

Supplementary appendix

This appendix formed part of the original submission and has been peer reviewed. We post it as supplied by the authors.

Supplement to: Bove B, Xie Y, Li T, et al. Associations of ambient coarse particulate matter, nitrogen dioxide, and carbon monoxide with the risk of kidney disease: a cohort study. *Lancet Planet Health* 2017; **1**: e267–76.

Supplemental Methods:

Data Sources:

Numerous Department of Veterans Affairs datasets were utilized. Medical SAS inpatient and outpatient datasets were used to determine patient demographic characteristics, location based on zip codes, and comorbidity information based on Current Procedural Terminology (CPT) codes, and ICD-9-CM diagnostic and procedure codes corresponding to inpatient and outpatient encounters¹⁻⁵. The VA Decision Support System Laboratory Results file provided data on outpatient and inpatient serum creatinine measurements³⁻⁵. The VA Vital Status and Beneficiary Identification Records Locator Subsystem (BIRLS) files supplied demographic characteristics and death follow-up through September 30, 2012¹⁻⁵. Data from the United States Renal Database System (USRDS) obtained through the VA/Centers for Medicare and Medicaid Services (CMS) was utilized in assessing ESRD status⁶. The Corporate Data Warehouse (CDW) dataset furnished data on body mass index (BMI), smoking status, and angiotensin-converting enzyme inhibitors (ACEIs) and angiotensin receptor blockers (ARBs) use from the Vital Signs, Health Factors, and RX Outpatient domains, respectively. The Census Bureau's Model-based Small Area Income & Poverty Estimates (SAIPE) supplied annual estimates of county level percent in poverty in 2004^{7,8}. Information on county level population density and population size was obtained from the 2000 Census of Population and Housing^{7,8}. Latitude and longitude for ZIP code tabulation area was obtained from the 2000 Census Gazetteer File^{7,8}. Data on the link between ZIP code and metropolitan statistical area (MSA) was obtained from the ZIP Code to Core Based Statistical Area Relationship File based on the Office of Management and Budget 2006 delineation of MSA from the US Census Bureau⁹.

Covariates:

Race/ethnicity was categorized as white, black, or other (Latino, Asian, Native American, or

other racial/ethnic minority groups). Comorbidities were assigned on the basis of relevant ICD-9-CM diagnostic and procedures codes and CPT codes in the VA Medical SAS datasets using definitions validated for use in VA datasets¹⁰⁻¹³. BMI was categorized into underweight (<18.50 kg/m²), normal weight (18.50-24.99 kg/m²), overweight (25.00-29.99 kg/m²), and obese (≥30.00 kg/m²). ACEI/ARB medication use was defined as use if there were prescriptions for 90 days or greater during the time before T₀. Smoking status was categorized as current, former, or never smoker. Number of outpatient eGFR measurements represented the cumulative number of outpatient eGFR values from October 1, 1999 to T₀. Number of hospitalizations was derived from the cumulative number of inpatient stays lasting a full day or longer from October 1, 1999 to T₀. Population density and percent in poverty were assigned based on county of residence at T₀.

Population Attributable Fraction (PAF) and Attributable Burden of Disease (ABD):

The PAF was calculated using an adapted Global Burden of Disease equation¹⁴. The Cox Proportional Hazards based equation for PAF is:

$$PAF = \frac{\int_{x=l}^u HR(x)P(x)dx - HR(TMREL)}{\int_{x=l}^u HR(x)P(x)dx} \quad (7)$$

where l to u is the lowest to highest observed pollutant, HR(x) the hazard ratio for pollutant x, P(x) the probability of exposure x, and TMREL the theoretical minimum risk exposure level. The TMREL was set as the 5th percentile of the pollutant distribution amongst air monitoring stations, meant to be representative of a realistically obtainable pollutant level, where levels under the TMREL were treated as contributing no risk.

To calculate the joint effect of the pollutants, which may be less than the sum of the individual PAFs due to overlap in effect resulting from correlation between the pollutants, a principal

component analysis was conducted using the 2004 air monitoring station data to generate factor score coefficients. Factor scores were then computed, using standardized exposure values, and used as the primary predictors in time dependent Cox models. The betas from this model were then used in calculation of the PAF, where $HR(\text{pollutants}) = \exp(\beta_1 * \text{factor score 1} + \beta_2 * \text{factor score 2} + \beta_3 * \text{factor score 3})$.

Burden of disease, as the number of incident outcomes per year attributable to exposure, was calculated using literature based estimates of outcome incident rates in the United States^{15,16} and the 2016 Census US population, from the equation:

$$ABD = PAF * IR * population \quad (10)$$

where ABD is the attributable burden of disease, PAF is the population attributable fraction, IR is the incident rate of the outcome, and population in that which the burden is being assessed in^{17,18}. Burden of disease confidence intervals were based on PAF variance.

Spline analyses:

Restricted cubic spline analyses were conducted in adjusted cox proportional hazard regression models with knots placed at pollutant quartiles¹⁹ based on the 2004 monitoring station distributions. Data at each tail end of the exposure distribution, corresponding to exposures that fell within the highest and lowest 2% of the air monitoring station exposure distribution, were excluded to reduce influence of potential outliers. For all splines the lowest pollutant value included in analyses was used as the reference.

Sensitivity analyses:

To test robustness of study findings we undertook a number of sensitivity analyses where we: a) Repeated the primary analyses while reducing the distance threshold where we assigned exposure to those residing within 10 and 5 miles of air monitoring station; b) repeated analyses

in those who lived in counties which had a population size in the top 200 of all zip codes in the United States;; c) repeated analyses while additionally controlling for US county level variables contained in the 2014 County Health Rankings (CHR) Dataset^{12,20,21}. The 56 variables included, those that were comparable across state, are listed in the County Health Rankings section below. Population density and poverty variables used in the primary analyses were excluded as the CHR data includes similar variables. A principal component analysis was first conducted on the CHR data to address multicollinearity between the county level characteristics, and then factor scores were computed and controlled for in analyses. d) examined the association of pollutant concentrations and the alternative outcomes of (1) doubling of serum creatinine, and (2) composite renal outcome of ESRD, dialysis, kidney transplant, or $\geq 50\%$ decline in eGFR; e) conducted sensitivity analyses for the competing risk of death, where censoring at death was considered to be informative of an increased risk of kidney outcomes²².

Within-city Model

PM_{2.5} exposures of all participants living in zip codes that fell within a city were averaged, providing a “city mean,” \bar{X}_j . As exposure was time varying, the city mean was calculated at the beginning of each year. Within-city models were fit using an equation for the hazard at time t for person i in city j $\lambda_{ij}(t)$:

$$\lambda_{ij}(t) = \lambda_0(t)e^{\beta_B \bar{X}_j + \beta_W (X_{ij} - \bar{X}_j) + \gamma Z_i}$$

where λ_0 is the baseline hazard, β_B (the between city effect) the coefficient for city j’s mean PM_{2.5} exposure \bar{X}_j , β_W (the within city effect) the coefficient for the difference between the individual i in city j’s PM_{2.5} exposure X_{ij} and the city j’s mean PM_{2.5} exposure \bar{X}_j , and γ the vector of coefficients for covariates Z for individual i²³.

County Health Rankings^{12,20}:

County Health Rankings county level variable definitions and data sources.

Variable	Source	Definition	Dates
Health Outcomes			
Premature death	National Center for Health Statistics	Age-adjusted years of potential life lost (YPLL) rate per 100,000	2008-2010
Poor or fair health	Behavioral Risk Factor Surveillance System	Percent of adults that report fair or poor health (age-adjusted)	2006-2012
Poor physical health days	Behavioral Risk Factor Surveillance System	Average number of reported physically unhealthy days per month	2006-2012
Poor mental health days	Behavioral Risk Factor Surveillance System	Average number of reported mentally unhealthy days per month	2006-2012
Low birthweight	National Center for Health Statistics	Percent of births with low birth weight (<2500g)	2005-2011
Diabetes	National Center for Chronic Disease Prevention and Health Promotion, Division of Diabetes Translation	Prevalence of diagnosed diabetes in a given county	2010
HIV prevalence rate	National Center for HIV/AIDS, Viral Hepatitis, STD, and TB prevention	Number of diagnoses cases of HIV in a county per 100,000 population	2010
Premature age-adjusted mortality	CDC WONDER mortality data	Number of deaths among residents under the age of 75 per 100,000 population	2008-2010
Infant mortality	Health Indicators Warehouse	Number of deaths among children less than one year of age per 100,000 population	2002-2008
Child mortality	CDC WONDER mortality data	Number of deaths among children under age 18 per 100,000 population	2007-2010
Health Behaviors			

Adult smoking	Behavioral Risk Factor Surveillance System	Percent of adults that reported currently smoking	2006-2012
Access to exercise opportunities	OneSource Global Business Browser, Delorme map data, ESRI, & US Census Tigerline Files	Percentage of the population with access to places for physical activity	2010 & 2012
Excessive drinking	Behavioral Risk Factor Surveillance System	Percent of adults that report excessive drinking	2006-2012
Alcohol-impaired driving deaths	Fatality Analysis Reporting System	Percent of driving deaths with alcohol involvement	2008-2012
Teen births	National Center for Health Statistics	Teen births / females ages 15-19 * 1,000	2005-2011
Limited access to healthy foods	USDA Food Environment Atlas	Percentage of the population who are low income and do not live close to a grocery store	2010
Motor vehicle crash deaths	National Center for Health Statistics	Number of deaths due to traffic accidents involving a motor vehicle per 100,000 population	2004-2010
Drug poisoning deaths	CDC WONDER mortality data	Number of deaths due to drug poisoning per 100,000 population	2004-2010
Clinical Care			
Uninsured	Small Area Health Insurance Estimates	Percent of population < 65 without insurance	2011
Primary care physicians	HRSA Area Resource Rile	Number of primary care physicians per 100,000 population	2011
Dentists	HRSA Area Resource Rile	Number of dentists per 100,000 population	2012
Mental health providers	CMS, National Provider Identification	Number of mental health providers per 100,000 population	2013
Preventable hospital stays	Medicare/Dartmouth Institute	Discharges for ambulatory care sensitive conditions/Medicare Enrollees * 1,000	2011
Diabetic monitoring	Medicare/Dartmouth Institute	Percent of Diabetic Medicare enrollees receiving HbA1c test	2011

Mammography screening	Medicare/Dartmouth Institute	Percent of female Medicare enrollees having at least 1 mammogram in 2 yrs (age 67-69)	2011
Uninsured adults	Small Area Health Insurance Estimates	Percentage of the population ages 18 to 65 that has no health insurance coverage	2011
Uninsured children	Small Area Health Insurance Estimates	Percentage of the population under age 19 that has no health insurance coverage	2011
Health Care Costs	Dartmouth Atlas of Health Care	Price-adjusted Medicare reimbursements (part A and B) per enrollee	2011
Could not see doctor due to costs	Behavioral Risk Factor Surveillance System	Percentage of the population who could not see a doctor due to costs	2006-2012
Other primary care providers	CMS, National Provider Identification	Number of other primary care providers per the population of a county	2013
Social and economic factors			
Some college	American Community Survey	Percent adults age 25-44 with some post-secondary education	2008-2012
Unemployment	Bureau of Labor Statistics	Percent of population age 16+ unemployed and looking for work	2012
Children in poverty	Small Area Income and Poverty Estimates	Percent of children (under age 18) living in poverty	2012
Inadequate Social Support	Behavioral Risk Factor Surveillance System	Percent of adults that report not getting social/emotional support	2005-2010
Children in single-parent households	American Community Survey	Percent of children that live in single-parent households	2008-2012
Injury deaths	CDC WONDER	Injury mortality rate per 100,000	2006-2010
Median household income	Small Area Income and Poverty Estimates	Median household income at which half the households earn more and half the households earn less	2012

Children eligible for free lunch	National Center for Education Statistics	Percentage of children enrolled in public schools eligible for free lunch	2011
Homicide rate	National Center for Health Statistics	Number of deaths from assaults per 100,000 population	2004-2010
Physical Environment			
Air pollution - particulate matter	CDC WONDER	Average daily amount of fine particulate matter in micrograms per cubic meter	2011
Drinking water violations	Safe Drinking Water Information System	Population affected by a water violation/Total population with public water	FY 2012-2013
Severe housing problems	HUD, Comprehensive Housing Affordability Strategy	Percentage of households with at least 1 of 4 housing problems: overcrowding, high housing costs, or lack of kitchen or plumbing facilities	2006-2010
Driving alone to work	American Community Survey	Percent of people who drive alone to work	2008-2012
Long commute - driving alone	American Community Survey	Among workers who commute in their car alone, the percentage that commute more than 30 minutes	2008-2012
Demographics			
Population	Census Population Estimates	Number of people in a county	2012
% below 18 years of age	Census Population Estimates	Percentage of the population below 18 years of age	2012
% 65 and older	Census Population Estimates	Percentage of the population 65 or older	2012
% Non-Hispanic African American	Census Population Estimates	Percentage of the population who are Non-Hispanic African American	2012
% American Indian and Alaska Native	Census Population Estimates	Percentage of the population who are American Indian and Alaska Native	2012
% Asian	Census Population Estimates	Percentage of the population who are Asian	2012

% Native Hawaiian/ Other Pacific Islander	Census Population Estimates	Percentage of the population who are Native Hawaiian/Other Pacific Islander	2012
% Hispanic	Census Population Estimates	Percentage of the population who are Hispanic	2012
% Non-Hispanic White	Census Population Estimates	Percentage of the population who are Non-Hispanic White	2012
% not proficient in English	American Community Survey, 5-year estimates	Percentage of the population not proficient in the English language	2008-2012
% Females	Census Population Estimates	Percentage of the population who are female	2012
% Rural	Census Population Estimates	Percentage of the population living in a rural area	2012

Supplementary Tables:

Supplemental table 1: Adjusted incident rates of kidney disease outcomes by pollutant

Pollutant	Category**	Incident eGFR Less Than 60⁺	Incident CKD*	≥ 30% Decline in eGFR	ESRD
Particulate Matter <10 µm in diameter	1-Low	6820.29 (6791.07, 6849.51)	3498.80 (3480.74, 3516.86)	3923.59 (3908.87, 3938.31)	32.24 (30.65, 33.83)
	2	7612.20 (7582.98, 7641.42)	4001.80 (3983.74, 4019.86)	4738.40 (4723.68, 4753.12)	44.96 (43.37, 46.55)
	3-High	7795.05 (7765.73, 7824.37)	4076.13 (4058.14, 4094.12)	4878.76 (4864.07, 4893.45)	49.55 (47.97, 51.13)
Nitrogen Dioxide	1-Low	7111.32 (7066.36, 7156.28)	3630.14 (3601.21, 3659.07)	4263.90 (4239.12, 4288.68)	35.70 (33.35, 38.05)
	2	7632.26 (7599.47, 7665.05)	4070.37 (4050.43, 4090.31)	4749.44 (4732.35, 4766.53)	51.57 (49.53, 53.61)
	3-High	8206.19 (8157.96, 8254.42)	4320.58 (4290.62, 4350.54)	5279.84 (5255.30, 5304.38)	55.49 (52.85, 58.13)
Carbon Monoxide	1-Low	7437.05 (7394.87, 7479.23)	3935.96 (3909.41, 3962.51)	4492.38 (4468.35, 4516.41)	44.04 (41.33, 46.75)
	2	7688.98 (7656.16, 7721.80)	4077.99 (4055.44, 4100.54)	4861.17 (4844.58, 4877.76)	47.84 (46.10, 49.58)
	3-High	7968.85 (7924.25, 8013.45)	4187.08 (4160.61, 4213.55)	5059.63 (5036.72, 5082.54)	49.46 (47.37, 51.55)
<p>Adjusted for age, race, gender, T₀ eGFR Incident rates are per 100,000 person years ** Categories are defined by 2004 cohort distribution as: ≤25th percentile, >25th to ≤75th percentile, and >75th percentile as categories 1-3, respectively. + Incident eGFR<60 was evaluated in a subcohort of people with no prior history of eGFR≤60 at time of cohort entry. *Incident CKD was evaluated in a subcohort of people with at least 2 eGFR separated by at least 90 days apart who had no prior history eGFR≤60 at time of cohort entry. Abbreviations: eGFR, estimated glomerular filtration rate; CKD, Chronic Kidney Disease; ESRD, end stage renal disease; N, sample size; HR, hazard ratio; CI, 95% confidence interval.</p>					

Supplemental Table 2: Risk of kidney outcomes by pollutant concentrations category

Pollutant	Ordinal Category**	Incident eGFR Less Than 60+ HR (CI)	Incident CKD* HR (CI)	≥ 30% Decline in eGFR HR (CI)	ESRD HR (CI)
Particulate Matter <10 μm in Diameter	2	1.07 (1.04, 1.09)	1.06 (1.03, 1.08)	1.08 (1.05, 1.10)	1.10 (1.03, 1.16)
	3 (High Concentration)	1.14 (1.11, 1.17)	1.14 (1.10, 1.17)	1.16 (1.13, 1.19)	1.19 (1.11, 1.28)
Nitrogen Dioxide	2	1.10 (1.08, 1.12)	1.12 (1.10, 1.15)	1.15 (1.13, 1.17)	1.09 (1.05, 1.14)
	3 (High Concentration)	1.17 (1.15, 1.20)	1.15 (1.12, 1.18)	1.22 (1.19, 1.25)	1.12 (1.06, 1.18)
Carbon Monoxide	2	1.09 (1.07, 1.11)	1.07 (1.05, 1.09)	1.09 (1.07, 1.10)	1.02 (0.98, 1.05)
	3 (High Concentration)	1.15 (1.12, 1.17)	1.17 (1.14, 1.20)	1.15 (1.12, 1.18)	1.08 (1.03, 1.14)
<p>**Categories based on year 2004 distribution in cohort. Category 1 (low concentration) served as the referent category.</p> <p>Models adjust for baseline age, race, gender, T₀ eGFR, hypertension, diabetes, cancer, cardiovascular disease, chronic lung disease, body mass index, smoking, ace arb use, number of hospitalizations, number of eGFR, county population density, and county percent in poverty.</p> <p>+ Incident eGFR<60 was evaluated in a subcohort of people with no prior history of eGFR≤60 at time of cohort entry.</p> <p>*Incident CKD was evaluated in a subcohort of people with at least 2 eGFR separated by at least 90 days apart who had no prior history eGFR≤60 at time of cohort entry.</p> <p>Abbreviations: eGFR, estimated glomerular filtration rate; CKD, Chronic Kidney Disease; ESRD, end stage renal disease; N, sample size; HR, hazard ratio; CI, 95% confidence interval.</p>					

Supplemental Table 3: Risk of kidney outcomes for every interquartile range increase in pollutant concentration using data from air monitoring stations within 10 and 5 miles from residential ZIP code centroid of cohort participants.

Pollutant	Maximum Distance to Nearest Monitoring Station (miles)	Measure	Incident eGFR Less Than 60*	Incident CKD*	≥ 30% Decline in eGFR	ESRD
Particulate Matter <10 µm in Diameter	10 miles	N	342,885	345,062	485,467	522,324
		HR (CI)	1.07 (1.05, 1.09)	1.07 (1.05, 1.09)	1.09 (1.07, 1.11)	1.10 (1.06, 1.15)
	5 miles	N	186,568	188,358	259,003	279,818
		HR (CI)	1.07 (1.04, 1.10)	1.08 (1.04, 1.11)	1.10 (1.07, 1.13)	1.10 (1.03, 1.16)
Nitrogen Dioxide	10 miles	N	590,677	577,994	847,059	870,106
		HR (CI)	1.11 (1.09, 1.12)	1.11 (1.09, 1.13)	1.13 (1.11, 1.15)	1.12 (1.08, 1.16)
	5 miles	N	331,917	328,191	465,226	485,633
		HR (CI)	1.14 (1.11, 1.16)	1.14 (1.11, 1.17)	1.15 (1.13, 1.18)	1.15 (1.09, 1.22)
Carbon Monoxide	10 miles	N	662,779	645,382	949,123	968,816
		HR (CI)	1.10 (1.08, 1.11)	1.10 (1.08, 1.12)	1.09 (1.07, 1.11)	1.05 (1.01, 1.08)
	5 miles	N	405,669	398,871	570,858	591,418
		HR (CI)	1.10 (1.08, 1.12)	1.10 (1.07, 1.12)	1.09 (1.07, 1.11)	1.08 (1.03, 1.13)
<p>Models adjusted for baseline age, race, gender, T₀ eGFR, hypertension, diabetes, cancer, cardiovascular disease, chronic lung disease, body mass index, smoking, angiotensin-converting enzyme inhibitor and angiotensin receptor blocker use, number of hospitalizations, number of eGFR, county population density, and county percent in poverty.</p> <p>+ Incident eGFR<60 was evaluated in a subcohort of people with no prior history of eGFR≤60 at time of cohort entry.</p> <p>*Incident CKD was evaluated in a subcohort of people with at least 2 eGFR separated by at least 90 days apart who had no prior history eGFR≤60 at time of cohort entry.</p> <p>Abbreviations: eGFR, estimated glomerular filtration rate; CKD, Chronic Kidney Disease; ESRD, end stage renal disease; N, sample size; HR, hazard ratio; CI, 95% confidence interval.</p>						

Supplemental Table 4: Risk of kidney disease outcomes for every interquartile range increase in air pollutant while controlling for additional US county level characteristics

Pollutant	Measure	Incident eGFR Less Than 60 ⁺	Incident CKD*	≥ 30% Decline in eGFR	ESRD
Particulate Matter <10 μm in Diameter	N	587686	591020	840946	907590
	HR (CI)	1.04 (1.02, 1.05)	1.05 (1.03, 1.07)	1.05 (1.03, 1.06)	1.00 (0.96, 1.04)
Nitrogen Dioxide	N	896,213	872,686	1,298,885	1,323,608
	HR (CI)	1.11 (1.09, 1.13)	1.12 (1.10, 1.15)	1.13 (1.12, 1.15)	1.04 (1.00, 1.09)
Carbon Monoxide	N	955,608	926,215	1,384,406	1,403,447
	HR (CI)	1.10 (1.08, 1.11)	1.11 (1.09, 1.13)	1.10 (1.09, 1.11)	1.07 (1.04, 1.10)
<p>Models adjust for baseline age, race, gender, T₀ eGFR, hypertension, diabetes, cancer, cardiovascular disease, chronic lung disease, body mass index, smoking, ace arb use, number of hospitalizations, number of eGFR, and county level characteristics from the County Health Rankings Dataset (variables listed in supplemental methods).</p> <p>+ Incident eGFR<60 was evaluated in a subcohort of people with no prior history of eGFR≤60 at time of cohort entry.</p> <p>*Incident CKD was evaluated in a subcohort of people with at least 2 eGFR separated by at least 90 days apart who had no prior history eGFR≤60 at time of cohort entry.</p> <p>Abbreviations: eGFR, estimated glomerular filtration rate; CKD, Chronic Kidney Disease; ESRD, end stage renal disease; N, sample size; HR, hazard ratio; CI, 95% confidence interval.</p>					

Supplemental Table 5: Risk of composite kidney outcome of ESRD or $\geq 50\%$ decline in eGFR for every interquartile range increase in pollutant concentrations.

Pollutant	Measure	Doubling of Serum Creatinine	Composite Outcome of ESRD or $\geq 50\%$ Decline in eGFR
Particulate Matter <10 μm in Diameter	N	1,018,635	1,034,117
	HR (CI)	1.10 (1.07, 1.12)	1.09 (1.06, 1.12)
Nitrogen Dioxide	N	1,448,076	1,452,539
	HR (CI)	1.12 (1.09, 1.16)	1.09 (1.06, 1.12)
Carbon Monoxide	N	1,507,166	1,510,379
	HR (CI)	1.14 (1.12, 1.17)	1.05 (1.02, 1.08)
<p>Models adjusted for baseline age, race, gender, T_0 eGFR, hypertension, diabetes, cancer, cardiovascular disease, chronic lung disease, body mass index, smoking, angiotensin-converting enzyme inhibitor and angiotensin receptor blocker use, number of hospitalizations, number of eGFR, county population density, and county percent in poverty.</p> <p>+ Incident eGFR<60 was evaluated in a subcohort of people with no prior history of eGFR≤ 60 at time of cohort entry.</p> <p>*Incident CKD was evaluated in a subcohort of people with at least 2 eGFR separated by at least 90 days apart who had no prior history eGFR≤ 60 at time of cohort entry.</p> <p>Abbreviations: eGFR, estimated glomerular filtration rate; CKD, Chronic Kidney Disease; ESRD, end stage renal disease; N, sample size; HR, hazard ratio; CI, 95% confidence interval.</p>			

Supplemental table 6: Risk of all-cause mortality for every interquartile range increase in pollutant concentration

Pollutant	Measure	All-cause Mortality
Particulate Matter <10 µm in Diameter	N	1,036,237
	HR (CI)	1.05 (1.04, 1.06)
Nitrogen Dioxide	N	1,453,255
	HR (CI)	1.05 (1.04, 1.06)
Carbon Monoxide	N	1,510,922
	HR (CI)	1.04 (1.03, 1.05)

Models adjusted for baseline age, race, gender, T₀ eGFR, hypertension, diabetes, cancer, cardiovascular disease, chronic lung disease, body mass index, smoking, angiotensin-converting enzyme inhibitor and angiotensin receptor blocker use, number of hospitalizations, number of eGFR, county population density, and county percent in poverty.
+ Incident eGFR<60 was evaluated in a subcohort of people with no prior history of eGFR≤60 at time of cohort entry.
*Incident CKD was evaluated in a subcohort of people with at least 2 eGFR separated by at least 90 days apart who had no prior history eGFR≤60 at time of cohort entry.
Abbreviations: eGFR, estimated glomerular filtration rate; CKD, Chronic Kidney Disease; ESRD, end stage renal disease; N, sample size; HR, hazard ratio; CI, 95% confidence interval.

Supplemental Table 7: Risk of kidney outcomes for every interquartile range increase in pollutant concentration using informative censoring sensitivity analysis for competing risk models.

Pollutant	Incident eGFR Less Than 60⁺	Incident CKD[*]	≥ 30% Decline in eGFR	ESRD
Particulate Matter <10 µm in Diameter	1.06 (1.05, 1.08)	1.06 (1.05, 1.08)	1.07 (1.06, 1.09)	1.06 (1.04, 1.07)
Nitrogen Dioxide	1.08 (1.07, 1.09)	1.08 (1.06, 1.09)	1.10 (1.09, 1.11)	1.05 (1.03, 1.06)
Carbon Monoxide	1.08 (1.07, 1.09)	1.08 (1.07, 1.09)	1.08 (1.07, 1.09)	1.03 (1.02, 1.04)
<p>In models death was censored as a risk. Models adjusted for baseline age, race, gender, T₀ eGFR, hypertension, diabetes, cancer, cardiovascular disease, chronic lung disease, body mass index, smoking, angiotensin-converting enzyme inhibitor and angiotensin receptor blocker use, number of hospitalizations, number of eGFR, county population density, and county percent in poverty. + Incident eGFR<60 was evaluated in a subcohort of people with no prior history of eGFR≤60 at time of cohort entry. *Incident CKD was evaluated in a subcohort of people with at least 2 eGFR separated by at least 90 days apart who had no prior history eGFR≤60 at time of cohort entry. Abbreviations: eGFR, estimated glomerular filtration rate; CKD, Chronic Kidney Disease; ESRD, end stage renal disease; N, sample size; HR, hazard ratio; CI, 95% confidence interval.</p>				

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