

# Rischio di incendi ed effetti sulla salute

## Bushfires likely to increase with global warming:

“It is now well recognised that because climate change will exacerbate high temperatures, increased severity and frequency of drought and extreme weather events, it has the potential to affect the intensity, return periods and spread of wildfire.”

(Hennessy *et. al.* 2006).

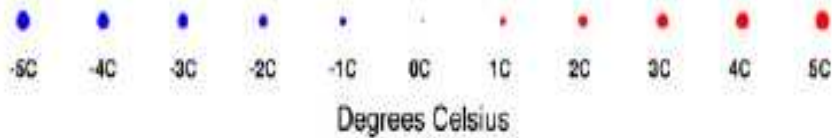
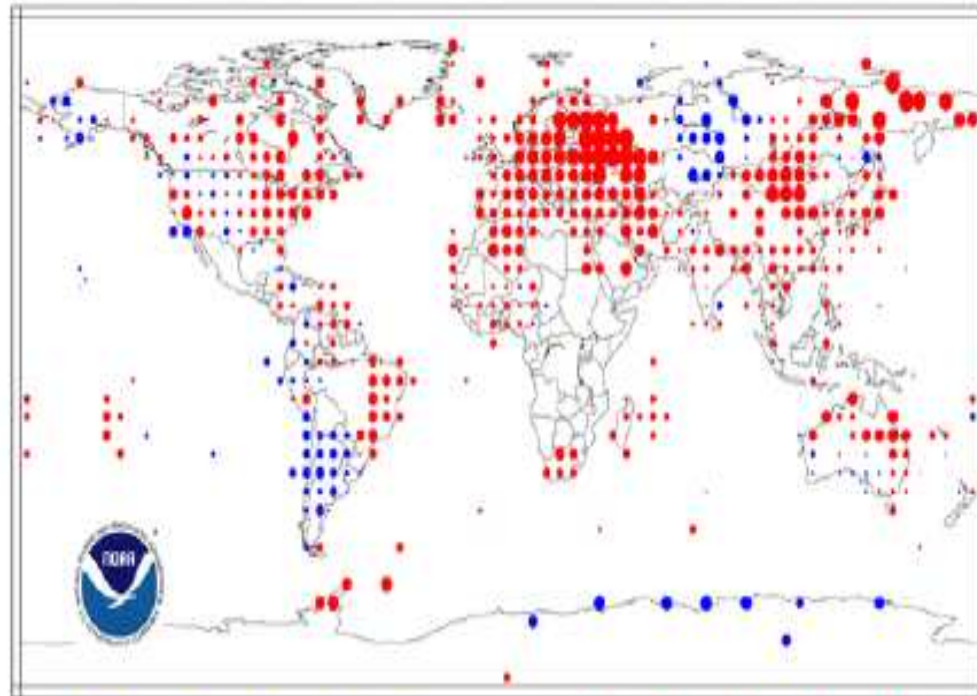
“Studies continue to show that climate change is likely to increase wildfire risk in areas where it is already a major issue. **These areas include Australia, the Americas, Southern Africa, Asia, and European countries such as France, Italy, Greece, Spain and Portugal.**”

(E.g. Hennessy *et. al.* 2006, Moriondo *et. al.* 2006, Kitzberger *et. al.* 2007).

# Temperature Anomalies July 2010

(with respect to a 1961-1990 base period)

National Climatic Data Center/NESDIS/NOAA



<http://www.ncdc.noaa.gov/oa/climate/research/2010/cmb-prod-global-2010.html>



**Incendi in Russia**

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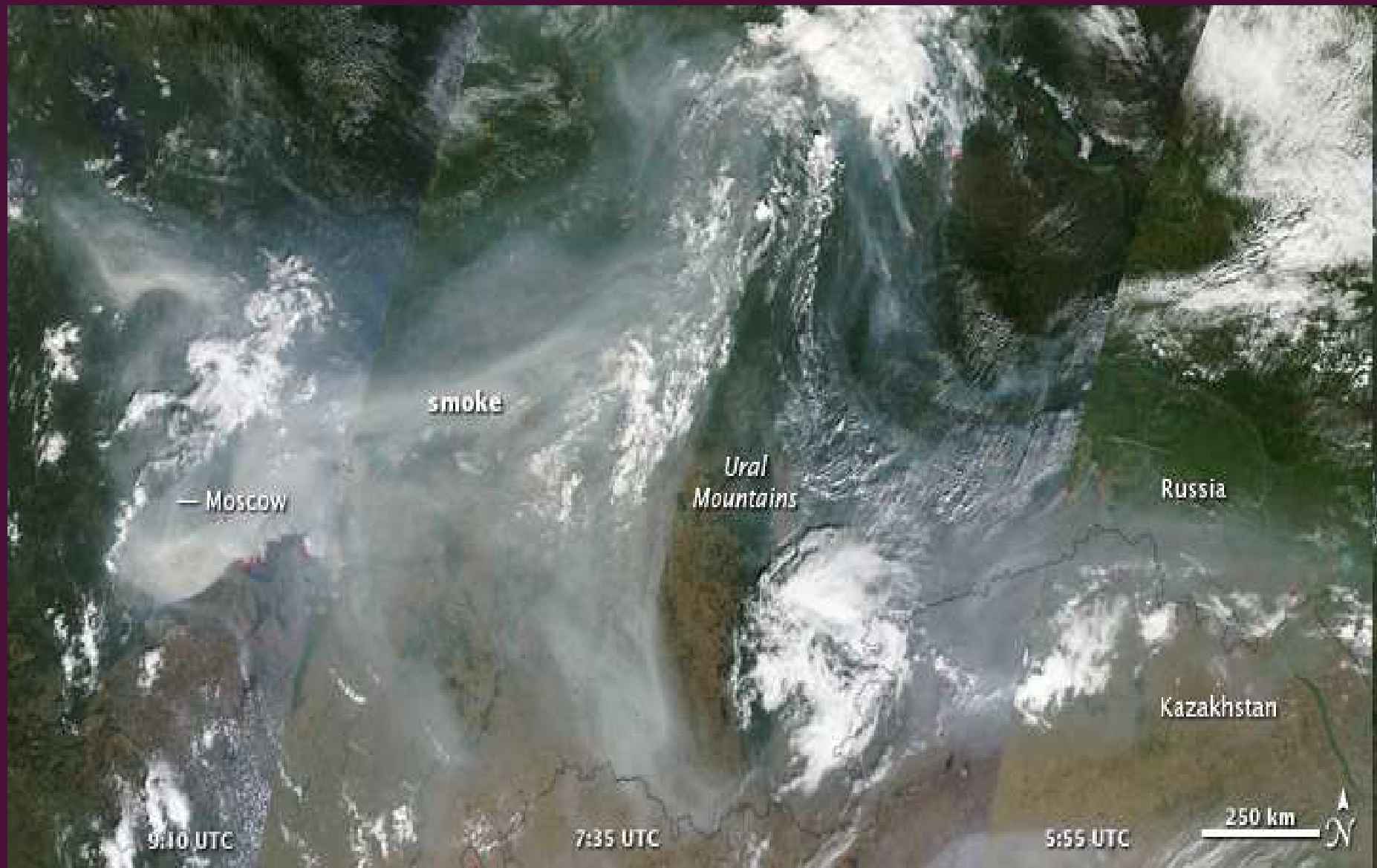
**Alluvioni in Moldova**

*Russia 4 Agosto 2010. Gli incendi particolarmente intensi sono evidenziati in rosso.*



immagine NASA

*l'immagine mostra le dimensioni reali del pennacchio di fumo che si espande per circa 3000 km.*



**immagine NASA**

Questa immagine evidenzia la quantità di monossido di carbonio dal 1° all' 8 Agosto 2010. In rosso , le zone dove i livelli di monossido carbonio sono più alti. Le aree in grigio rappresentano quelle zone in cui il sensore non ha potuto raccogliere i dati a causa della nuvolosità. Rilasciato nell'aria dagli incendi delle foreste e delle torbiere, il monossido di carbonio può creare seri problemi alla salute.

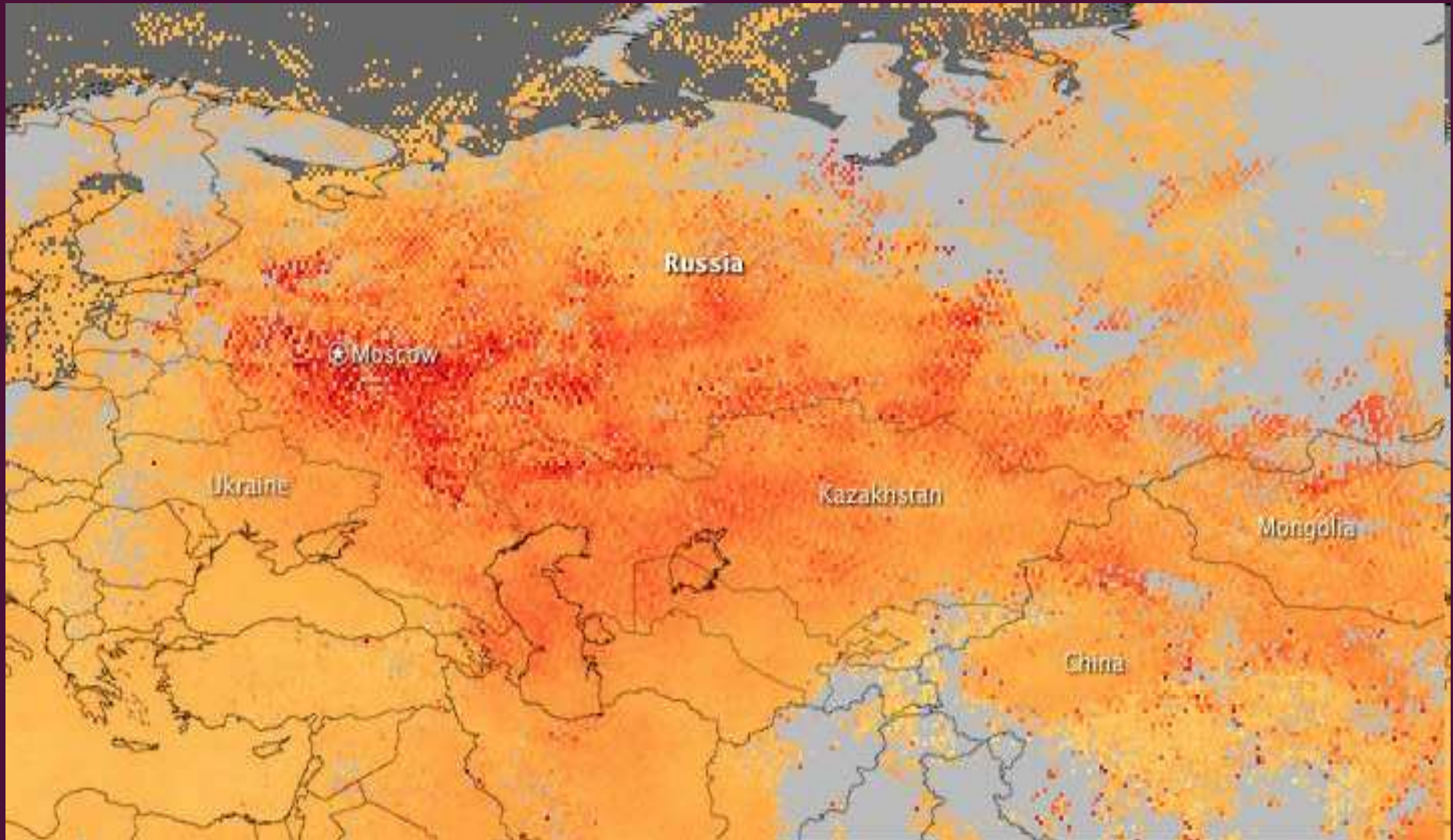


immagine NASA

# What's in smoke?

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Le sostanze sprigionate nella combustione possono essere così suddivise:

- Particolato (PM)
- Idrocarburi aromatici polinucleari (PAH)
- Ossidi di carbonio (CO e CO<sub>2</sub>)
- Aldeidi
- Acidi organici
- Componenti volatili e semi-volatili (VOC)
- Composti a base di azoto e zolfo
- Radicali liberi
- Ossidanti dell'ozono

Smoke travels vast distances and can affect large populations:

Russia → Finland, Australia → New Zealand, Indonesia → Australia

Pollutants from bushfires have half-lives of days in the atmosphere and they can be transported to hundreds of kilometres.

Depending on the affected area determined by the prevailing winds and air mass movements, millions of people can be exposed to the harmful combustion products and even a small increase in the health risk can cause large public health problems.

Fine and ultrafine particles are the pollutants with the greatest increase in concentrations (70-95%) during fire events

*Emmanuel SC, Respirology 2000 - Phuleria H J, Geohys 2005 - Naeher LP, Inhal Toxicol 2007*

- **PM<sub>10</sub> (thoracic particles)**
  - PM<sub>10-2.5</sub> (coarse fraction)
  - Can lodge deep in lungs; less harmful
- **PM<sub>2.5</sub> (fine particles)**
  - 70-95% of smoke particles
  - Can more easily penetrate lungs; not harmless
- **PM<sub>0.1</sub> (ultrafines)**
  - Can enter bloodstream and brain; not harmless
  - Better correlation with adverse health effects



# Health Effects

Although the adverse effect of urban fine particle on cardiovascular and respiratory health have been well documented, the population health impacts associated with smoke from bushfires are not well defined, in particular for cardiovascular diseases

*Naeher LP, et al. Inhal Toxicol 2007;19:67-106. Review*

There is insufficient evidence to conclude that wood smoke particles are significantly less or more damaging to health than general ambient fine particles of similar size

*Dennekamp M & Abramson M. Respirology 2010 (accepted). Review*

The air pollutant that increases during bushfire smoke is PM. Bushfire smoke is associated with hospital admissions for respiratory diseases.

PM10 from bushfire smoke is at least as toxic as urban PM10, but more research is needed

# Immediate exposure health effects

- PM can cause temporary eye and respiratory tract irritation with coughing and difficult breathing
- Higher levels of CO exposure can cause headaches, dizziness, visual impairment
- Formaldehyde and acrolein add to the cumulative irritant properties of smoke
- Hot smoke and gases can also burn the passage of the nose, airways and lungs
- Decreased lung function
- Aggravated asthma and bronchitis
- Increased ER and hospital visits

*Shusterman D, et al. West J Med 1993 – California Alameda County - 8 days fire 1991*  
ER admissions: bronchospastic reactions to smoke (31%), irritative reactions to smoke (20%), corneal abrasions (13%), and minor trauma (7%), other medical problems (8%).

*Viswanathan S, J Air Waste Manag Assoc 2006 – San Diego County – 10 days fire 2003*  
Direct correlation between the increase in PM and ED visits for asthma, respiratory problems with no fever, eye irritation and smoke inhalation during the fire period (lag 1-1.5 days)

# Short-term exposure health effects

Significant association between outdoor PM concentrations during fires and health effects were found for:

- increased all causes mortality
- Increased hospitalization and visits to emergency room
- increased respiratory symptoms
- exacerbation of asthma
- decreased lung function

## *Delfino RJ et al. Occup Environ Med 2009 – Southern California - 10 days bushfire 2003*

Increase in asthma admissions across all ages for increase in PM<sub>2.5</sub> during the wildfire period (lag2). Strongest effect with asthma admission in elderly (10.1%), children (8.3%) and adults (4.1%). Effect of PM<sub>2.5</sub> increase during wildfire for:

- Acute bronchitis in all ages (9.6%)
- COPD in 20-64 yrs (6.9%)
- pneumonia in 5-18yrs (6.4%)

## *Morgan G et al. Epidemiology 2010 – Sydney Australia – bushfires in 1994-2002 period*

Bushfire PM<sub>10</sub> associated with a small increase in all-cause mortality at lag 0(0.80%). No association with cardiovascular/respiratory mortality. In the elderly increase in admissions for:

- ischemic heart disease at lag 0 (1.2%)
- respiratory disease at lag 0(1.72%)
- COPD (3.29%)
- pneumonia and acute bronchitis at lag 1 (2.81%)

In adults:

Increase in asthma at lag 0 (5.02%)

# Short-term exposure health effects

## Contrasting results have been found for cardiovascular diseases

*Moore D, et al. Revue Canadienne De Sante Publique 2006*

*Forest Fires in British Columbia, Vancouver, 16 August-29 September 2003 bushfire*

No effects on visits for cardiovascular diseases or mental disorders were seen above mean reference rates

*Hanigan IC, et al. Environmental Health 2008*

*Darwin, Northern Australia – bushfires from 1996-2005 April-November*

Negative estimates for cardiovascular disease

*Delfino RJ et al. Occup Environ Med 2009*

*Southern California - 10 days fire October 2003*

Increase in cardiovascular admissions (6.1%) and congestive heart disease admission (11.3%) in post wildfire period

*Morgan G et al. Epidemiology 2010*

*Sydney Australia – bushfires in the period 1994-2002*

No association with cardiovascular/respiratory mortality.

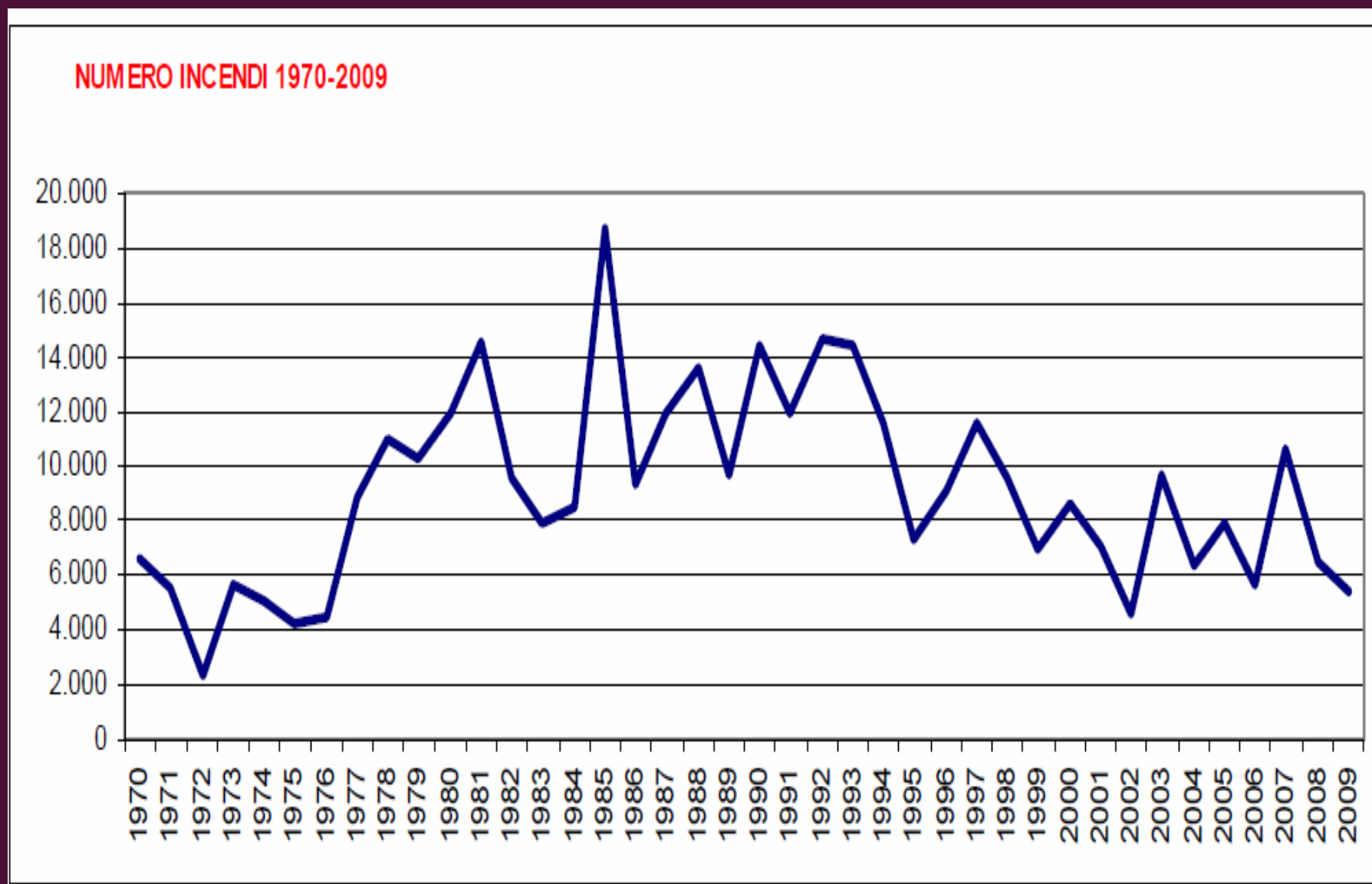
In the elderly increase in admissions for ischemic heart disease

# Sensitive populations

The health impacts have been observed primarily in

- the infants and very young
- the elderly
- elderly with previous hospitalization for any cause, cardio-respiratory disease and respiratory disease
- in individuals with pre-existing illness (asthma, COPD, sinusitis, upper respiratory infections, laryngitis)

# Gli incendi in Italia



Fonte: Corpo Forestale dello Stato

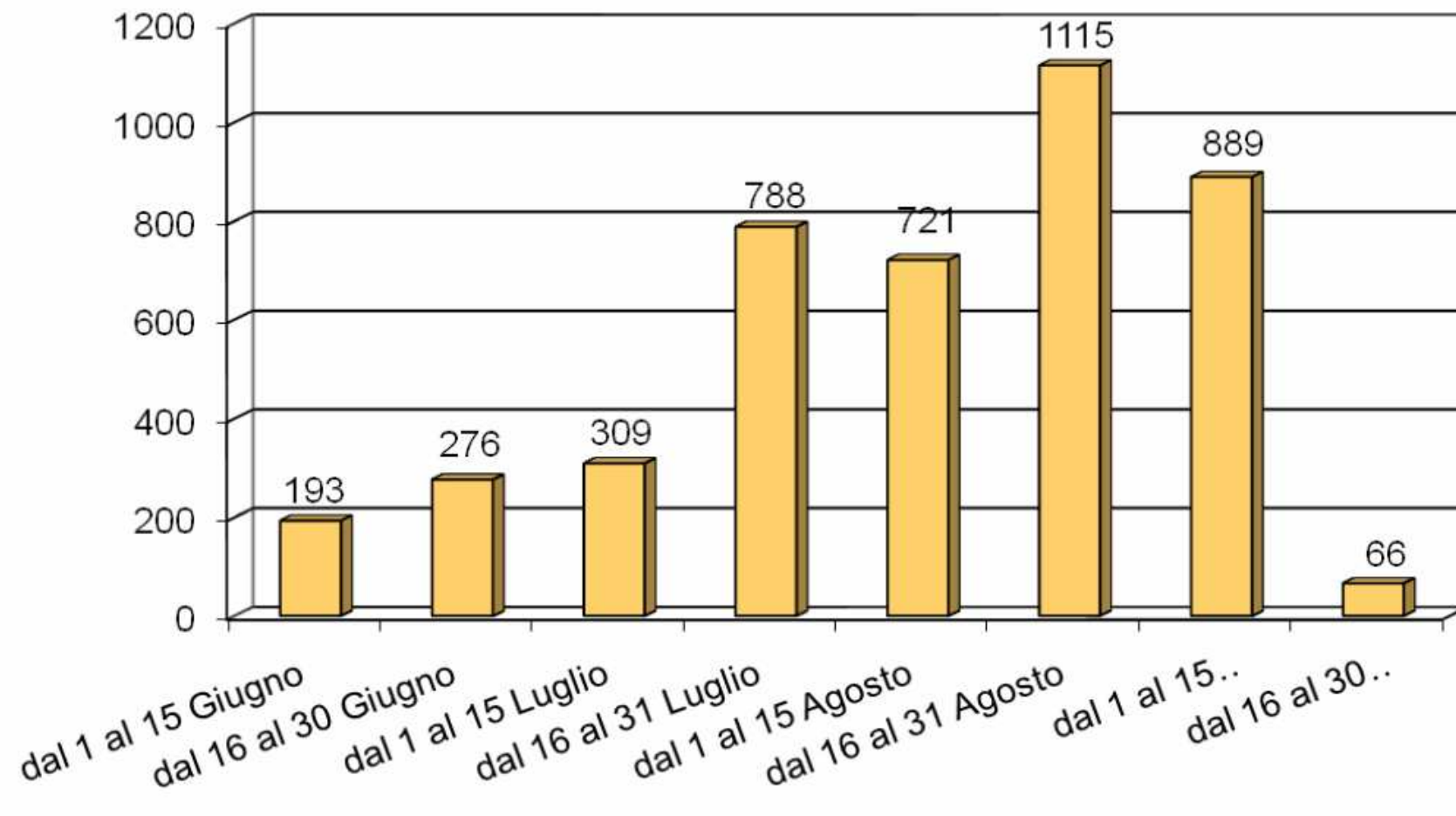
ANNO	NUMERO	SUPERFICIE PERCORSA DAL FUOCO (HA)			
		BOSCATA	NON BOSCATATA	TOTALE	MEDIA
1970	6.579	68.170	23.006	91.176	13,9
1971	5.617	82.339	18.463	100.802	17,9
1972	2.358	19.314	7.989	27.303	11,6
1973	5.681	84.438	24.400	108.838	19,2
1974	5.055	66.035	36.909	102.944	20,4
1975	4.257	31.551	23.135	54.686	12,8
1976	4.457	30.735	20.056	50.791	11,4
1977	8.878	37.708	55.031	92.739	10,4
1978	11.052	43.331	84.246	127.577	11,5
1979	10.325	39.788	73.446	113.234	11,0
1980	11.963	45.838	98.081	143.919	12,0
1981	14.503	74.287	155.563	229.850	15,8
1982	9.557	48.832	81.624	130.456	13,7
1983	7.956	78.938	133.740	212.678	26,7
1984	8.482	31.077	44.195	75.272	8,9
1985	18.664	76.548	114.092	190.640	10,2
1986	9.398	26.795	59.625	86.420	9,2
1987	11.972	46.040	74.657	120.697	10,1
1988	13.588	60.109	126.296	186.405	13,7
1989	9.669	45.933	49.228	95.161	9,8
1990	14.477	98.410	96.909	195.319	13,5
1991	11.965	30.172	69.688	99.860	8,3
1992	14.641	44.522	61.170	105.692	7,2
1993	14.412	116.378	87.371	203.749	14,1
1994	11.588	47.099	89.235	136.334	11,8
1995	7.378	20.995	27.889	48.884	6,6
1996	9.093	20.329	37.659	57.988	6,4
1997	11.612	62.775	48.455	111.230	9,6
1998	9.540	73.017	82.536	155.553	16,3
1999	6.932	39.362	31.755	71.117	10,3
2000	8.595	58.234	56.414	114.648	13,3
2001	7.134	38.186	38.241	76.427	10,7
2002	4.601	20.218	20.573	40.791	8,9
2003	9.697	44.064	47.741	91.805	9,5
2004	6.428	20.866	39.310	60.176	9,4
2005	7.951	21.470	26.105	47.575	6,0
2006	5.643	16.422	23.524	39.946	7,1
2007	10.639	116.602	111.127	227.729	21,4
2008	6.486	30.273	36.055	66.328	10,2
2009	5.422	31.060	42.295	73.355	13,5

**INCENDI BOSCHIVI IN ITALIA**
**PER REGIONE**

REGIONE	NUMERO	SUPERFICIE PERCORSA DAL FUOCO (HA)			
		BOSCATA	NON BOSCATI	TOTALE	MEDIA
VALLE D'AOSTA	13	2	5	7	0,5
PIEMONTE	117	286	87	373	3,2
LOMBARDIA	138	268	128	396	2,9
TRENTINO A. A.	48	4	1	5	0,1
VENETO	99	30	24	54	0,5
FRIULI V. G.	73	198	156	354	4,8
LIGURIA	332	1.489	1.155	2.644	8,0
EMILIA ROMAGNA	86	69	102	171	2,0
TOSCANA	549	1.407	431	1.838	3,3
UMBRIA	56	44	11	55	1,0
MARCHE	19	38	25	63	3,3
LAZIO	325	1.802	726	2.528	7,8
ABRUZZO	34	104	55	159	4,7
MOLISE	49	75	111	186	3,8
CAMPANIA	<b>903</b>	4.881	1.321	6.202	6,9
PUGLIA	277	1.527	2.831	4.358	15,7
BASILICATA	142	651	390	1.041	7,3
CALABRIA	716	4.114	3.087	7.201	10,1
SICILIA	762	1.801	6.815	8.616	11,3
SARDEGNA	684	<b>12.270</b>	24.834	<b>37.104</b>	54,2
<b>TOTALE</b>	<b>5.422</b>	<b>31.060</b>	<b>42.295</b>	<b>73.355</b>	<b>13,5</b>



## NUMERO INCENDI BOSCHIVI DURANTE I MESI ESTIVI PER QUINDICINA

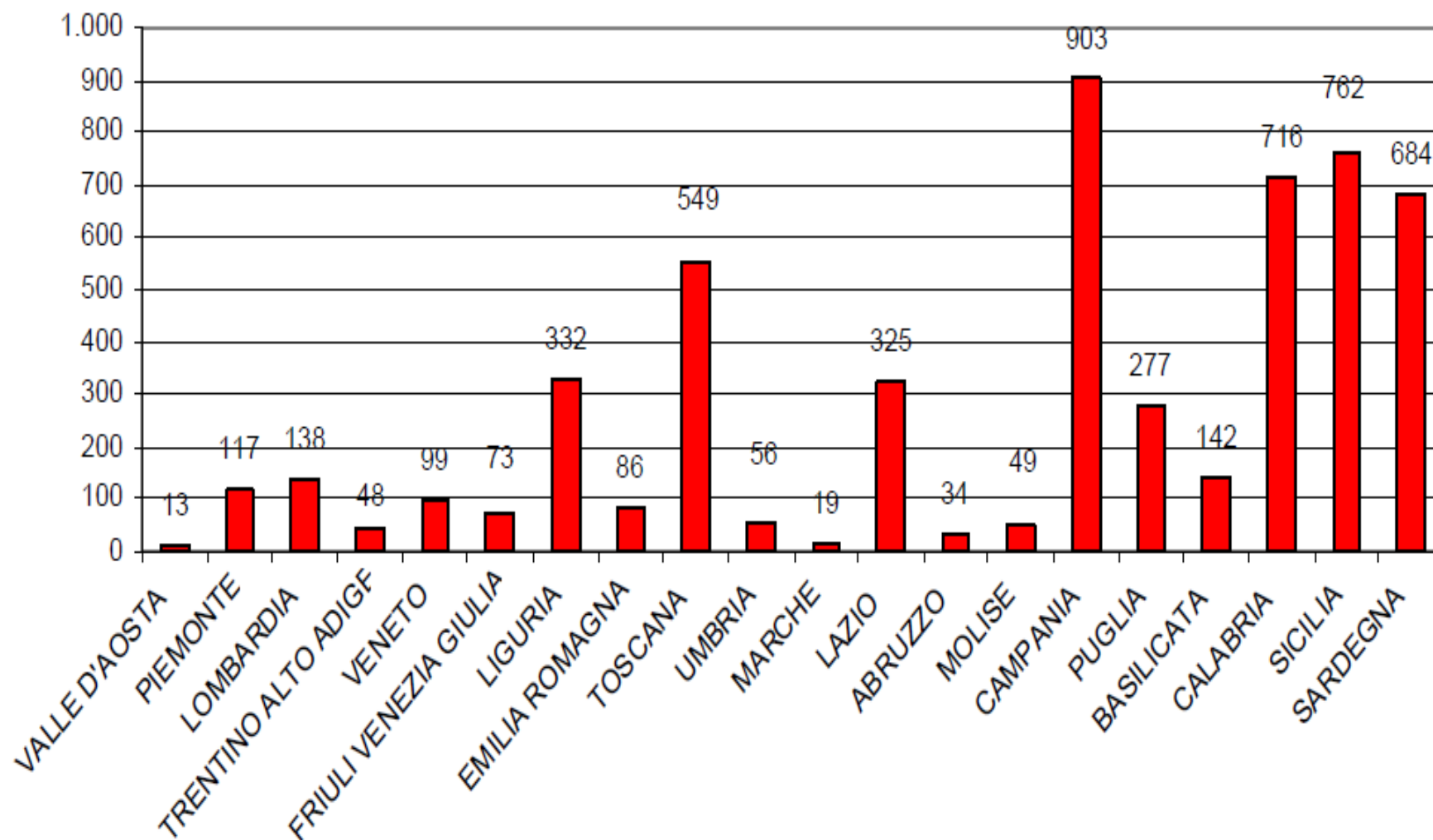


### ANNO 2009

L'incendio che ha destato maggiore allarme sociale è quello verificatosi alla periferia di Genova tra il 6 e l'8 settembre 2009; ha percorso complessivamente 945 ettari

Fonte: Corpo Forestale dello Stato

## NUMERO INCENDI BOSCHIVI PER REGIONE



# Ipotesi per uno studio italiano?

## Regioni più colpite

Liguria, Toscana, Lazio, Campania, Puglia, Calabria, Sicilia, Sardegna

- Serie storiche dati di mortalità
- Serie storiche dati di ospedalizzazioni e/o accesso al Pronto Soccorso
- Serie storiche dati di inquinamento atmosferico
- Serie storiche dati meteorologici
- Serie storiche dati sugli incendi

### Dati Corpo Forestale dello Stato

Il Corpo Forestale dello Stato ha adottato una procedura informatizzata di raccolta dei dati degli incendi boschivi, denominata **Fascicolo Territoriale (FT)**. Per ciascun evento sono presenti dati quali la data e l'ora di completo spegnimento dell'incendio, i mezzi aerei intervenuti, informazioni di natura spaziale, la superficie boscata percorsa dal fuoco, le coordinate del punto dove risiede la centralina di rilevamento meteo-nivometrico.

Altre fonti?