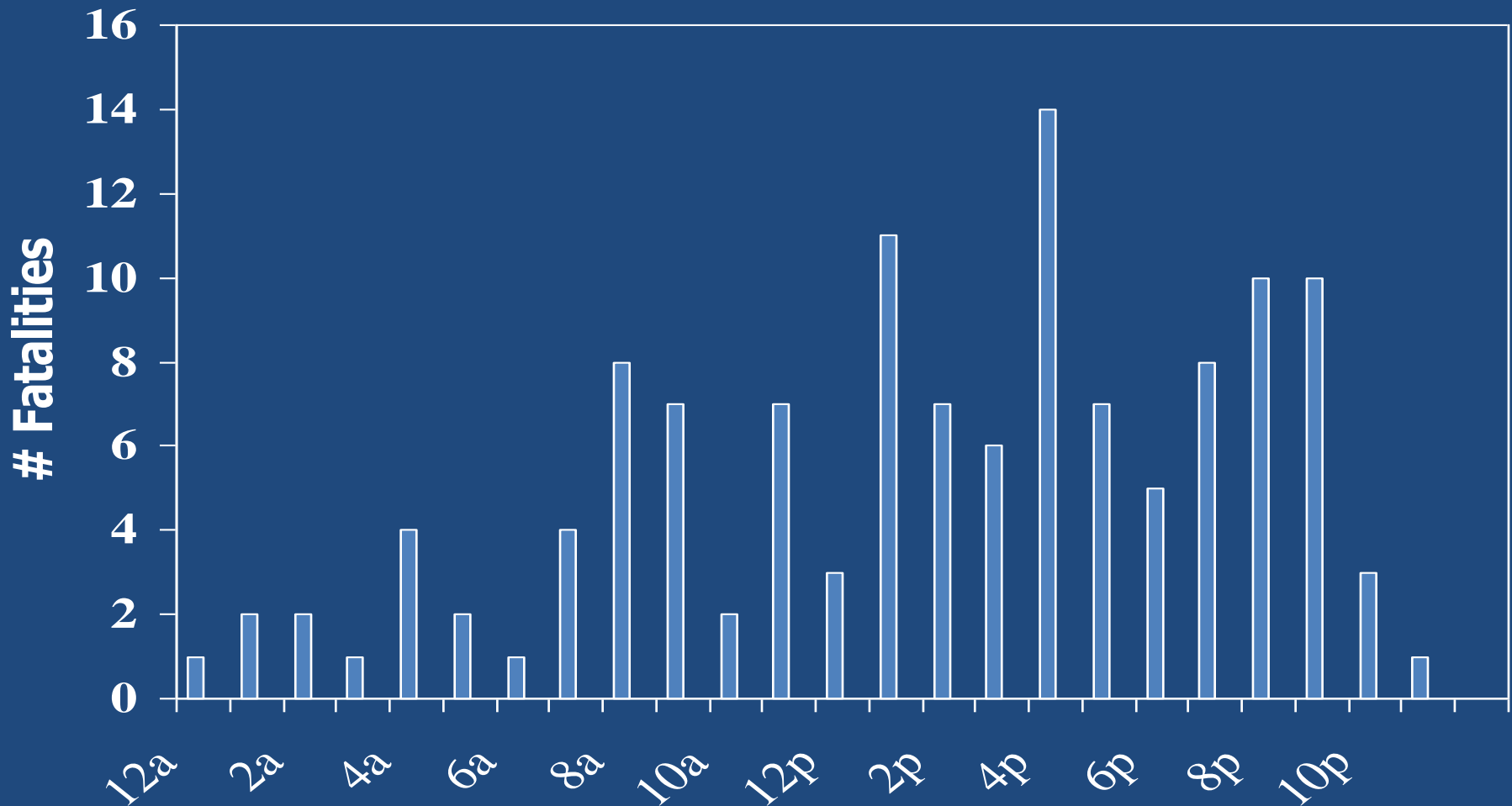
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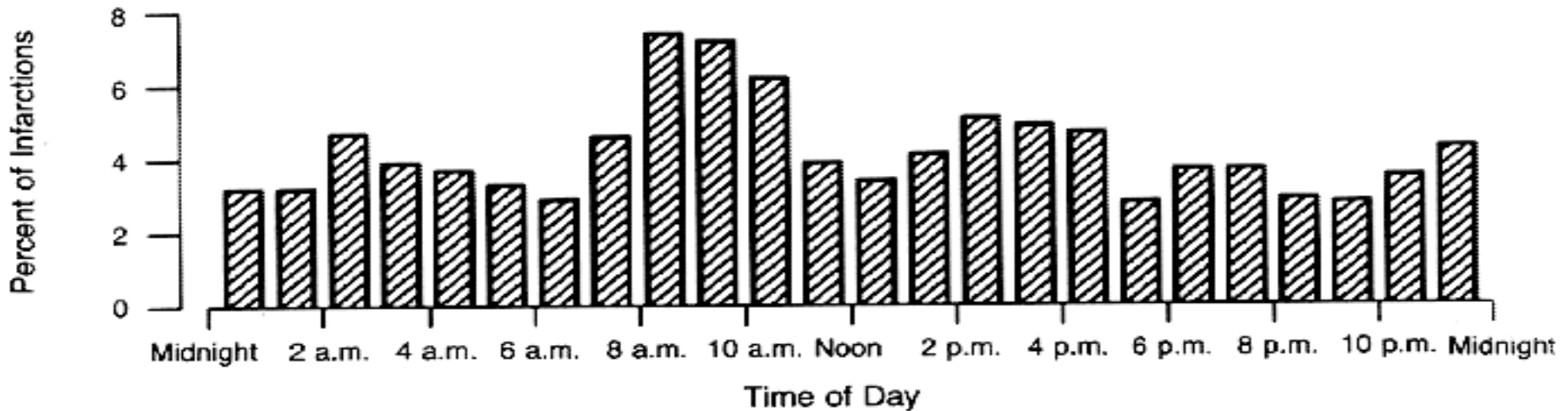
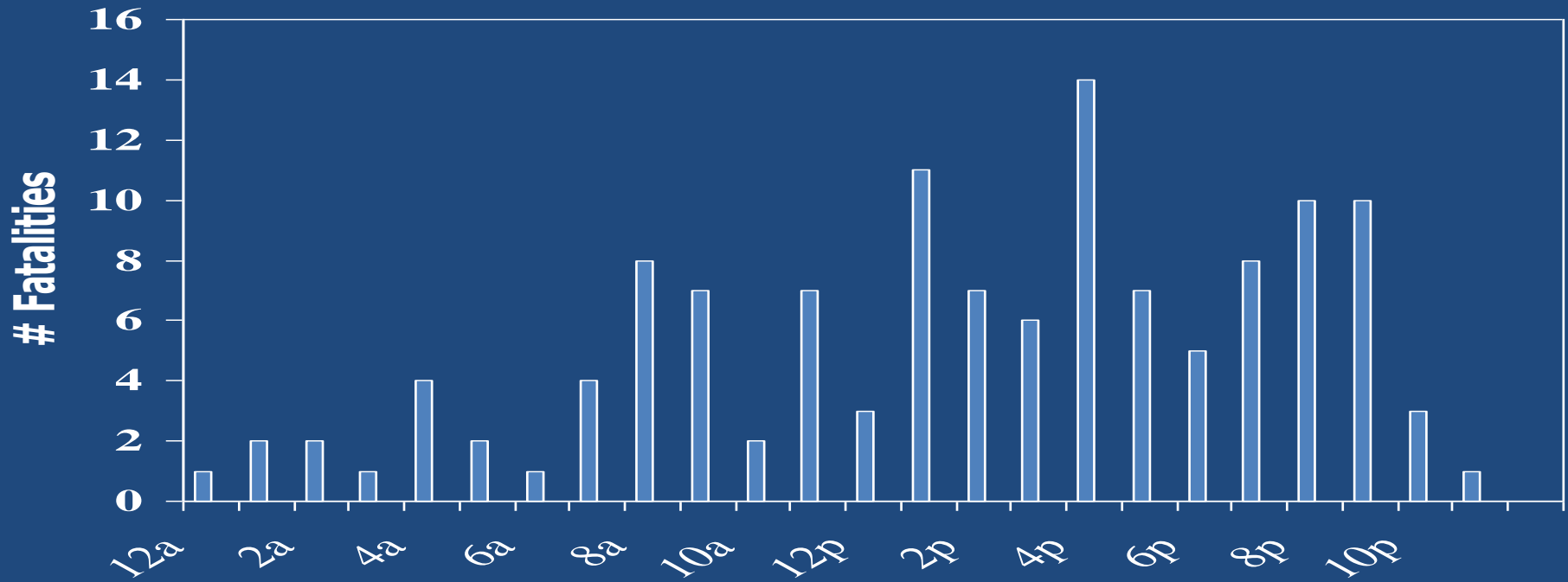
U.S. On-Duty Firefighter Fatalities Due to Sudden Cardiac Death 1977 - 2012



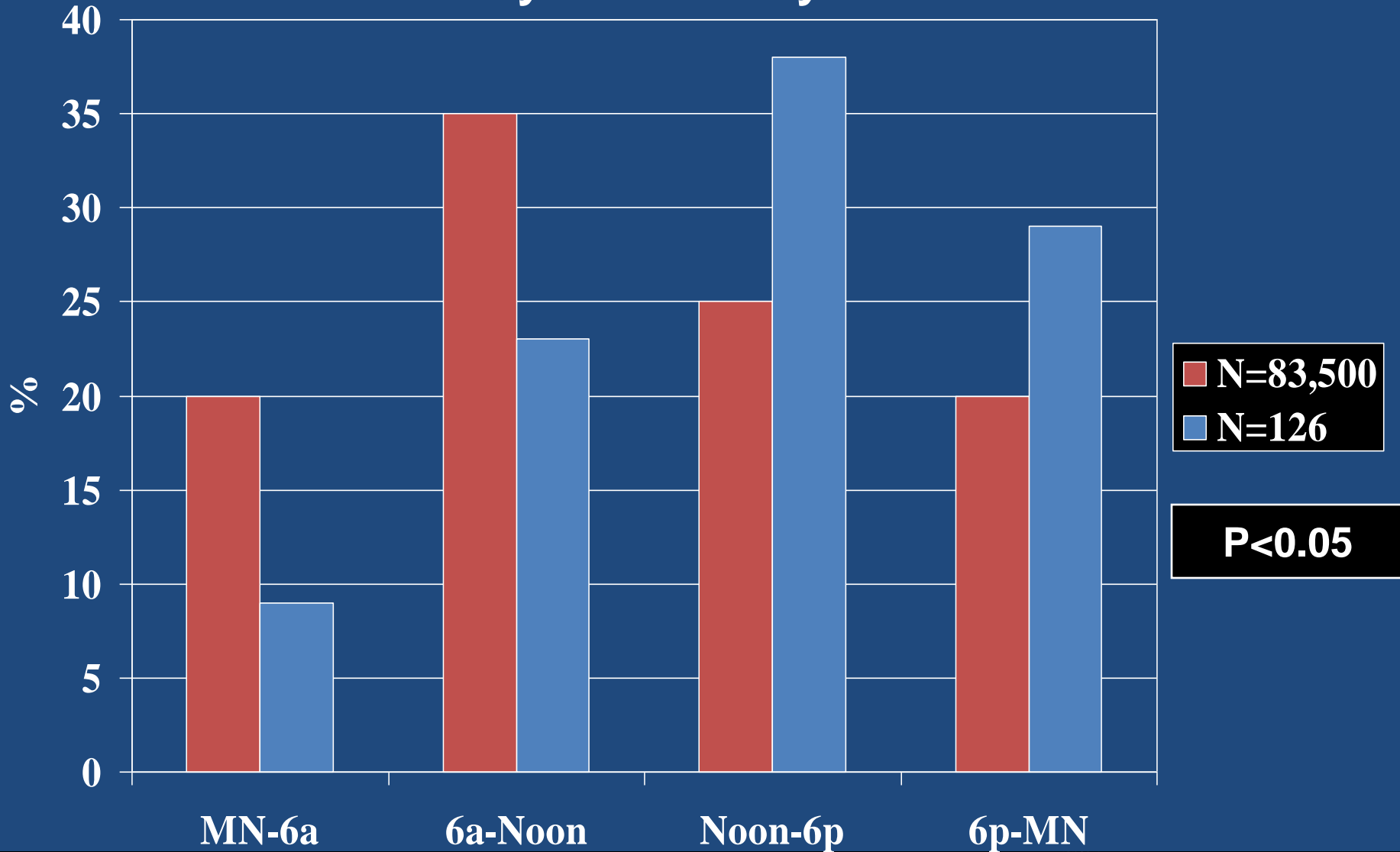
On-Duty FF Cardiac Deaths by time of day



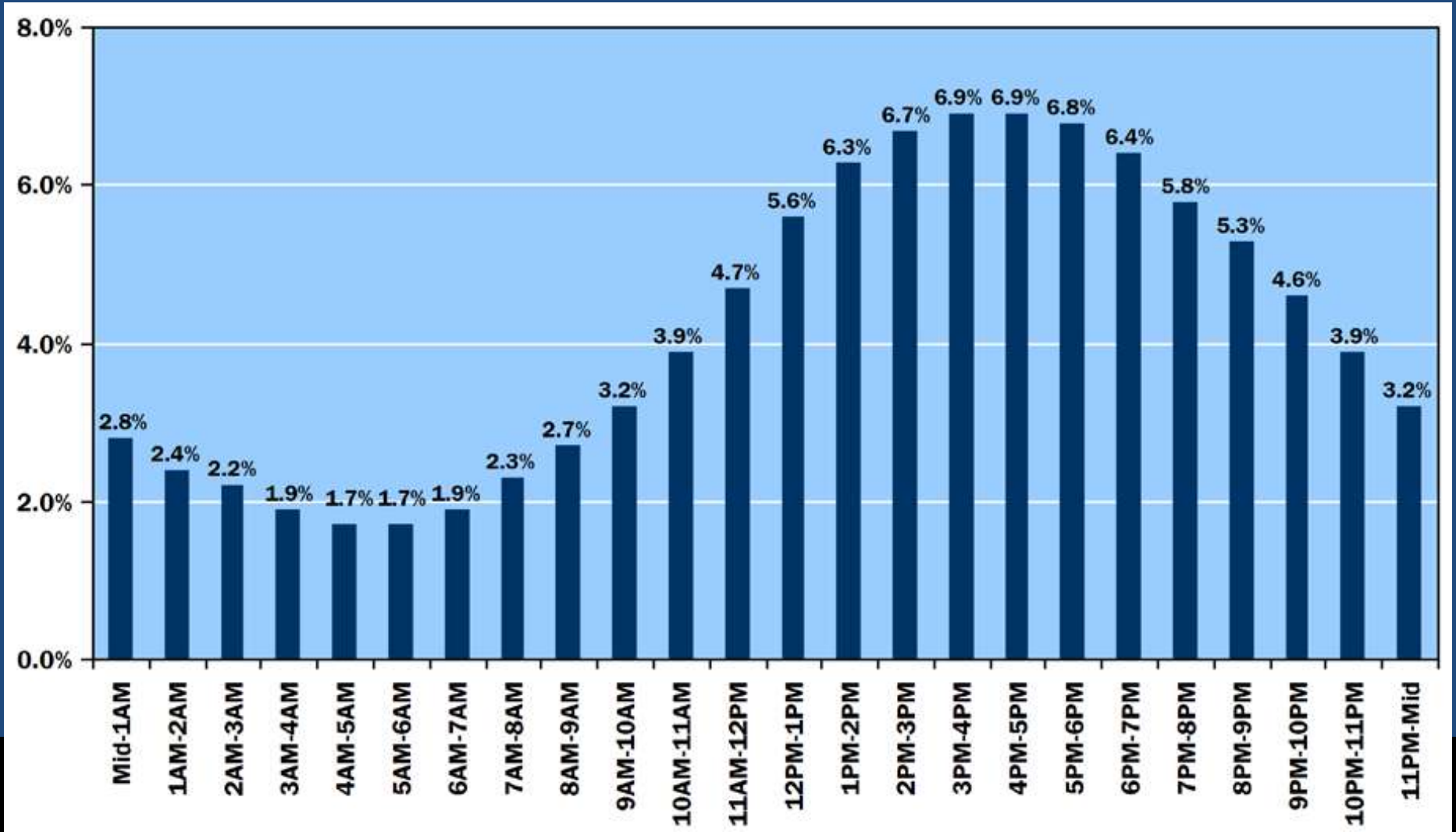
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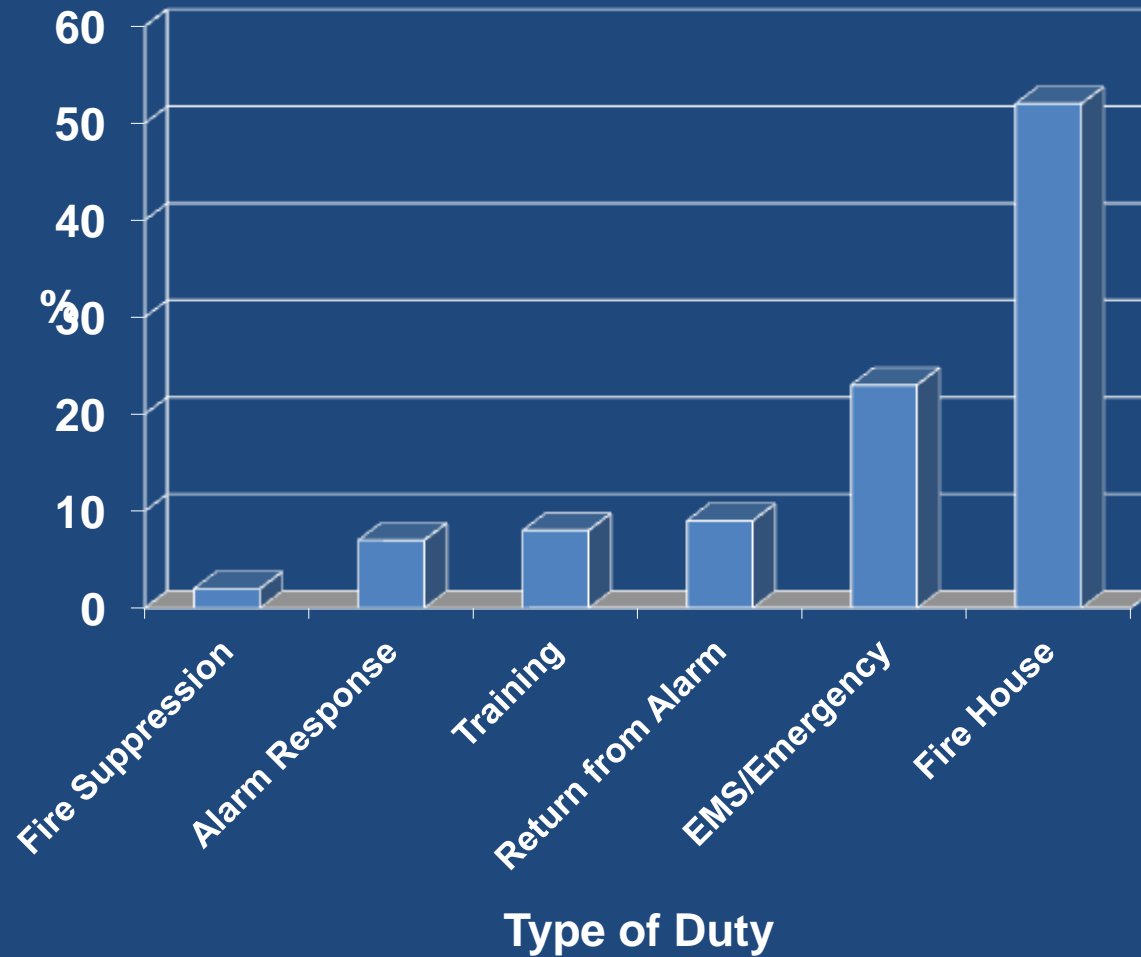
Sudden Cardiac Event by Time of Day



Fire Department Fire Runs by Alarm Time, NFIRS data



Percent of Time Spent in Fire Fighter Duties



Source: Kales et al. Environ Hlth: a global access science source. 2003;2:14

Research

Open Access

Firefighters and on-duty deaths from coronary heart disease: a case control study

Stefanos N Kales^{*1,2}, Elpidoforos S Soteriades^{1,2}, Stavros G Christoudias¹ and David C Christiani^{2,3,4}

NIOSH Cases of Duties being Performed at Death

Adjusted for time spent at various fire service duties

NIOSH Investigated On-duty Cardiac Deaths by Job Duty

<u>Risk Factor</u>	<u>OR</u>	<u>(95% CI)</u>
Fire Suppression	64.0	(7.4-556)
Heavy Physical Training	7.6	(1.8-31.3)
Alarm Response	5.6	(1.1-28.8)
Alarm Return	3.4	(0.8-14.7)
Fire stn/Non-emerg	1.0	

Source: a) Kales et al. Environ Health 2003;2:14
b) Kales et al. NEJM 2007;356:1207-1215

What triggers SCD on Fire Ground?

- **NIOSH Case-Series**
 - CO & HCN - No
 - Exertion
 - Gen Pop
 - Ergo studies
 - Something else??



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Exposure Studies



Fire Smoke – Exposures, IARC 2010

- 10 “Group 1” Substances
 - [arsenic, asbestos, benzene, Benzo[a]pyrene, 1,3-butadiene, cadmium, formaldehyde, silica, diesel exhaust, radioactivity]
- 4 “Group 2a” Substances
- 21 “Group 2b” Substances

Group 1 = Carcinogenic to humans

Group 2a = Probable “ “ “

Group 2b = Possible “ “ “

Group 3 = Not classifiable,

Group 4 = Probably not “ “ “



Source: IARC <http://monographs.iarc.fr/ENG/Monographs/vol98/index.php>.

Outcome Data

- 19 Cohort Studies
- 11 Case-Control Studies
- 14 Other designs

Mixed results

Limitations: Small studies

Few PYAR

Few cancer cases –
esp rare cancers



Results: Excess Cancers

Outcome*	Mortality		Incidence	
	Obs	SMR (95% CI)	Obs	SIR (95% CI)
Esophagus	113	1.39 (1.14 to 1.67)	90	1.62 (1.31 to 2.00)
Intestine	326	1.30 (1.16 to 1.44)	398	1.21 (1.09 to 1.33)
Lung	1046	1.10 (1.04 to 1.17)	716	1.12 (1.04 to 1.21)
Kidney	94	1.29 (1.05 to 1.58)	166	1.27 (1.09 to 1.48)
Oral cavity [†]	94	1.40 (1.13 to 1.72)	174	1.39 (1.19 to 1.62)
Mesothelioma	12	2.00 (1.03 to 3.49)	35	2.29 (1.60 to 3.19)

*Cancers with statistically significant excesses in mortality and incidence.

[†]Oral cavity includes lip (excluding skin of the lip), tongue, salivary glands, gum, mouth, pharynx, oropharynx, nasopharynx, and hypopharynx

Summary - Injury Data

- Injury Data - past 30 years:
 - ↓ # and rate of **fatal** injuries
 - ↓ # and rate of **non-fatal** injuries
- Health Data –
 - Sudden cardiac deaths seems to be triggered by something on the FG
 - NIOSH study supports the mounting scientific evidence that FF, as an occupation, has increased risk of cancer



Thank you

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