



# Fire Safety in Housing and Self-preparedness

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Photo: Esa Kokki

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# Content

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1. Fire deaths 2007-2010 in Finland
  - General features of fire deaths and fatal fires
  - Course of events during fatal fire
  - Functions in connection with fatal fire
2. Legislative actions
  - Fire inspections, Smoke alarms
  - RIP-cigarettes
  - Exit safety
  - Exchange of information of authorities
3. Examples of novel fire risks
  - Risky inhabitation policy
  - Light steel chimneys



# Content

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## 1. Fire deaths 2007-2010 in Finland

- General features of fire deaths and fatal fires
- Course of events during fatal fire
- Functions in connection with fatal fire

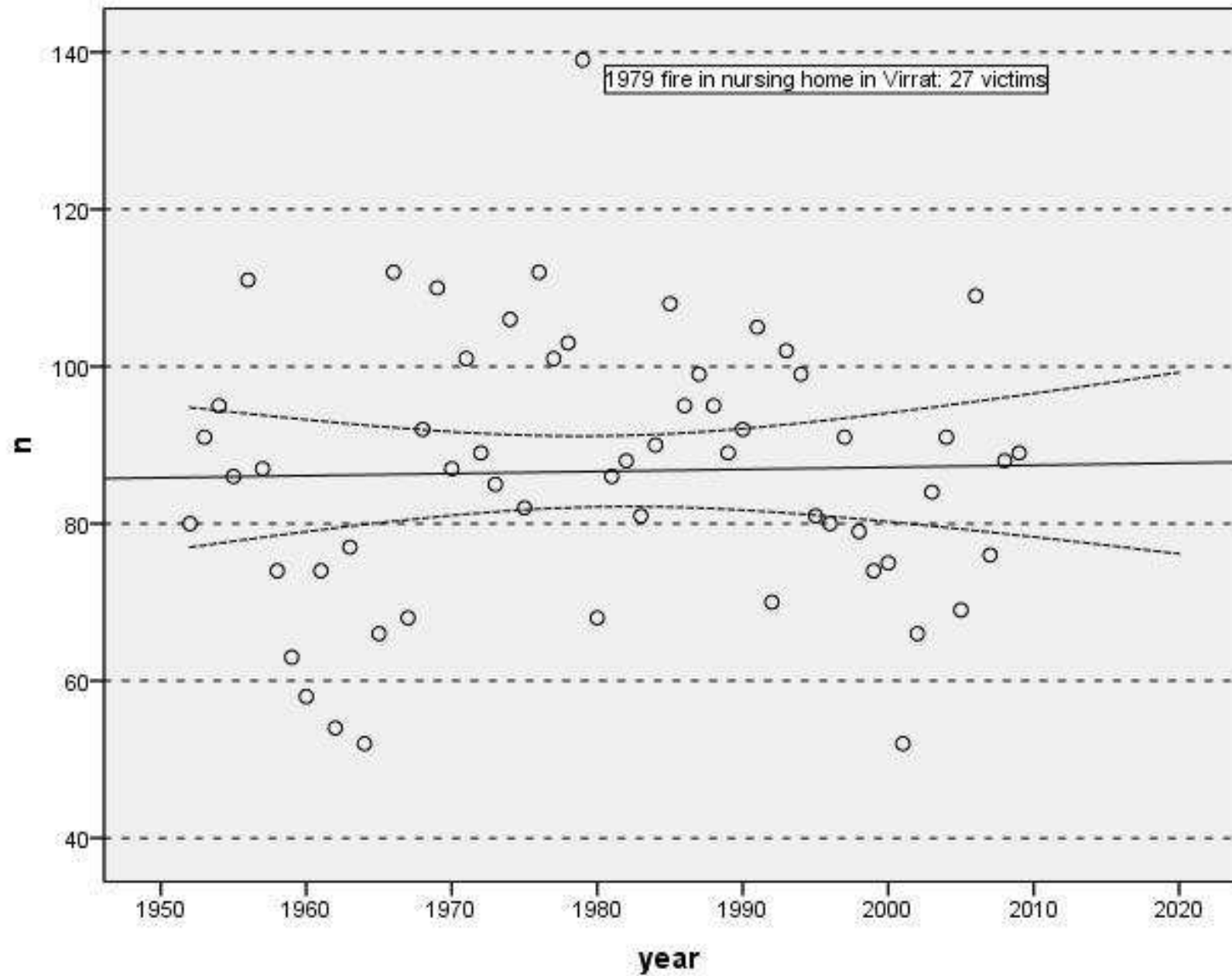
## 2. Legislative actions

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- Exit safety
- Exchange of information of authorities

## 3. Examples of novel fire risks

- Risky inhabitation policy
- Light steel chimneys

## Accidental fire deaths 1952-2009 in Finland



# Fire Deaths, Background

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- About 100 persons die in fires in Finland annually
  - About 19 victims per 1 million inhabitants
- More than other Western European countries
- In 2006 the group of ministries for internal safety set a goal: **At most 50 fire deaths in 2015**
- Since 2007 fire investigators from all 22 Finnish fire departments has investigated every fire causing serious injury
  - Co-operation with police
- Research done by the Emergency Services College

# Definition of Fire Death in this Research

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- Death as a result of injuries caused directly by fire (~30 %) or death by intoxication (~70 %)
- Death within 30 days from the accident
- Death caused indirectly by fire
  - e.g. collapse of a building due to fire
- Not an incident where, for some other reason, the deceased experienced the effects of fire
- Not a carbon monoxide poisoning which was caused by controlled fire
  - e.g. fault in a fireplace or misuse thereof

Kokki, E. (2011). Fire deaths and rescuing of people in fires in 2007-2010. Publications of Emergency Services College B3/2011.

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# 342 Fatal Fires in 2007-2010

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- 379 fire deaths (85, 107, 107, 80 victims)
  - Reduce of 25 % in 2010
- Usually fires with 1 victim
- Annually 6 fires with 2 victims
- Fire with 3 victims in 2007 and in 2010
- Fire with 5 victims in 2008 and in 2009

Kokki, E. (2011). Fire deaths and rescuing of people in fires in 2007-2010. Publications of Emergency Services College B3/2011.

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# Building Fires Most Dangerous

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- 21 000 building fires: 343 victims (91 %)
- 9 800 vehicle fires: 26 victims (7 %)
- 11 700 wildfires: 2 victims (1 %)
- 16 300 other fires: 8 victims (2 %)

Kokki, E. (2011). Fire deaths and rescuing of people in fires in 2007-2010. Publications of Emergency Services College B3/2011.

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# Most Building Fires in Dwellings

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- 11 900 dwelling fires: 325 victims (86 %)
  - > 50 % in dwellings built before 1960
  - ~ 55 % in one family houses
  - ~ 25 % in apartment buildings
  - ~ 10 % in row houses
- 600 fires in health care buildings: 3 victims (1%)
- 300 fires in residential facilities: 3 victims (1%)

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Kokki, E. (2011). Fire deaths and rescuing of people in fires in 2007-2010. Publications of Emergency Services College B3/2011.



# Fire Deaths During Cold Months



Kokki, E. (2011). Fire deaths and rescuing of people in fires in 2007-2010. Publications of Emergency Services College B3/2011.



# Fire Death Usually at Night

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Time of day	Fire deaths		Rescuing activities by fire brigade	
	n	%	n	%
00–03	60	22	216	19
04–07	52	19	181	16
08–11	24	9	109	10
12–15	35	13	144	13
16–19	44	16	233	21
20–23	58	21	241	21
Unknown	106			
<b>Total</b>	<b>379</b>	<b>100</b>	<b>1 124</b>	<b>100</b>

Kokki, E. (2011). Fire deaths and rescuing of people in fires in 2007-2010. Publications of Emergency Services College B3/2011.

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# Fire Deaths Caused by Smoking Decreased 43 %

- Smoking decreased in 2010
  - Compare 1988-97: 44 %
- Careless open fire decreased also
- Arson increased

Reason of ignition	Fire deaths 2007 - 2009		Fire deaths 2010	
	n	%	n	%
<b>Smoking</b>	84	<b>35</b>	16	<b>23</b>
<b>Arson</b>	39	<b>16</b>	17	<b>24</b>
<b>Electricity</b>	30	<b>12</b>	10	<b>14</b>
<b>Careless open fire</b>	40	<b>16</b>	7	<b>10</b>
<b>Wrong use of equipment</b>	14	<b>6</b>	2	<b>3</b>
<b>Other cause</b>	36	<b>15</b>	19	<b>27</b>
<b>Unknown</b>	56		9	
<b>Total</b>	<b>299</b>	<b>100</b>	<b>80</b>	<b>100</b>

Kokki, E. (2011). Fire deaths and rescuing of



# Ignitions in Living Rooms or Bedrooms

- Fatal fires in bedrooms decreased (2010: 13 %)
- Fatal fires in living rooms increased
  - Compare 1988-97: bedrooms 34 %, living rooms 17 %
- Rescuings mostly in kitchen fires

Room of Ignition	Fire deaths		Rescuing activities by fire brigade
	n	%	%
Living Room	79	27	22
Bedroom	63	22	11
Kitchen	53	18	51
Other	94	33	15
Unknown	54		
<b>Total</b>	<b>343</b>	<b>100</b>	<b>100</b>

Kokki, E. (2011). Fire deaths and rescuing of





# Victims

- Men have almost 3-fold risk (reduce of 26 % in 2010)
- Risk increases with age
- 70 % living alone (>2-fold risk)
- 62 % with low-income (11-fold risk)
- 39 % blue-collar workers, 35 % pensioners
- 36 % single, 29 % divorced (5-fold risk)

Age group	Men		Women	
	n	n / 1M inh.	n	n / 1M inh.
0-9	2	1.7	2	1.8
10-19	9	6.8	2	1.6
20-29	10	7.3	8	6.2
30-39	19	14.3	4	3.2
40-49	46	30.5	12	8.1
50-59	69	44.1	19	12.1
60-69	81	68.2	20	15.7
70-79	27	39.8	17	18.8
80-89	13	50.1	16	28.9
90+	1	39.1	1	10.3
<b>Total</b>	<b>277</b>	<b>26.6</b>	<b>101</b>	<b>9.3</b>

Kokki, E. (2011). Fire deaths and rescuing of people in fires in 2007-20

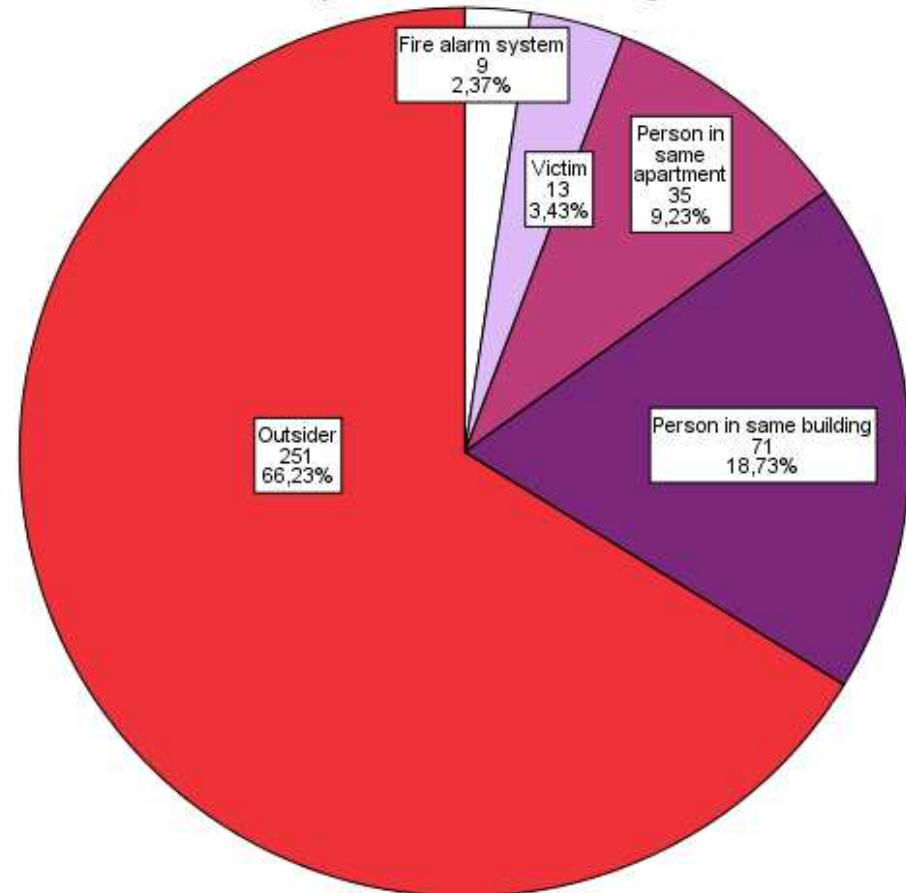


# Environment of Fatal Fires

- 49% in rural risk area IV, **3-fold risk**
- 55 % in one family houses, **2-fold risk**
- 66 % of fires notified by outsider (**2010: 74 %**)

Risk area	Fire deaths	
	n	n / 1M inh.
I	72	12.6
II	103	13.1
III	48	13.3
IV	156	38.7
<b>Total</b>	<b>379</b>	<b>100</b>

Fire Deaths by the Source Activating Fire Alarm



Kokki, E. (2011). Fire deaths and rescuing of people in fires in 200



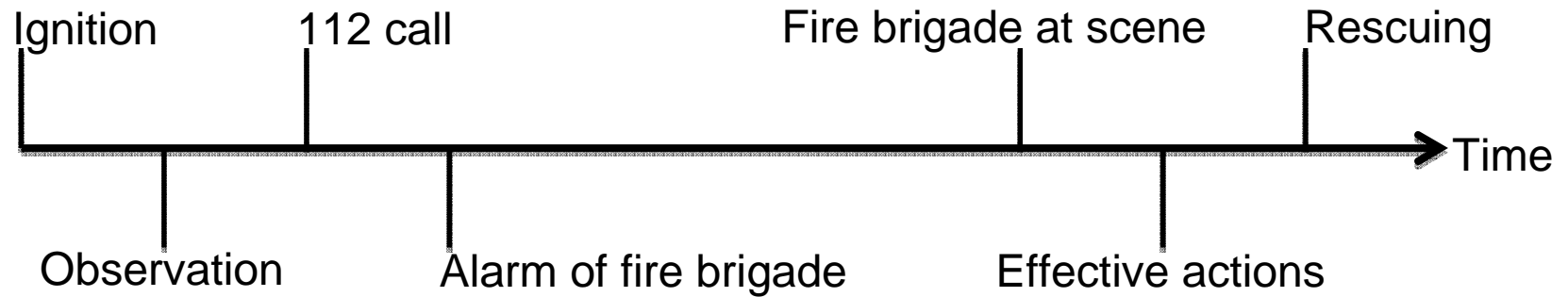
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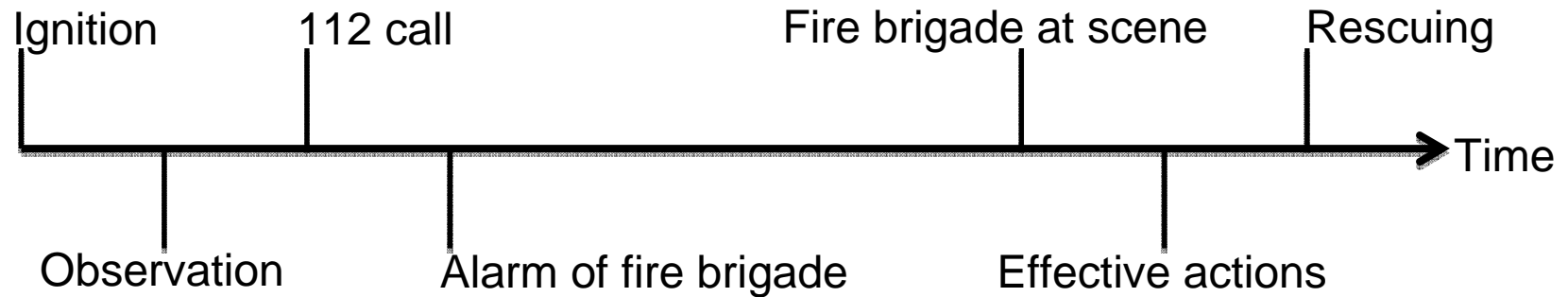
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  - Risky inhabitation policy
  - Light steel chimneys

# Course of Events During Fire

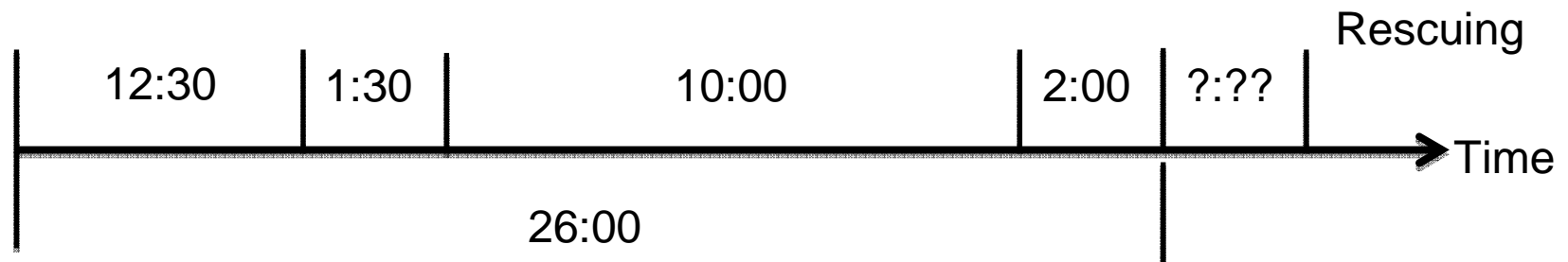
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# Course of Events During Fire



- In case of fire deaths times on average (minutes):



- Time between ignition and 112 call most critical

Kokki, E. (2011). Fire deaths and rescuing of people in fires in 2007-2010. Publications of Emergency Services College B3/2011.

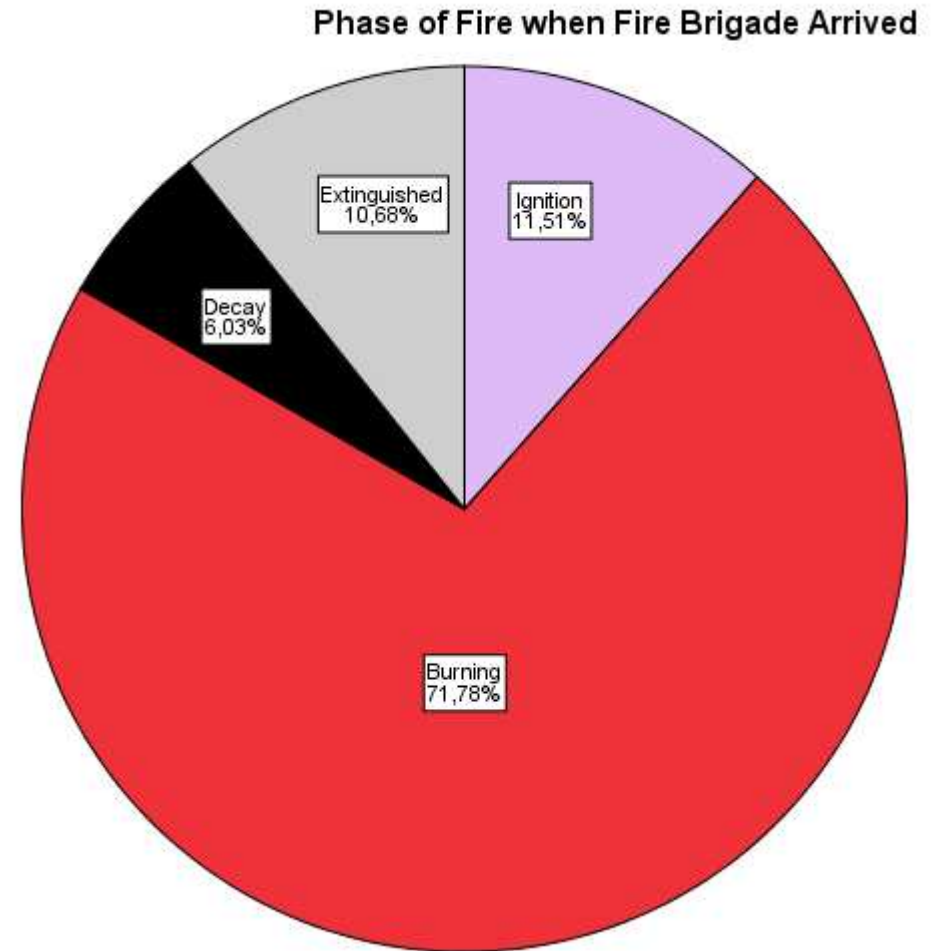




# Fire in Burning Phase when Fire Brigade Arrives

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- Fatal fires
  - 12 % in ignition phase
  - 72 % in burning phase
- In fires with rescuings
  - 38 % in ignition phase
  - 46 % in burning phase



Kokki, E. (2011). Fire deaths and rescuing of people in fires in 2007-2010. Publications of Emergency Services College B3/2011.

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# Smoke Alarm and First Extinguishing

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- According to the survey by the Ministry of the Interior, 95 % of households have acquired a smoke alarm
- Dwellings without smoke alarm
  - Fatal fires: 40 %
  - Fires with rescuings: 38 %
  - All dwelling fires: 36 %
- First extinguishing tried
  - Fatal fires in 2010: 28 %
  - Fatal fires in 2007-2009: 10 %
  - Fires with rescuings: 11 %
  - All building fires: 37 %

Kokki, E. (2011). Fire deaths and rescuing of people in fires in 2007-2010. Publications of Emergency Services College B3/2011.

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# Victim Alone, Lowered Capacity to Function

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- Victim usually alone in fatal building fire
- In 12 % of fires other persons in same fire compartment
- 10 % of victims were known to have normal capacity to function
  - 28 % of seriously injured
- 70 % of victims under the influence of alcohol
  - has become more common among females

Kokki, E., Jäntti J. (2009). Serious injuries caused by fires 2007-2008. Publications of Emergency Services College B2/2009.

Kokki, E. (2011). Fire deaths and rescuing of people in fires in 2007-2010. Publications of Emergency Services College B3/2011.

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# Cause of non- Evacuation

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- 58 % of victims didn't detect fire or react to it on time
  - 17 % of victims didn't detect at all
  - 4 % of seriously injured didn't detect at all

Cause of non-evacuation	Fire deaths	Seriously injured
Didn't detect fire	17 %	4 %
Didn't react on time	41 %	40 %
Didn't know how to react	12 %	22 %
Other cause	30 %	34 %
<b>Total</b>	<b>100 %</b>	<b>100 %</b>

Kokki, E., Jäntti J. (2009). Serious injuries caused by fires 2007-2008. Publications of Emergency Services College B2/2009.

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# Legislation on Fire Inspections

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- Hospitals and health care buildings every year
- Hotels and accomodation facilities every year
- Residential buildings every 10<sup>th</sup> year
  - ~1 200 000 residential buildings
  - ~2 800 000 apartments

Building type	2009		2010	
	Planned Inspections	Done	Planned Inspections	Done
Hospitals, health care building	4 130	96 %	4 486	88 %
Hotels, accomodation facilities	3 101	91 %	3 149	89 %
Residential building	160 235	51 %	149 557	47 %

# Legislation on Smoke Alarms

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- 1.9.1999: one smoke alarm compulsory in dwelling
  - 2000: 1 % increase in accidental fire deaths,
    - 9 % increase in dwelling fires with smoke alarm
  - 2001: 31 % decrease in accidental fire deaths
- 1.2.2009: smoke alarm connected to electric grid in new dwellings
  - 2009: 1 % increase in accidental fire deaths
    - No effect on share of dwelling fires with smoke alarm
- 1.1.2010: one smoke alarm in every floor and for every 60 m<sup>2</sup>
  - 2010: 23 % decrease in accidental fire deaths
    - No effect on share of dwelling fires with smoke alarm

# Legislation on RIP-cigarettes

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- After 1.4.2010 only Reduced Ignition Propensity Cigarettes sold in Finland
- At least 25 % of cigarettes should be self-extinguishing



Photo: Esa Kokki

# Fires Caused by Smoking Decreased 12 %

Number of Fire Deaths Caused by Smoking		Difference
2007-2009 on average	2010	
28	16	-43 %

	Number of Fires Caused by Smoking		Difference
	April 2009 - March 2010	April 2010 - March 2011	
<b>Building fires</b>	288	273	-5 %
<i>Dwelling fires</i>	225	222	-1 %
<b>Vehicle fires</b>	13	9	-31 %
<b>Wild fires</b>	286	266	-7 %
<b>Other fires</b>	277	214	-23 %
<b>All fires</b>	<b>864</b>	<b>762</b>	<b>-12 %</b>





# Legislation on Exit Safety

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- 1.7.2011: **Exit safety explanation** for buildings for tenants with reduced capacity to function
  - Health care buildings, Nursing homes, Shelter houses, Other similar residential facilities
- How exit safety of tenants and personnel is ensured
- Same principles in **Safety explanation** since 2002
  - Exit safety explanation more detailed
- **No legislation of extinguishing equipments!**

# Legislation on Exchange of Information of Authorities

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- 1.7.2011: other authorities should inform rescue authority about fire risks in dwellings

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# Risky Inhabitation Policy, Example 1

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- Feb 2011 fire in senior house in Espoo
  - In 2010 similar fatal fire
  - 1 elderly woman died
  - Fire ignited in kitchen
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- Brakes of walker turned electric cooker on
  - Elderly people staying longer at home



Photo: Tuomas Pälviä



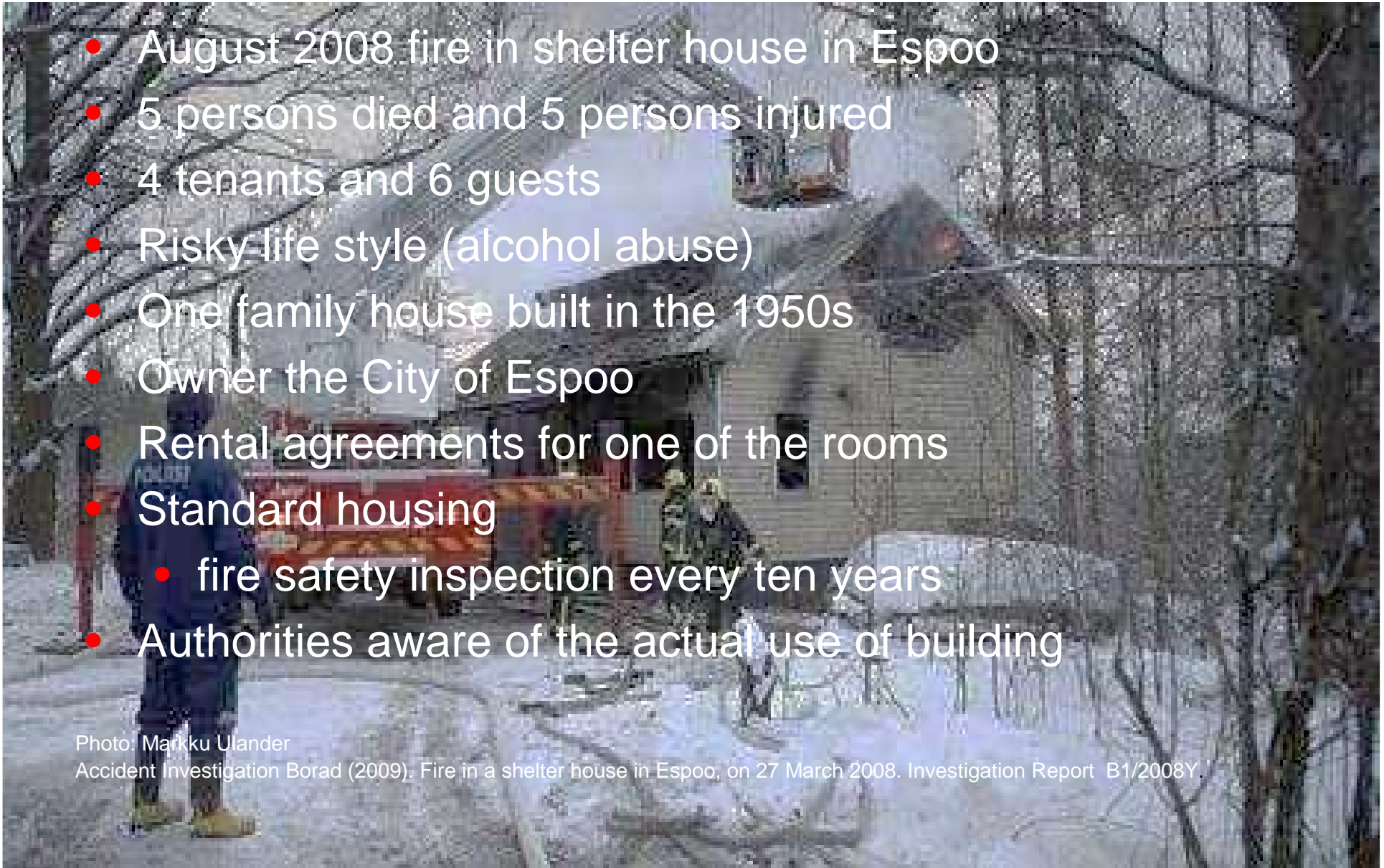
# Risky Inhabitation Policy, Example 2a

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- August 2008 fire in shelter house in Espoo
- 5 persons died and 5 persons injured
- 4 tenants and 6 guests
- Risky life style (alcohol abuse)
- One family house built in the 1950s
- Owner the City of Espoo
- Rental agreements for one of the rooms
- Standard housing
  - fire safety inspection every ten years
- Authorities aware of the actual use of building

Photo: Markku Ulander

Accident Investigation Board (2009). Fire in a shelter house in Espoo, on 27 March 2008. Investigation Report B1/2008Y.





# Risky Inhabitation Policy, Example 2b

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- Since 2000 seven serious fires in same row house in Iisalmi
  - 1 victim in 2006, 1 victim in 2007, 2 victims in 2011
  - Other big fires: once in 2002 and twice in 2007
  - Over ten smaller fires
- Rental apartment, Owner the City of Iisalmi
- Tenants having risky life style (alcohol abuse)
- No smoke alarms



Savon Sanomat, Asta Tenhunen 22.1.2011.

# Risky Inhabitation Policy, Example 2c

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- Niuskala nursing home and shelter house in Turku
- Built 1992
- Inhabitants alcohol abusers
- No extinguishing equipment or automatic smoke alarms
- 8 fires since 2000
- 30-40 police visits annually
- 30-40 ambulance visits annually





# Light Steel Chimneys

- 2004 60 fires, 2009 100 fires from light steel chimneys
- CE-markings T080,...,T600
  - T600: temperatures of smoke < 600 °C
  - Manufacturer responsible, not tested by authority
- Finnish standards SFS-EN
  - Height of insulation in inlet 20 cm
- Using in sauna, temperatures of smoke > 1000 °C
- Using “ignition damper” in fireplace high temperatures
- In Finland insulation in inlet may be > 100 cm
  - Increased temperatures

Photos: Esa Kokki

Inha T., Leppänen P., Peltomäki M. Fire safety of light steel chimneys. Research Report PALO 1950/2011.





# Conclusions

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- Health care buildings and hotels safe in Finland
- One family houses problem in fire safety
  - Victim alone, outsider notifies
- RIP cigarettes improved fire safety in 2010
- Actions during the ignition most critical
  - Self-preparation
  - Safe houses for persons with risky life style
- Fire safety in housing multi-sectorial problem, not only Rescue Services'
- Co-operation with authorities needed

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**Thank you! Tack! Kiitos!**

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