Impatto del freddo sulla salute (mortalità e ricoveri per causa)

- Evidenze dell’impatto del freddo su mortalità e ricoveri
- Variazione temporale
- Fattori di esposizione
- Lag
- Interazione freddo inquinamento

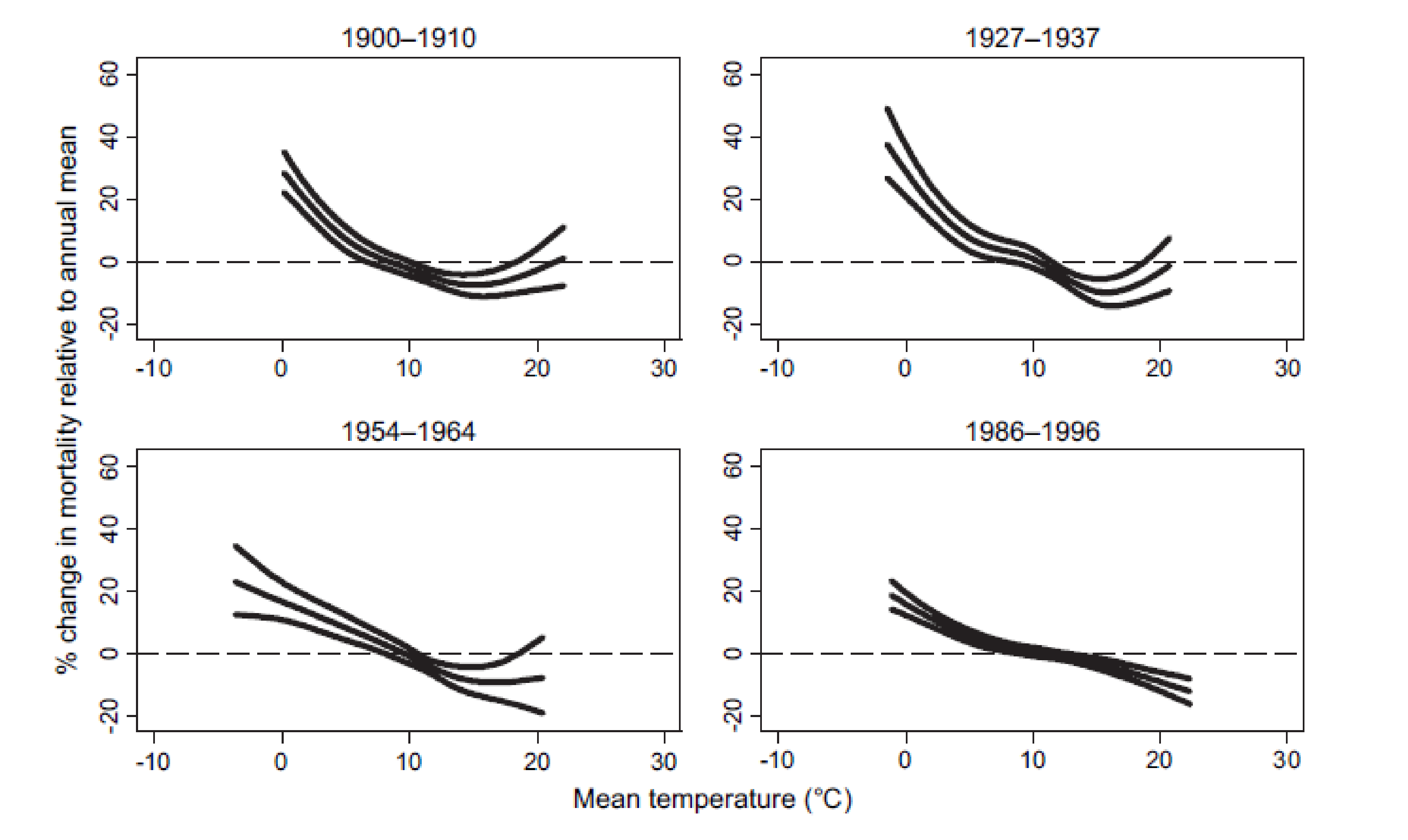
Freddo e mortalità per malattie cardiovascolari: gli studi epidemiologici negli ultimi 5 anni

Causa	ICD-IX	Età	Range variazione percentuale	Unità di misura	Autore, anno
Malattie	**390-459**	tutte	14%-30%	Ondata di freddo *vs* riferimento	*Kysely 2009*
del sistema circolatorio			1%-12%	Per decremento di 1°C di T giornaliera	*O'Neill 2005, Carson 2006*
			5%	In giorni con T estreme vs altri giorni	*Medina-Ramon 2006*
		15-64	1%-11%	Per decremento di 1°C di T giornaliera	*O'Neill 2005, Analitis 2008*
		45-64	7% (donne)	Per decremento di 1°C di T giornaliera	*Diaz 2006*
		65-74	1%-6%	Per decremento di 1°C di T giornaliera	*Diaz 2005, Analitis 2008*
		75+	2%-3%	Per decremento di 1°C di T giornaliera	*Analitis 2008, Diaz 2005*
Infarto miocardico acuto	**410**	tutte	4%	In giorni con T estreme vs altri giorni	*Medina-Ramon 2007*
		35-64	7%	In giorni freddi vs altri giorni	*Barnett 2005*
Arresto cardiaco	**427.5**	tutte	14%-16%	In giorni con T estreme vs altri giorni	*Medina-Ramon 2006, 2007*
Malattie cerebrovascolari	**430-438**	tutte	1%	Per decremento di 1°C di T giornaliera	*Analitis 2008*
		65-74	1%		
		75+	2%		

Freddo e mortalità per malattie respiratorie: gli studi epidemiologici negli ultimi 5 anni

Causa	ICD-IX	Età	Range variazione	Unità di misura	Autore, anno
Malattie dell'apparato respiratorio	**460-519**	tutte	3%-21%	Per decremento di 1°C di T	*Carder 2005, O'Neill 2005, Carson 2006, Analitis 2008*
		15-64	3%-17%	Per decremento di 1°C di T	*O'Neill 2005, Analitis 2008*
		65-74	4%	Per decremento di 1°C di T	*Analitis 2008*
		75+	3%-10%	Per decremento di 1°C di T	*Diaz 2005, Analitis 2008*

Percent change in all-cause mortality by mean weekly temperature in London, United Kingdom, over the course of the 20th century, by period

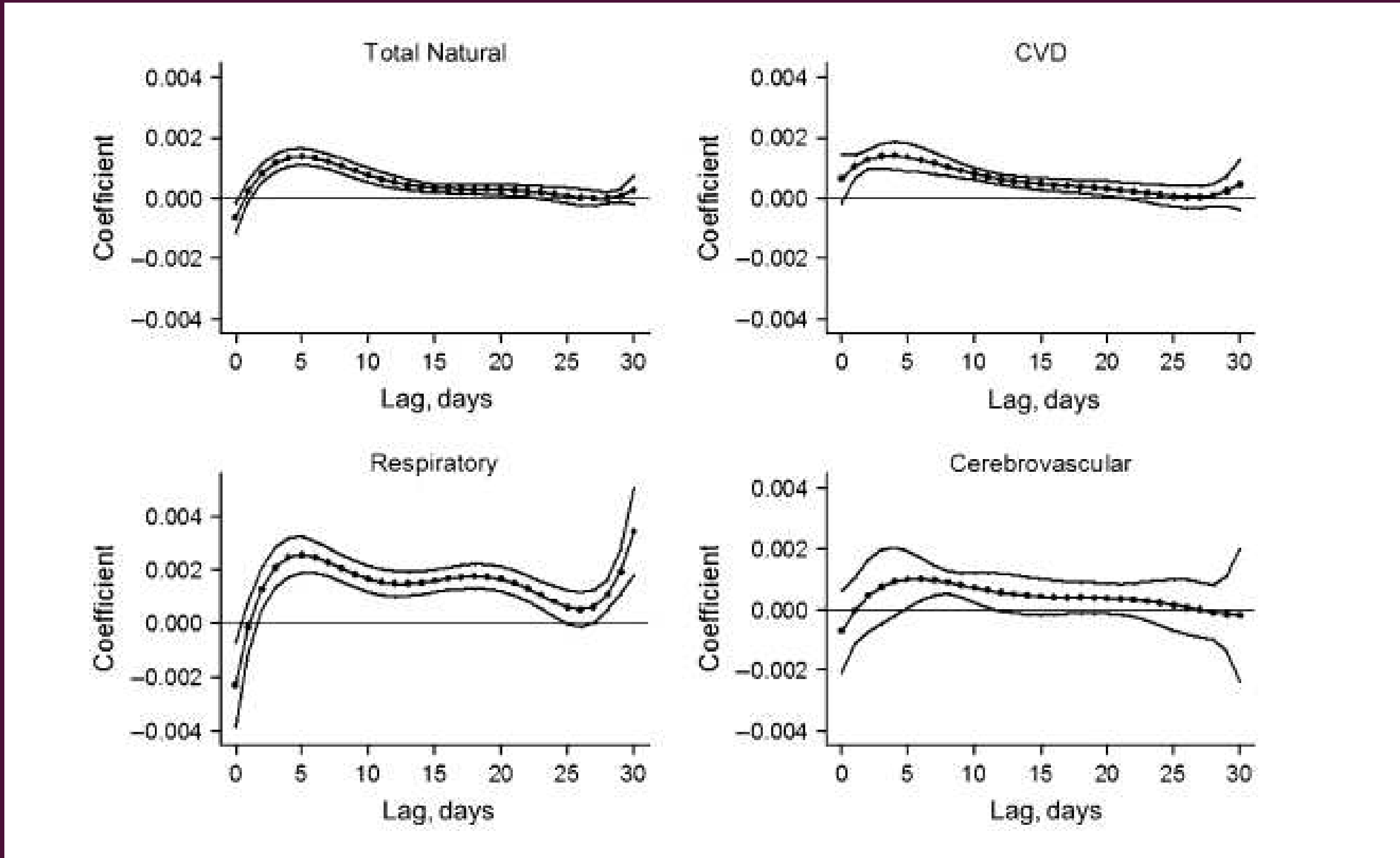


Source: Carson et al 2006 AJE Declining Vulnerability to Temperature-related Mortality in London over the 20th Century

Freddo e impatto sulla salute. Studi epidemiologici, outcome di salute, indicatori di esposizione e latenza.

Author	Setting	Outcome	Lag	Exposure	cold spells/threshold
Eurowinter, 1997	EU regions	mortality	up to 12 days	Tmean	<18°C
Hajat et al. 2004	16 cities, UK	gp consulation	lag 0-20	Tmean	<5°C
Barnett et al. 2005	Multi city, WHO MON	coronary even	up to 15 days	Tmean, rh	-
Morabito et al. 2005	Florence, Italy	AMI deaths	0, lag 1.-3	Tapp(ATI), wind chill(NWCTI)	Hours of discomfort <10th pct ATI and
Carder et al. 2005	Scotland	CV mortality	lag 0-6,up to lag 0-24	Tmean, Windchill	1°C decline below 11°C
Diaz et al. 2005	Madrid	mortality	lag 0-14	Tmin, Tmean, Tmax	
Carson et al. 2006	London, UK	mortality		Tmean	<15°C
Barnett et al. 2007	USA	CV mortality	lag 0-6	Tmean, dew point	
Hajat et al. 2007	UK	mortality	lag 0-13	Tmean	
Madina-Ramon 2007	50 US cities	mortality, IMA card.	lag 0, 1	Tmax	Tmax< 1st pct, Tmax<17°C
Analitis et al. 2008	15 EU cities	mortality	lag 0-15	Tappmin	
Kysely et al. 2009	Czech Republic	CV mortality	up to 20 days	Tmax	cold spell Tmax<-3.5°C
Baksharam et al. 2010	UK	IMA HA	0-1, weekly up to 28 days	Tmean	
Iniguez et al. 2010	Spain, 13 cities	CV and Resp mort	lag up to 10 days	Tmean, dew point	Tmean<city secific MMT
Anderson Bell, 2009	107 US cities	mortality	lag 0-25	Tmean	

PHEWE mortality: Combined distributed lags curves (95% CI) up to 30 days of the effect of a reduction of 1℃ in apparent temperature on da ily number of deaths for cardiovascular disease during the cold season (October–March), 1990–2000.



Analitis et al. 2008

Incremento % nella mortalità per 1℃ di decremento n ella temperatura apparente minima (lag 0-15)

	Mediterranean		North-Cen	
	Increase	95% CI	Increase	95% CI
Total natural mortality				
Fixed pooled estimate	1.62	1.44, 1.80	1.16[a]	1.04, 1.28
Random pooled estimate	1.62	1.38, 1.85	1.15	0.96, 1.34
Cardiovascular disease mortality				
Fixed pooled estimate	2.29	2.02, 2.56	1.41	1.24, 1.58
Random pooled estimate	2.29	2.01, 2.57	1.38	1.16, 1.61
Respiratory mortality				
Fixed pooled estimate	2.98[a]	2.28, 3.68	3.87[a]	3.41, 4.33
Random pooled estimate	2.80	1.62, 4.01	3.66	2.87, 4.45
Cerebrovascular mortality				
Fixed pooled estimate	2.05	1.44, 2.66	0.89	0.52, 1.26
Random pooled estimate	2.03	1.36, 2.69	0.89	0.52, 1.26

Abbreviation: CI, confidence interval.

[a] Significant heterogeneity.

Analitis A, et al. American Journal of Epidemiology 2008

Malattie cardiovascolari/respiratorie e freddo : meccanismi patogenetici

Malattie cardiovascolari

- Attivazione risposte infiammatorie e della coagulazione in persone suscettibili
- Vasocostrizione cutanea, aumento della pressione sistolica e del volume ematico, della gittata cardiaca e del fabbisogno di ossigeno
- Cambiamenti ematologici conseguenti alla vasocostrizione e conseguente emoconcentrazione

Vuori I. The heart and the cold. *Annals Clin Research* 1987; 19: 156-162
Schneider A, et al. *Epidemiology* 2008;19:391-400

Malattie respiratorie

- Vasocostrizione delle vie aeree superiori, inibizione delle difese respiratorie e maggiore suscettibilità alle infezioni virali
- Aumento del numero di granulociti e macrofagi nelle basse vie aeree di soggetti sani e aumento dell'iper-reattività bronchiale all'istamina
- Riduzione nella funzionalità polmonare, deterioramento dello stato di salute e maggiore suscettibilità alle infezioni virali in pazienti con BPCO
- Alterazione risposta coagulativa a causa di infezioni respiratorie (es. *Chlamidia pneumoniae*), danno alle pareti dei vasi e rischio di aterosclerosi

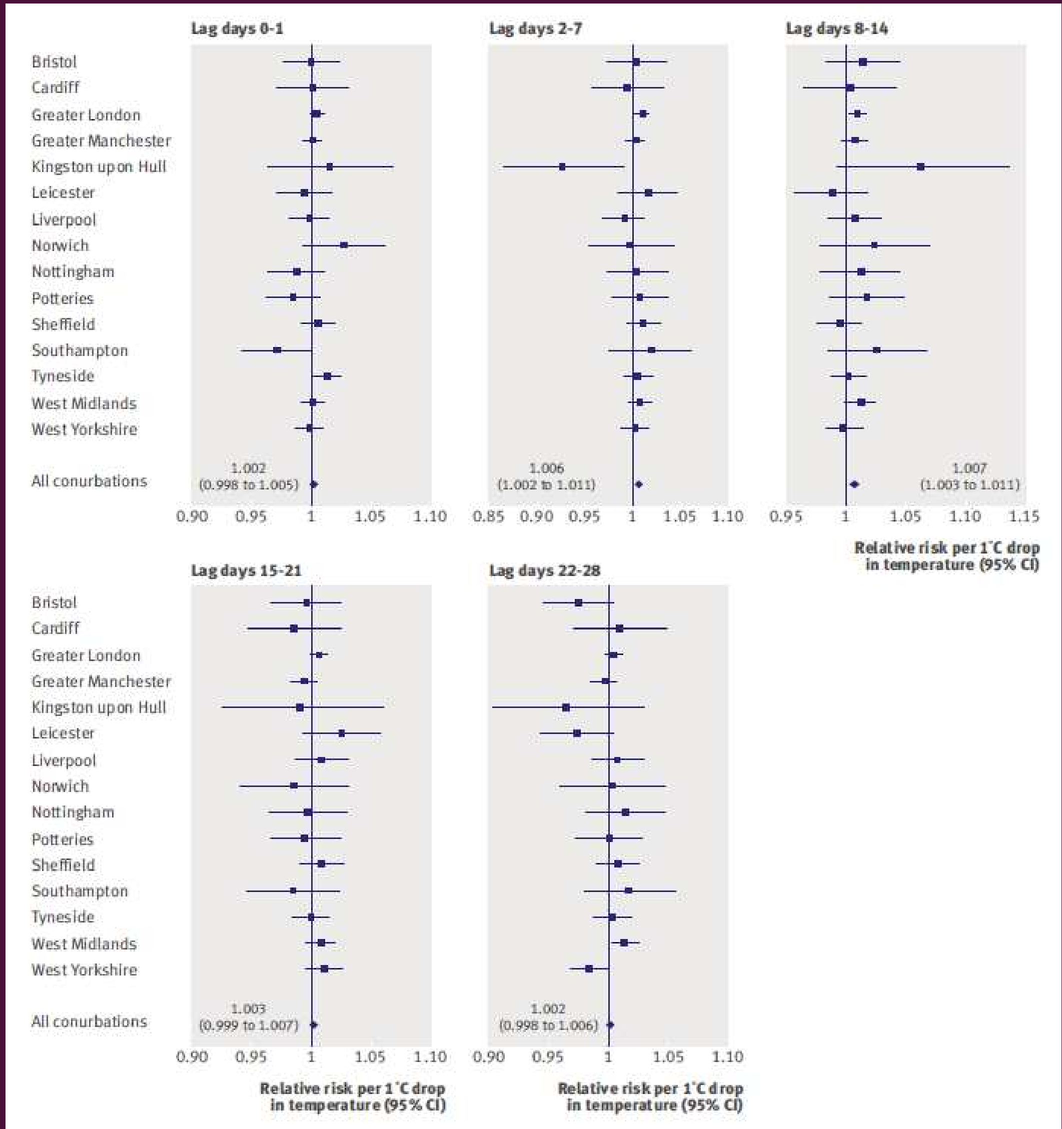
Koskela HO. 2007;66(2):91-100.
Donaldson GC, et al. Eur Respir J 1999;13:844-849.

Ricoveri ospedalieri PHEWE12 città europee. Incremento % nei ricoveri per 1°C di decremento nella temperatura minima (lag 0-15)

	Mediterranean cities		North Continental cities	
	%increase	(95% CI)	%increase	(95% CI)
Cardiovascular				
All Ages	0.1	(-0.3 ; 0.5)	0.1	(-0.4 ; 0.6)
Ages 15-64	-0.2	(-0.9 ; 0.4)	-0.5	(-0.9 ; -0.1)
Ages 65-74	0.1	(-0.4 ; 0.5)	0.2	(-0.1 ; 0.5)
Ages 75+	0.3	(-0.2 ; 0.8)	0.6	(-0.3 ; 1.4)
Cerebrovascular				
All Ages	0.4	(-0.1 ; 0.9)	0.1	(-0.3 ; 0.5)
Ages 15-64	0.4	(-0.7 ; 1.6)	-0.4	(-1.1 ; 0.4)
Ages 65-74	1.6	(-0.3 ; 3.5)	-0.1	(-0.8 ; 0.6)
Ages 75+	0.1	(-0.6 ; 0.8)	0.4	(-0.3 ; 1.1)
Respiratory				
All Ages	**1.6**	**(0.6 ; 2.5)**	**2.5**	**(1.3 ; 3.8)**
Ages 0-14	0.8	(-0.7 ; 2.4)	1.2	(0.5 ; 1.8)
Ages 15-64	1.4	(-0.2 ; 3.1)	1.8	(0.7 ; 2.8)
Ages 65-74	1.8	(0.6 ; 2.9)	**3.5**	**(1.7 ; 5.3)**
Ages 75+	**2.7**	**(2.1 ; 3.5)**	**4.3**	**(2.5 ; 6.1)**

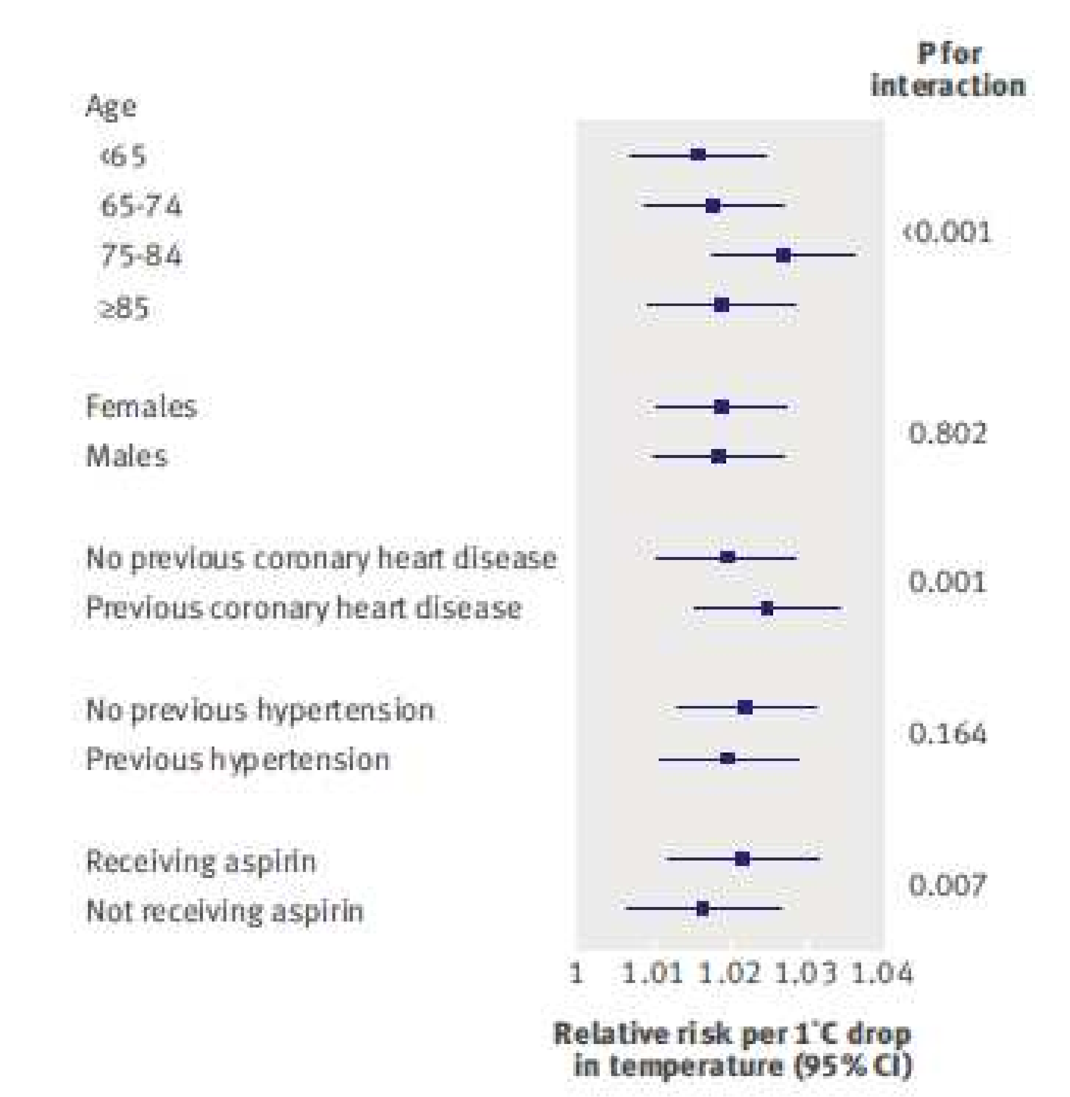
Michelozzi P, et al. ***unpublished***

Ricoveri ospedalieri. Estimated relative risk of myocardial infarction per 1℃ reduction in temperature by conurbation. Estimates from a combined model including five temperature terms (lag days 0-1, 2-7, 8-14, 15-21, and 28).



Bhaskaran et al. 2010

Ricoveri Ospedalieri. Estimated relative risk of myocardial infarction per 1℃ reduction in temperature: effect modification by age, sex, history, and aspirin use.



Bhaskaran et al. 2010

Temperature changes and the risk of cardiac events

Prevention strategies should target subgroups who are vulnerable to heat and cold

RESEARCH, p 338

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doi: 10.1136/bmj.c3720

Climate change is a concern in many regions of the world where extreme hot and cold temperatures may affect people with cardiovascular diseases and increase the incidence of coronary events. The impact may be greater in areas with inequalities in the access to medical services.[1]

In the linked study, Bhaskaran and colleagues assessed the effect of temperature on the risk of myocardial infarction and other acute coronary syndromes[2]; they performed a time series analysis across 15 conurbations in England and Wales using clinically confirmed hospital admissions data. They found that each 1°C reduction in daily mean temperature was associated with a 2.0% (95% CI 1.1% to 2.9%) cumulative increase in the risk of myocardial infarction for 28 days; the highest risk was within two weeks of exposure. They found no association at higher temperatures.

The results for cold temperatures are consistent with several other studies,[3] although others have found that myocardial infarction is associated with higher temperatures. The absence of an effect of heat on myocardial infarction agrees with results from a previous study in Paris during the 2003 heat wave, which found an increased risk of sudden cardiac death but no increase in myocardial infarction.[4] Moreover, results from a large European multi-city study reported contrasting patterns, with heat affecting mortality from cardiovascular disease but having no effect on hospital admissions for cardiovascular diseases. This suggests that deaths from cardiac disease occur before patients receive medical treatment or are admitted to hospital.[5]

The main strength of the present study is that myocardial infarction was confirmed by clinical data.[2] To date, few studies have investigated the effect of temperature on specific cardiac outcomes. Most evidence is on cardiovascular causes as a whole and does not distinguish between differences in the course of the disease or the underlying mechanisms through which temperature may worsen conditions and increase the risk of death. Future studies should assess the effect of temperature on specific causes and improve the accuracy of disease definition by collecting information from disease registers integrated with administrative data.

Interazione tra temperatura e inquinamento

Conflicting results, and it is uncertain whether air pollutants are confounders and/or effect modifiers (i.e., a synergistic effect) of the temperature-mortality association, even less evidence in relationship with cold temperatures

Confounders

Ozone and Pm10:- 4 studies
Ozone (medina-Ramon, 2007) Ozone on warm humid days (Vaneckova 2008)
Pm10 in summer (Basu 2005)
No effect:- 7 studies

Effect Modifiers

Ozone (Ren, 2008) (Filleul 2006)
Pm10 : (Ren 2008)
Not modifiers: Zanobetti and Schwartz, 2008 and Basu, 2008

Obiettivi gruppo di lavoro:

- Effetto sulla mortalità giornaliera;
- Effetto sui ricoveri ospedalieri per cause specifiche
- Struttura Lag
- Ruolo delle condizioni socioeconomiche
- Analisi dell'interazione tra freddo e inquinamento atmosferico