



APPENDIX AVAILABLE ON THE HEI WEB SITE

Research Report 178

**National Particle Component Toxicity (NPACT) Initiative Report on
Cardiovascular Effects**

Sverre Vedal et al.

**Section 1: NPACT Epidemiologic Study of Components of Fine Particulate Matter
and Cardiovascular Disease in the MESA and WHI-OS Cohorts**

**Appendix N. Prediction Model and Health Effect Analysis for Nickel, Vanadium,
and Copper Analyses**

Note: Appendices that are available only on the Web have been assigned letter identifiers that differ from the lettering in the original Investigators' Report. HEI has not changed the content of these documents, only their identifiers.

Appendix N was originally Appendix M

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APPENDIX M: Prediction model and health effect analysis for nickel, vanadium, and copper analyses

- **Cross-validation**
- **Prediction maps in MESA**
- **Health effects analyses**
- **EC, NO₂, and copper prediction correlations**

Cross-validation and predictions for Ni, V, and copper

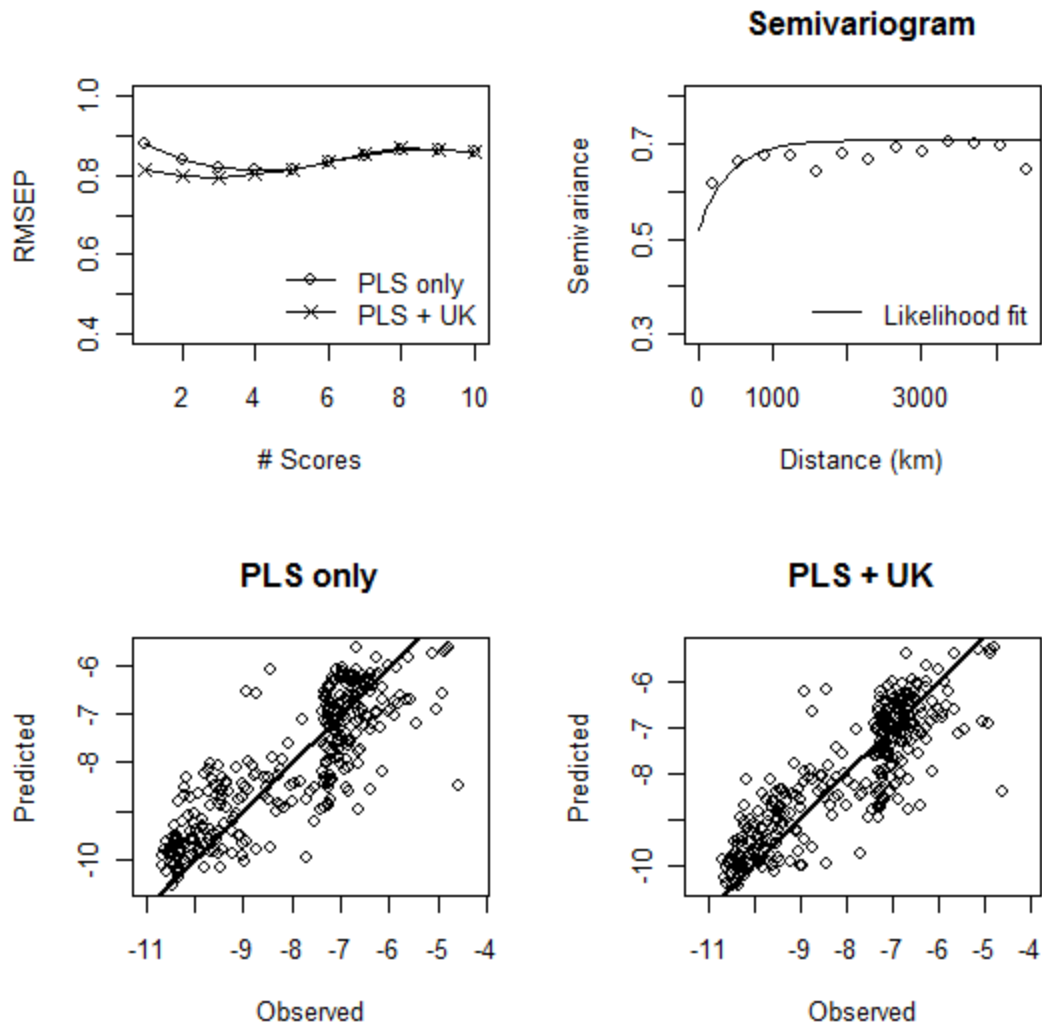
We predicted long-term concentrations of nickel, vanadium, and copper using the national spatial model. Appendix Table M.1 showed cross-validation statistics of predictions for the three pollutants. R^2 s for nickel, vanadium, and copper were 0.63, 0.71, and 0.36, respectively, when the models included PLS as well as universal kriging. Nickel and vanadium predictions at MESA participants were much higher in New York than other cities (Appendix Figure M.4). Copper predictions were higher in LA.

Given large differences of nickel and vanadium predictions between New York and other cities, we performed the health analysis for about 850 MESA cohorts only in New York in addition to those in 6 cities. In the cross-sectional analysis, nickel and vanadium predictions were not associated with CAC and CIMT in both New York and 6 cities, whereas copper predictions were associated with CIMT in 6 cities. We did not find cross-sectional and longitudinal associations between three predictions and CIMT in the longitudinal analysis.

Appendix Table M.1. Cross-validation statistics for predicted nickel, vanadium, and copper concentrations from the national spatial model

	Nation-wide				MESA Air 6 city area*			
	PLS only		PLS + Universal kriging		PLS only		PLS + Universal kriging	
	RMSE	R^2	RMSE	R^2	RMSE	R^2	RMSE	R^2
Nickel	0.84	0.71	0.80	0.73	0.82	0.54	0.74	0.63
Vanadium	0.01	0.54	0.01	0.74	0.01	0.48	0.01	0.71
Copper	0.74	0.68	0.65	0.75	0.81	0.27	0.75	0.36

* Defined by 200 kilometer buffers from each city center



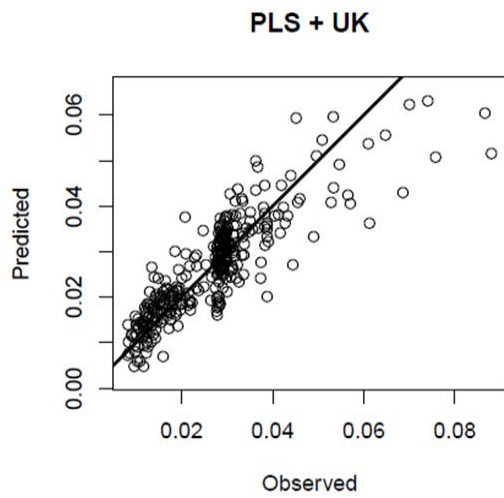
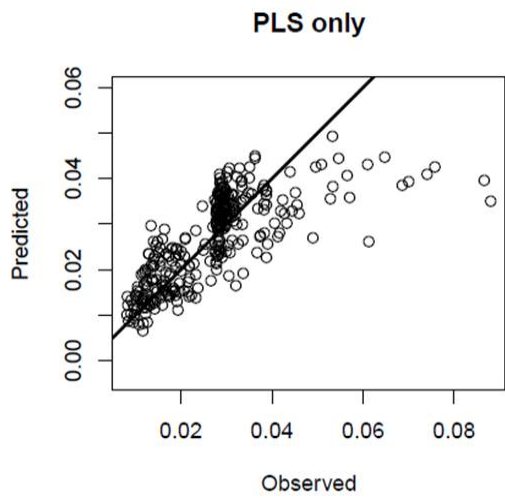
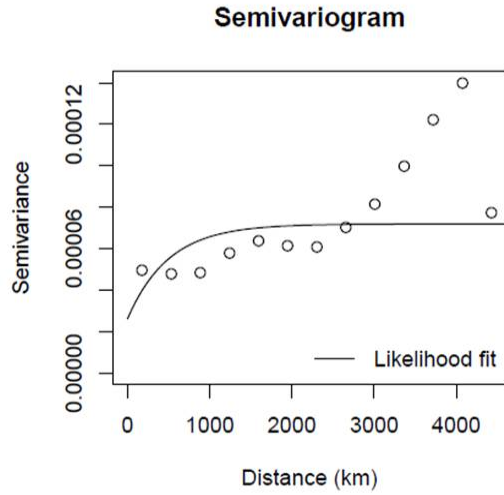
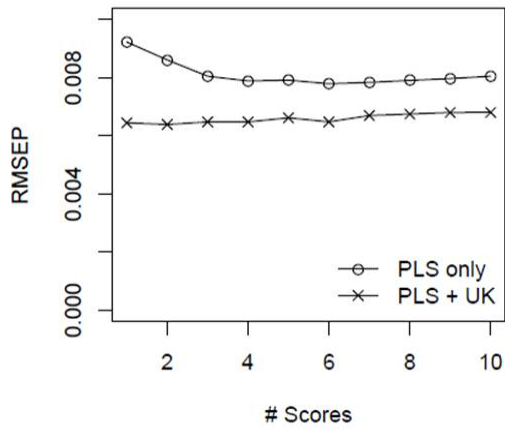
Appendix Figure M.1: Ni 10-fold CV results. Fitted variogram and predicted vs. observed plots correspond to using PLS with 2 components as the mean model.

RMSEP = root mean squared error of prediction

PLS=partial least squares

UK= universal kriging; UK Pars= UK parameters

CV= cross-validation



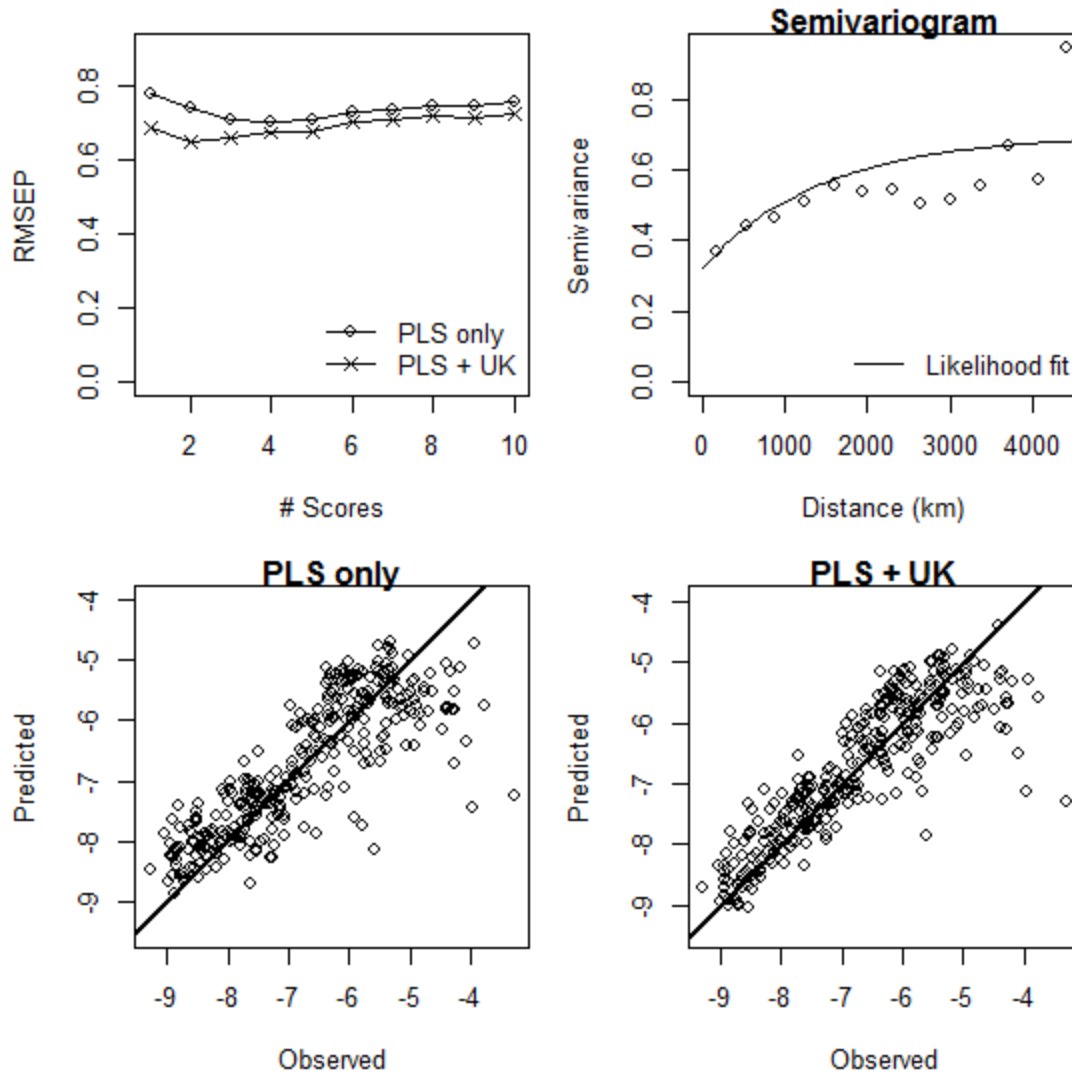
Appendix Figure M.2: V 10-fold CV results. Fitted variogram and predicted vs. observed plots correspond to using PLS with 2 components as the mean model.

RMSEP = root mean squared error of prediction

PLS=partial least squares

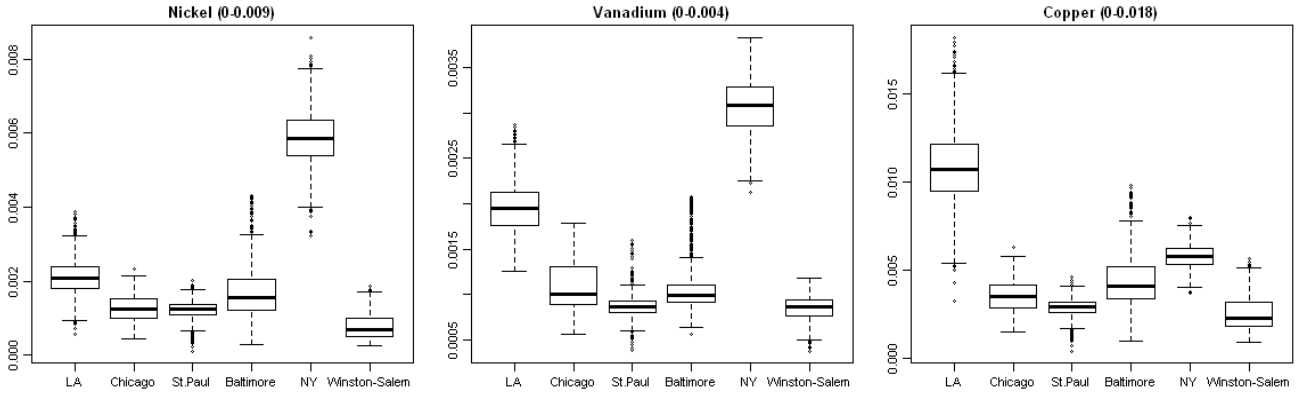
UK= universal kriging; UK Pars= UK parameters

CV= cross-validation

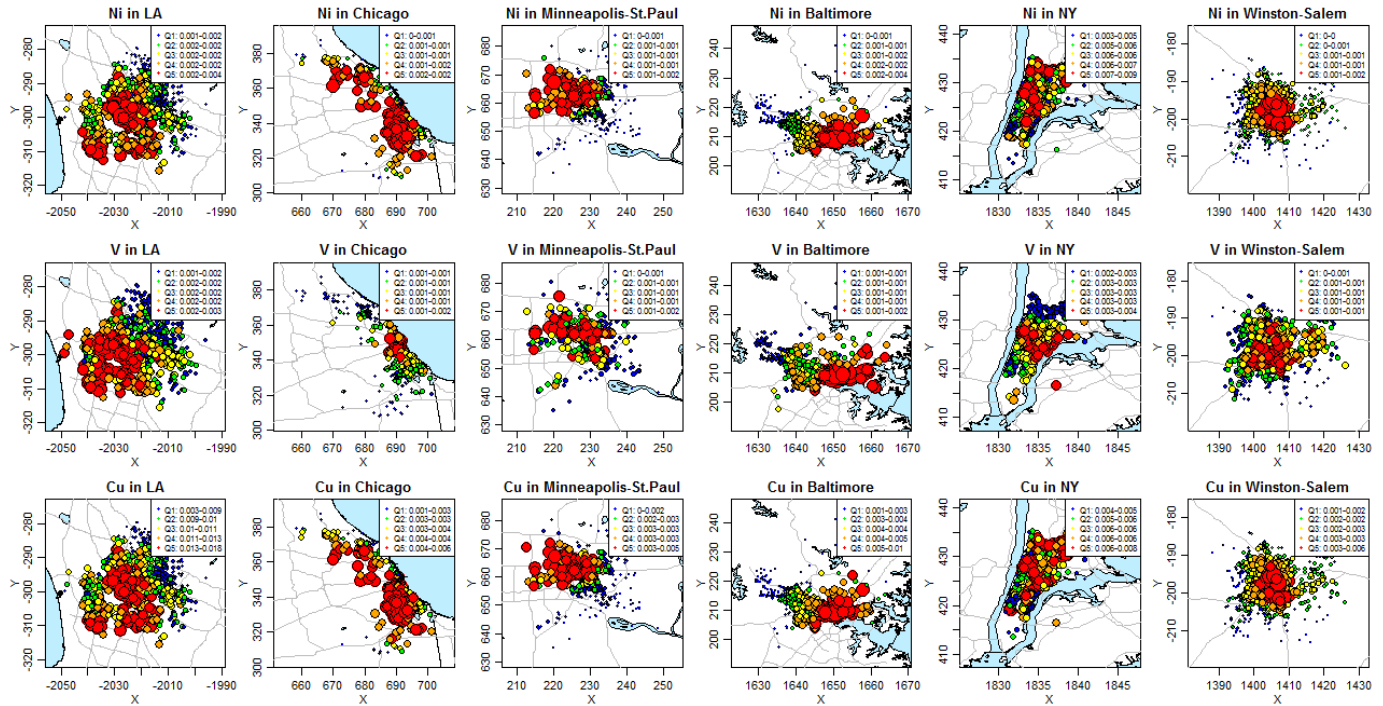


Appendix Figure M.3: Cu 10-fold CV results. Fitted variogram and predicted vs. observed plots correspond to using PLS with 2 components as the mean model.

RMSEP = root mean squared error of prediction
 PLS=partial least squares
 UK= universal kriging; UK Pars= UK parameters
 CV= cross-validation

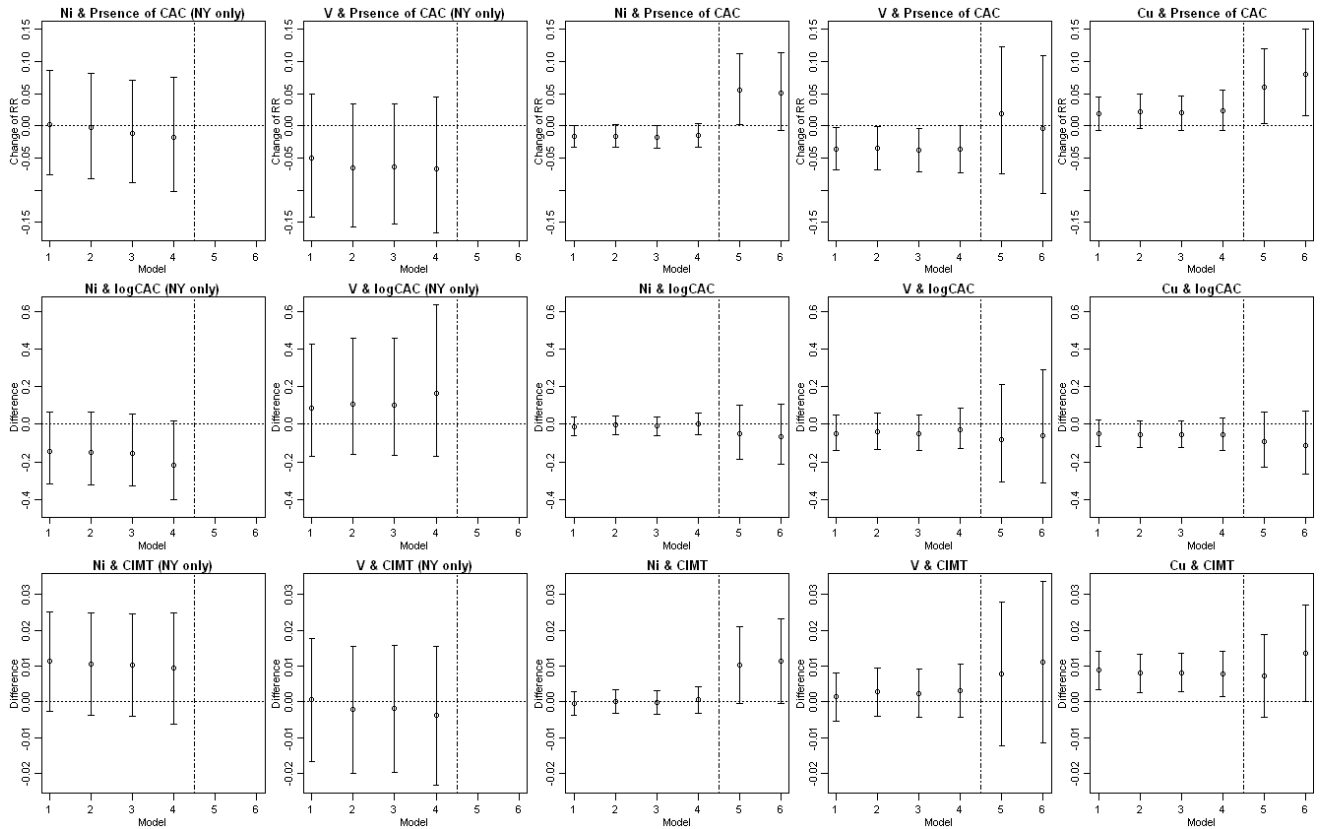


Appendix Figure M.4. Box plots of predicted long-term concentrations of nickel, vanadium, and copper from the national spatial models at participant locations by 6 cities

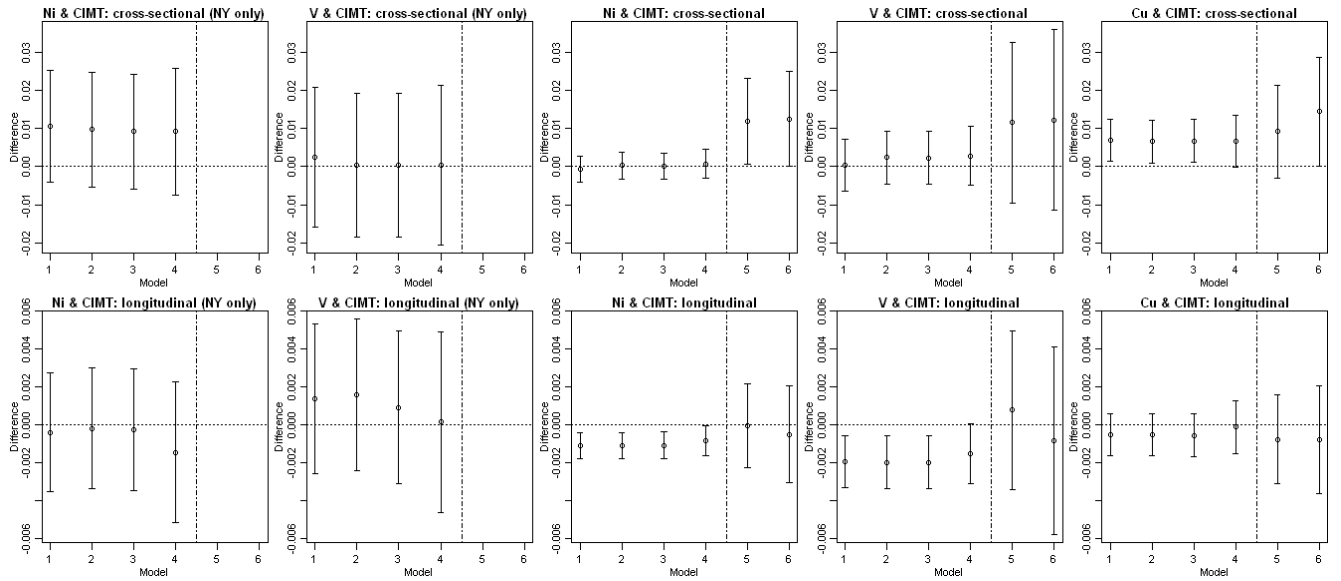


Appendix Figure M.5. Predicted long-term concentrations of nickel, vanadium, and copper from the national spatial model at participant locations by 6 cities (different colors represent quintiles of the range of concentrations for a component in each city; blue, green, yellow, orange, and red display 1st, 2nd, 3rd, 4th, and 5th quintiles).

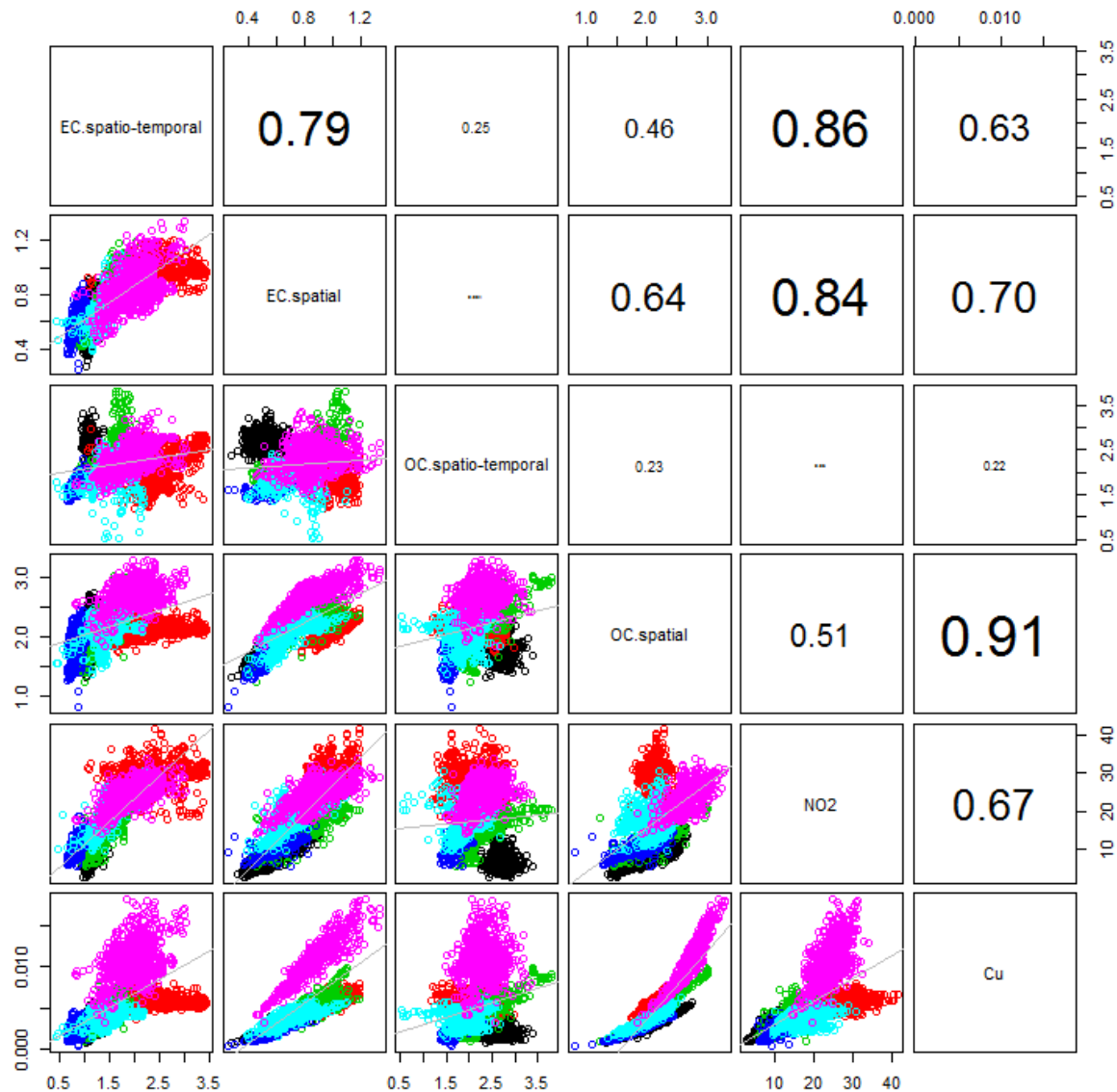
Health effects analyses



Appendix Figure M.6. Cross-sectional associations for presence of CAC, log(CAC) and CIMT in MESA at exam 1 for an interquartile increase (0.0010 and 0.0004 for nickel and vanadium in New York; 0.0012, 0.0011, and 0.0033 for nickel, vanadium, and copper, respectively, in MESA Air six cities) in predicted nickel, vanadium, and copper concentrations from the national spatial models in six cross-sectional models



Appendix Figure M.7. Cross-sectional and longitudinal associations for CIMT in MESA for an interquartile increase (0.0010 and 0.0004 for nickel and vanadium in New York; 0.0012, 0.0011, and 0.0033 for nickel, vanadium, and copper, respectively, in MESA Air six cities) in predicted nickel, vanadium, and copper concentrations from the national spatial models in six longitudinal models



Appendix Figure M.8. Scatter plots of predictions of EC from the spatio-temporal and the national spatial models, NO₂ from the spatio-temporal model, and copper from the national spatial model (color code: black = Winston-Salem, red = NY, green = Baltimore, blue = St.Paul, light blue = LA, and pink = Chicago)