

# Supplemental Material for Chapter 7 of the Integrated Science Assessment for Particulate Matter – Health Criteria

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Table S7-1. Corresponding effect estimates for Figure 7-10

Study	Cohort	Years	Mean	RR	LCL	UCL
† {Park, 2015, 2833715@ @author-year}	MESA Air-6 Sites, U.S.	2000	17	1.11	0.75	1.61
† {Puett, 2011, 690098@ @author-year}	NHS and HPFU, U.S.	1976/86-2009	18.3 and 17.5	1.04	0.95	1.13
† {Coogan, 2016, 3359571@ @author-year}	BWHS-56 Metro Areas, U.S.	1999-2008	13.9	0.98	0.83	1.16
† {Chen, 2013, 1646773@ @author-year}	Ontario, Canada	2001-2006	1.7	1.05	1.01	1.10
† {Hansen, 2016, 3274613@ @author-year}	Danish Nurses Cohort	1990-2013	18.1	1.18	1.03	1.38
† {Weinmayr, 2015, 3010176@ @author-year}	HNR Study, Germany	2002-2003	16.8	1.18	0.78	1.74

†Studies published since the 2009 Integrated Science Assessment for Particulate Matter.

BWHS=Black Women's Health Study, HNR=Heinz Nixdorf Recall study, HPFU=Health Professionals Follow-up Study, LCL=lower confidence limit, MESA=Multiethnic Study of Atherosclerosis, NHS=Nurses' Health Study, RR=relative risk, UCL=upper confidence limit.

Table S7-2. Corresponding effect estimates for Figure 7-11

Study	Cohort	Pollutant	Correlation	RR	LCL	UCL
† {Puett, 2011, 690098@ @author-year}	HPFU Study	PM <sub>2.5</sub>	NR	1.04	0.95	1.13
		+ PM <sub>10-2.5</sub>		1.00	0.91	1.10
† {Hansen, 2016, 3274613@ @author-year}	Danish Nurses Cohort	PM <sub>2.5</sub>	NR	1.18	1.03	1.38
		+ PM <sub>10</sub>		0.98	0.84	1.13
† {Coogan, 2012, 1254278@ @author-year}	BWHS	PM <sub>2.5</sub>	NR	1.28	0.88	1.85
		+ NO <sub>x</sub>		1.07	0.71	1.61
† {Hansen, 2016, 3274613@ @author-year}	Danish Nurses Cohort	PM <sub>2.5</sub>	NR	1.18	1.03	1.38
		+ NO <sub>2</sub>		1.22	0.98	1.51

†Studies published since the 2009 Integrated Science Assessment for Particulate Matter.

BWHS=Black Women's Health Study, HPFU=Health Professionals Follow-up Study, LCL=lower confidence limit, NR=Not Reported, RR=relative risk, UCL=upper confidence limit.

**Table S7-3. Corresponding effect estimates for Figure 7-12**

Reference	Cohort	Notes	Years	Mean ( $\mu\text{g}/\text{m}^3$ )	HR	LCL	UCL
†{Brook, 2013, 2333186@ @author-year}	CanCHEC		1991-2001	8.7	1.23	1.18	1.28
†{Crouse, 2015, 3019335@ @author-year}	CanCHEC		1991-2006	8.9	1.15	1.11	1.19
†{Crouse, 2016, 3270238@ @author-year}	CanCHEC		1991-2006	8.9	1.14	1.11	1.17
†{Jerrett, 2016, 3420194@ @author-year}	ACS		1982-2004	11.4	1.06	1.00	1.13
†{Turner, 2016, 3060878@ @author-year}	ACS		1982-2004	12.6	1.07	1.01	1.13
†{Pope, 2014, 2534118@ @author-year}	ACS		1982-2004	12.6	1.06	1.01	1.12
†{Crouse, 2015, 3019335@ @author-year}	CanCHEC	Circ+Diabetes	1991-2006	8.9	1.04	1.03	1.05
†{Pinault, 2016, 3119908@ @author-year}	CCHS	Circ+Diabetes	2000-2011	6.3	1.11	1.05	1.17
†{Weichenthal, 2016, 3103397}	CanCHEC	Cardiometabolic	2001-2008	9.81	1.04	0.98	1.08

†Studies published since the 2009 Integrated Science Assessment for Particulate Matter.

ACS=American Cancer Society, CanCHEC=Canadian Census Health and the Environment Cohort, Circ=Circulatory, CCHS= Canadian Community Health Survey, HR=hazard ratio, LCL=lower confidence limit, UCL=upper confidence limit.

**Table S7-4. Summary of Studies Examining the Concentration-Response Relationships for Long-term Exposure to PM<sub>2.5</sub> and Metabolic Effects**

Study Location – Cohort (Table/Figure from Reference)	Outcome	Exposure PM <sub>2.5</sub> Mean (Range) in µg/m <sup>3</sup>	Statistical Analysis Summary
†{Chen, 2013, 1646773@ @author-year} Ontario, Canada (Figure S2)	Type 2 Diabetes	6-yr avg at postal code centroid, Satellite derived AOD Mean 10.6 (range: 2.6-19.1)	Natural cubic splines with 2 degrees of freedom. AIC to assess relative goodness of fit. Adjusted HRs estimated by comparing to a reference category of 2.6 µg/m <sup>3</sup> .  No evidence of departure from linearity.
†{Hansen, 2016, 3274613@ @author-year} Danish Nurse Cohort, Denmark (Figure 2)	Type 2 Diabetes	5-yr avg at residence, dispersion model Mean 18.1	Restricted cubic spline and log likelihood test  No evidence of deviation from linearity. HRs become less precise at approximately 20 µg/m <sup>3</sup> .
†{Wallwork,2017,3455472 @ @author-year} NAS, greater Boston (Figure 2)	Abdominal Obesity High FBG Low HDL cholesterol Hypertension Hyper-triglyceridemia Metabolic Syndrome	Mean: 10.5 Range: 4.2-13.6	LOESS or visual assessment of linearity for continuous variables.  No major departures from linearity apparent. HRs remained significant and strengthened in sensitivity analysis restricted to 1-year avg PM <sub>2.5</sub> levels < 12 µg/m <sup>3</sup>
†{Thiering, 2013, 1644928@ @author-year} Munich, Wesel and South Germany GINIplus and LISApus	HOMA IR	Annual avg at residence, LUR	GAM models that allowed the use of smooth functions for covariates and exposures to assess linearity  No evidence of departure from linearity
†{Wolf,2016,3420335@ @a uthor-year} Augsburg and 2 adjacent rural counties, Germany	HOMA IR	Mean (SD) 13.5 and 13.6 (0.8-0.9)	Restricted cubic spline with 3 degrees of freedom.  Deviation from linearity observed so exposure concentration was log-transformed

†Studies published since the 2009 Integrated Science Assessment for Particulate Matter.

AIC= Akaike information criterion, AOD=Aerosol Optical Density, FBG=fasting blood glucose, GAM=generalized additive model, GINIplus= German Infant Study on the Influence of Nutrition Intervention plus Environmental and Genetic Influences on Allergy Development, LOESS=locally weighted scatterplot smoothing, HOMA IR= Homeostatic model assessment of Insulin Resistance, HDL=high density lipoprotein, HR=hazard ratio, LISApus= Influence of LifeStyle Factors on the Development of the Immune System and Allergies in East and West Germany plus the Influence of Traffic Emissions and Genetics, LUR=land use regression, NAS=Normative Aging Study

Note: An important consideration is whether the C-R function is linear across the full concentration range that is encountered, or if there are concentration ranges where there are departures from linearity. Generally, the results of these analyses support a linear or log-linear relationship for metabolic effects examined.

