

Air Pollution and Total Mortality In California

James E. Enstrom, Ph.D., M.P.H.

Epidemiologist

UCLA School of Public Health

President

Scientific Integrity Institute

Los Angeles, CA

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Fine Particulate Matter (PM_{2.5}) & Total Mortality Relationship Since 1993

Based on Prospective Epidemiologic Cohorts

Dockery, Pope, et al. NEJM 1993 “An association between air pollution and mortality in six U.S. cities” (H6CS)

Pope, Thun, et al. AJRCCM 1995 “Particulate air pollution as predictor of mortality in prospective study of U.S. adults” (CPS II)

Wall Street Journal April 7, 1997

“Pollution study sparks debate over secret data”

SCIENCE July 25, 1997 “Showdown Over Clean Air Science”
& “Researchers and Lawmakers Clash Over Access to Data”

Robert F. Phalen “The Particulate Air Pollution Controversy”
2002 Book and 2004 Paper

Fine Particulate Matter (PM_{2.5})

PM_{2.5} is defined by particle size ($\leq 2.5 \mu\text{m}$ in diameter) and not by chemical composition. PM_{2.5} is generated mainly by combustion processes. The major sources of PM_{2.5} in California are forest fires, agricultural dust, industrial combustion, China, and diesel engines (about 10%)

PM_{2.5} epidemiology has been used to establish the following scientifically contested regulations that have had and still have multi-billion dollar economic impacts in California and the US:

- 1) 1997 & 2012 US EPA Annual National Ambient Air Quality Standard (NAAQS) for PM_{2.5}: $15 \mu\text{g}/\text{m}^3$ and now $12 \mu\text{g}/\text{m}^3$
- 2) 2008 CARB Truck and Bus Regulation for Diesel Vehicles
- 3) 2003-2007-2012 SCAQMD Air Quality Management Plans₃

“Premature Deaths” Attributed to PM_{2.5}

A relative risk greater than 1.0 [RR > 1.00] for the relationship between PM_{2.5} and total (all cause) mortality is interpreted by US EPA and CARB as evidence that PM_{2.5} “causes” “premature deaths.”

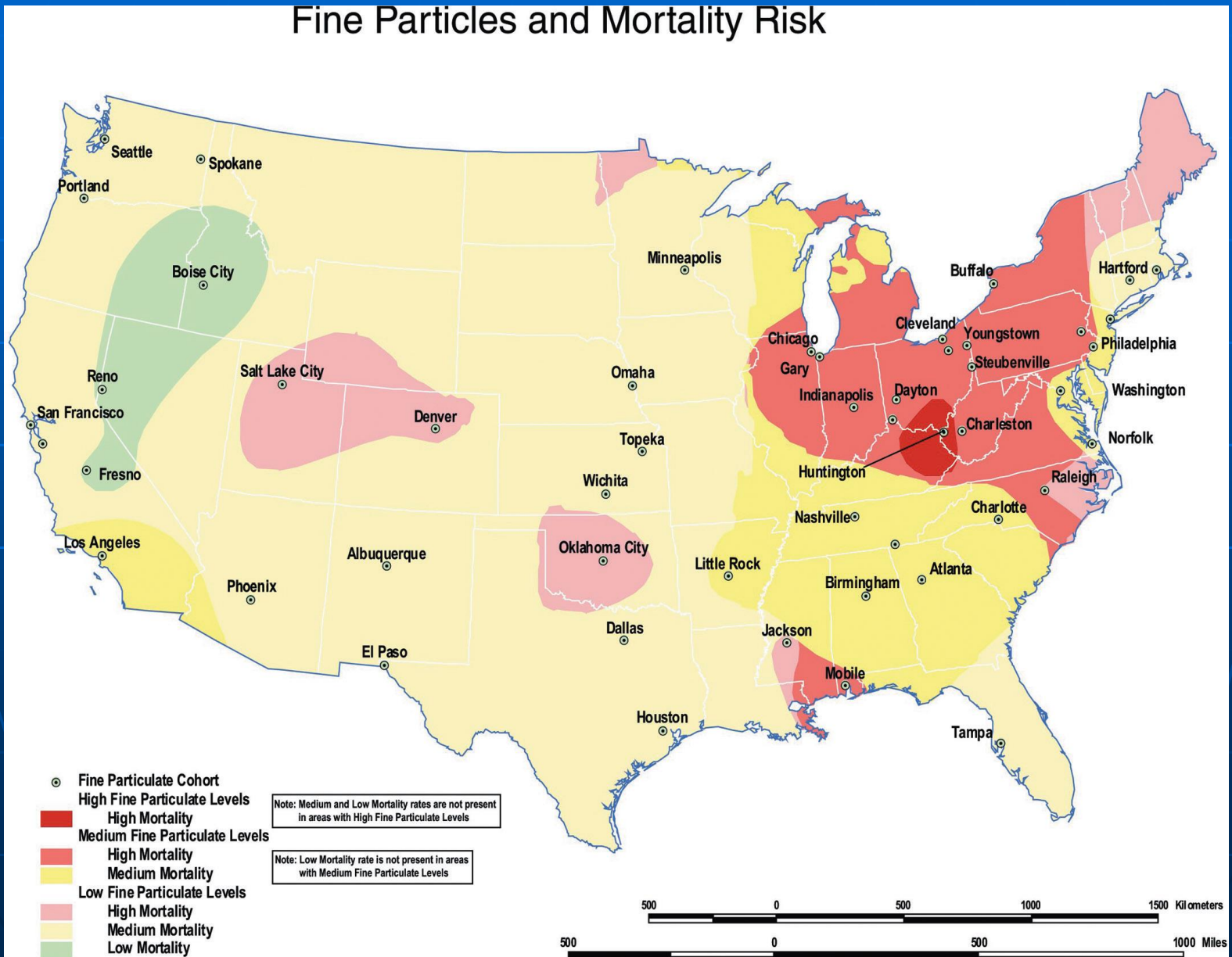
Because EPA assigns a lifetime monetary value of about \$9 million to each “death,” the health benefits of preventing these “deaths” are assumed to exceed the compliance costs of the EPA and CARB regulations that are designed to reduce PM_{2.5} levels and PM_{2.5}-related deaths.

Without PM_{2.5}-related “premature deaths” the EPA and CARB regulations are not justified on a socioeconomic cost-benefit basis.

2000 Krewski Jerrett HEI Report Figure 21

1982-1989 CPS II PM_{2.5} Mortality Risk <1.0 in CA

Fine Particles and Mortality Risk



August 31, 2010 Letter from Krewski to HEI President Greenbaum

(http://www.arb.ca.gov/research/health/pm-mort/HEI_Correspondence.pdf)

**Special Analysis of California Subjects
in Krewski 2009 HEI Research Report 140
(direct result of repeated requests to HEI
by Ad Hoc Trucking Group during 2010)**

RR = 0.872 (0.805 – 0.944) during 1982-1989

RR = 0.960 (0.920 – 1.002) during 1982-2000

Based on 40,408 CPS II subjects in 4 CA Metro Areas (MSAs)

PM_{2.5} & Total Mortality in California: RR (95% CI)

(<http://www.scientificintegrityinstitute.org/ASAS092812.pdf>)

McDonnell 2000 (9 air sheds)	AHSMOG	RR ~ 1.03 (0.95-1.12)	1976-1992
Krewski 2000 (4 MSAs, reported in 2010)	CA CPS II	RR = 0.87 (0.81-0.94)	1982-1989
Enstrom 2005 (11 cos & 25 cos)	CA CPS I	RR = 1.00 (0.98-1.02)	1983-2002
Zeger 2008 (CA + OR + WA)	MCAPS "West"	RR = 0.99 (0.97-1.01)	2000-2005
Krewski 2010 (4 MSAs)	CA CPS II	RR = 0.96 (0.92-1.00)	1982-2000
Jerrett 2010-11 (Nine Model Average)	CA CPS II	RR = 1.00 (0.99-1.01)	1982-2000
Lipsett 2011	CA Teachers	RR = 1.01 (0.95-1.09)	2000-2005
Jerrett 2013 (Conurbation LUR Model Only)	CA CPS II	RR = 1.06 (1.00-1.12)	1982-2000
Enstrom Unpub	NIH	RR ~ 1.00	1995-2006

PM₁₀ & Total Mortality in California: RR (95% CI)

Abbey 1999 AHSMOG RR = 1.00 (0.97-1.04) 1977-1992
(N=6,338; SC&SD&SF Air Basins; all natural causes)

Chen 2010 AHSMOG RR = 1.01 (0.98-1.04) 1977-2006
(N=4,830; SC&SD&SF Air Basins; all natural causes)

Jerrett 2011 CA CPS II RR = 1.00 (0.99-1.02) 1982-2000
(N=76,135;KRG Zip Model; 20 ind cov+7 eco var; Table 37)

Lipsett 2011 CA Teachers RR = 1.01 (0.95-1.09) 2000-2005
(N=73,489 F; California)

Enstrom Unpub CA CPS I RR ~ 1.00 1983-2002
(N~80,000; California)

Enstrom Unpub NIH RR ~ 1.00 1995-2006
(N~150,000; California)

Ozone & Total Mortality in California: RR (95% CI)

Abbey 1991 AHSMOG RR ~ 1.00 (0.89-1.12) 1977-1986
(N=6,303; SC&SD&SF Air Basins; all natural causes)

Abbey 1999 AHSMOG RR ~ 1.00 (0.92-1.09) 1977-1992
(N=5,893; SC&SD&SF Air Basins; all natural causes)

Chen 2010 AHSMOG RR = 0.95 (0.89-1.01) 1977-2006
(N=4,830; SC&SD&SF Air Basins; all natural causes)

Lipsett 2011 CA Teachers RR = 0.97 (0.94-1.01) 1997-2005
(N=107,784 F; California)

Jerrett 2011,2013 CA CPS II RR = 1.00 (0.98-1.02) 1982-2000
(N=73,711; IWD Model; California)

Enstrom Unpub CA CPS I RR ~ 1.00 1983-2002
(N~80,000; California)

Enstrom Unpub NIH RR ~ 1.00 1996-2006
(N~150,000; California)

October 28, 2011 Jerrett Final Report

(<http://www.arb.ca.gov/research/apr/past/06-332.pdf>)

Figure 22: PM_{2.5} and Total Mortality in CA during 1982-2000
RR = 1.08 (1.00-1.15) New “Conurbation” LUR Model
RR = 1.002 (0.992-1.012) Nine Model Average

September 1, 2013 Jerrett AJRCCM Paper

(<http://www.atsjournals.org/doi/abs/10.1164/rccm.201303-0609OC>)

Figure 6: PM_{2.5} and Total Mortality in CA during 1982-2000
RR = 1.06 (1.00-1.12) “Conurbation” LUR Model

“NO₂ (a marker for traffic pollution) and fine particulate matter were also associated with mortality from all causes combined”
“confirm that air pollution is a significant risk factor for mortality”

NO Mention of NULL Jerrett Report Results (Nine Model Average)

NO Mention of Other Major NULL CA PM_{2.5} Mortality Results

NO Mention That These Findings Do Not Support CA Regulations

Summary of “Premature Deaths” in California

235,000 Annual Deaths in California

1) Based on H6CS & CPS II US Results Used by EPA

~18,000 Annual Premature Deaths Due to All PM_{2.5}

~3,500 Annual Premature Deaths Due to Diesel PM

~250 Annual Premature Deaths Prevented by CARB

2) Based on CA-specific Results (see Enstrom 2012)

~0 Annual Premature Deaths Due to All PM_{2.5}

~0 Annual Premature Deaths Due to Diesel PM

~0 Annual Premature Deaths Prevented by CARB

August 1, 2013 US House Science Committee Subpoena of “Secret Science” Data Used by EPA for Deaths Related to PM_{2.5} & Ozone

Original Two Papers

- 1993 Dockery Pope NEJM PM2.5 Paper (H6CS Data)
- 1995 Pope Thun AJRCCM PM2.5 Paper (ACS CPS II Data)

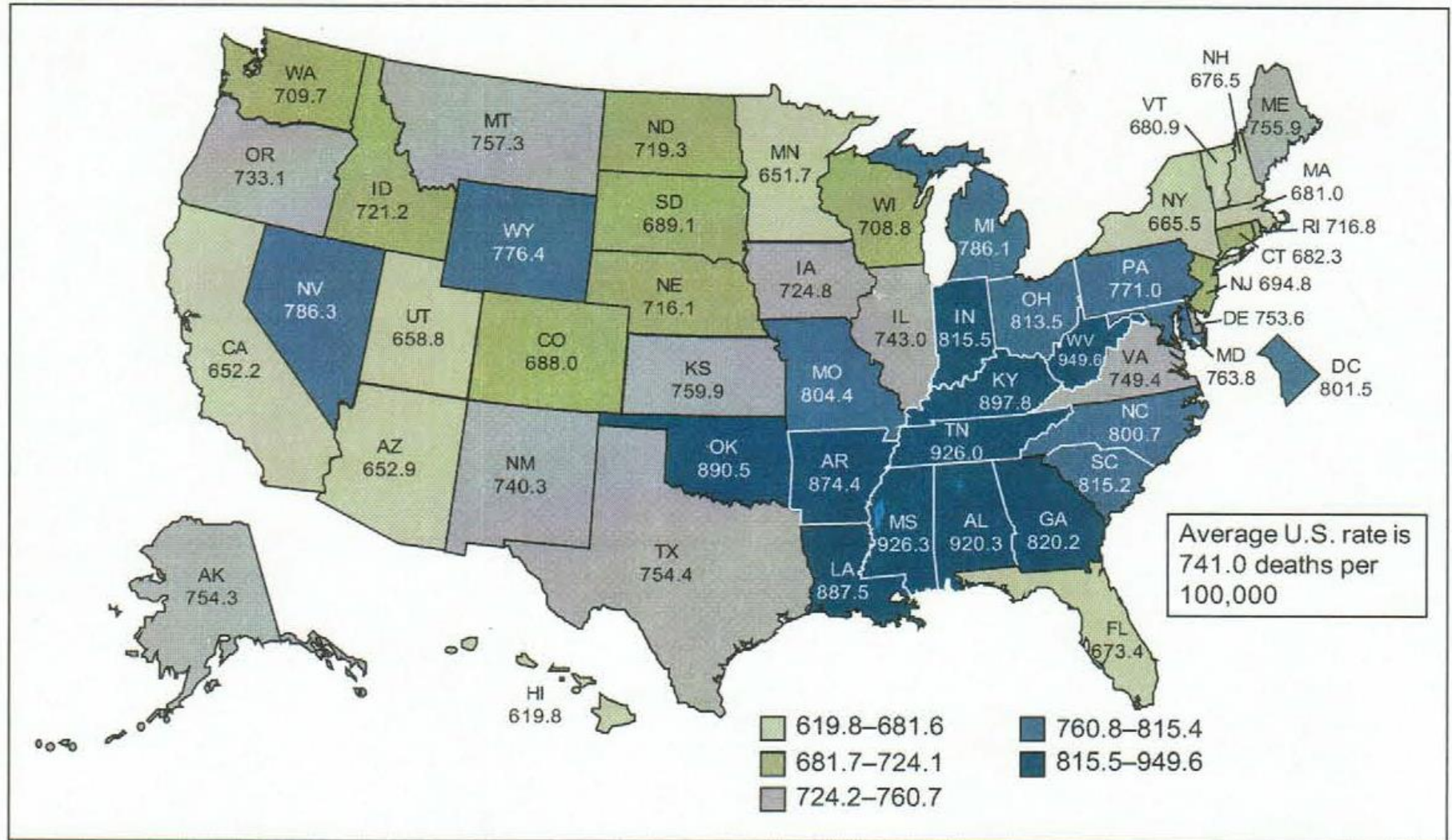
Seven Subpoened Follow-up Papers

- 2000 Krewski Burnett Jerrett HEI PM2.5 Reanalysis Report
- 2002 Pope Burnett Thun Krewski JAMA PM2.5 Paper
- 2006 Laden Dockery AJRCCM PM2.5 Paper
- 2009 Krewski Jerrett Burnett Pope Thun HEI PM2.5 Report
- 2009 Jerrett Krewski Pope Thun NEJM Ozone Paper
- 2009 Pope Dockery NEJM PM2.5 Paper
- 2012 Lepeule Dockery EHP Paper

2009 Age-Adjusted Total Death Rates by State

NCHS (<http://www.cdc.gov/nchs/data/databriefs/db64.pdf>)

Figure 4. Age-adjusted death rates, by state and the District of Columbia: United States, preliminary 2009



SOURCE: CDC/NCHS, National Vital Statistics System, Mortality.

Ratio of 2009 Age-Adjusted Total Death Rates in California Compared with US (Annual Deaths/100,000) CDC NCHS Wonder Database (<http://wonder.cdc.gov/ucd-icd10.html>)

California / U.S.	$652.2 / 741.1 = 0.880 = 88.0\%$
'South Coast Air Basin' / U.S.	$650.8 / 741.1 = 0.878 = 87.8\%$
Los Angeles County / U.S.	$637.3 / 741.1 = 0.860 = 86.0\%$
Orange County / U.S.	$570.9 / 741.1 = 0.770 = 77.0\%$

California PM_{2.5} and Ozone from China

December 1, 2010

California Pollution: Made in China?

<http://blogs.wsj.com/chinarealtime/2010/12/01/california-pollution-made-in-china/>

January 17, 2013

US cities suffer impact of downwind Chinese air pollution

<https://www.chinadialogue.net/article/show/single/en/5615-US-cities-suffer-impact-of-downwind-Chinese-air-pollution>

January 19, 2013

How China's air pollution disaster is coming to America

<http://www.examiner.com/article/how-china-s-air-pollution-disaster-is-coming-to-america>¹⁵

Conclusions About Air Pollution and Total Mortality in California Based on Prospective Epidemiologic Studies

- 1) Overwhelming Evidence in CA that Premature Death is NOT Related to PM_{2.5}, PM₁₀, and Ozone**
- 2) Harvard & ACS Must Comply with August 2013 Subpoena of “Secret Science” Data Used by EPA**
- 3) EPA and CARB PM_{2.5} & Ozone Regulations in CA Should be Frozen Pending Outcome of Subpoena**
- 4) Air Pollution in CA and South Coast Air Basin Must Be Put Into SES Context Given Low Total Death Rates & More PM_{2.5} from China than Diesel**