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# ADDITIONAL MATERIALS AVAILABLE ON THE HEI WEB SITE

**Special Report 19** 

# Diesel Emissions and Lung Cancer: An Evaluation of Recent Epidemiological Evidence for Quantitative Risk Assessment

**HEI Diesel Epidemiology Panel** 

Additional Materials 2. Analytical Data Sets for the Cohort (Attfield et al. 2012) and Case–Control (Silverman et al. 2012) Studies, and HEI Diesel Epidemiology Panel Replication of Selected Analyses in the DEMS Case–Control Study

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# DEMS COHORT MORTALITY STUDY <u>EXTERNAL</u> ANALYTICAL SET\* (Attfield et al. 2012)\*\*

# VARIABLES

ID - Record Number Date of Birth (MM/DD/YYYY) Sex Code: 0=Female; 1=Male Race Code: 0=Unknown; 1=White; 2=Non-white Vital Status: 0=Unknown; 1=Living; 2=Dead International Classification of Diseases (ICD) Version - ICD at time of death (XX) Underlying Cause of Death ICD Code (XXX.X) Contributing Cause of Death ICD Codes 1–10 (XXX.X) Last Observed Date (MM/DD/YYYY) State (worked the longest): 1=Ohio; 2=Missouri; 3=New Mexico; 4=Wyoming Exposure Begin Date (MM/DD/YYYY) - at study facilities Exposure End Date (MM/DD/YYYY) - at study facilities Location Code: 1=Underground; 2=Surface; 3=Surface/Underground; 4=Inactive/Offsite

\* Source: <u>http://www.cdc.gov/niosh/topics/cancer/diesel/DEMSCohortVariables.html</u>

\*\* Attfield MD, Schleiff PL, Lubin JH, Blair A, Stewart PA, Vermeulen R, et al. 2012. The diesel exhaust in miners study: A cohort mortality study with emphasis on lung cancer. J Natl Cancer Inst 104:869–883.

# DEMS COHORT MORTALITY STUDY <u>INTERNAL</u> ANALYTICAL SET\* (Attfield et al. 2012)\*\*

# VARIABLES

**ID** - Record Number Date of Birth (MM/DD/YYYY) Sex Code: 0=Female; 1=Male Race Code: 0=Unknown; 1=White; 2=Non-white Vital Status: 0=Unknown; 1=Living; 2=Dead Underlying Lung Cancer Mortality: 0=No; 1=Yes Contributing Lung Cancer Mortality: 0=No; 1=Yes Underlying Esophageal Cancer Mortality: 0=No; 1=Yes Contributing Esophageal Cancer Mortality: 0=No; 1=Yes Last Observed Date (MM/DD/YYYY) State (worked the longest): 1=Ohio; 2=Missouri; 3=New Mexico; 4=Wyoming Mine Type Code (worked the longest): 1=Lime; 2=Potash; 3=Salt; 4=Trona Hired Date (MM/DD/YYYY) Exposure Begin Date (MM/DD/YYYY) - at study facilities Exposure End Date (MM/DD/YYYY) - at study facilities Location Code: 1=Underground; 2=Surface; 3=Surface/Underground; 4=Inactive/Offsite **Underground Percent** Respirable Elemental Carbon Metric ( $\mu g/m^3$ ) Respirable Elemental Carbon Alternative Metrics (5-year Means, Power Model, Medians) Respirable Dust Metric  $(mg/m^3)$ Radon Metric (WL=Working Level) Silica Level Code: 0=None; 1=Low; 2=Medium; 3=High Asbestos Level Code: 0=None; 1=Low; 2=Medium; 3=High Non-Diesel Polycyclic Aromatic Hydrocarbons Level Code: 0=Absent; 1=Present

<sup>\*</sup> Source: <u>http://www.cdc.gov/niosh/topics/cancer/diesel/DEMSCohortVariables.html</u>

<sup>\*\*</sup> Attfield MD, Schleiff PL, Lubin JH, Blair A, Stewart PA, Vermeulen R, et al. 2012. The diesel exhaust in miners study: A cohort mortality study with emphasis on lung cancer. J Natl Cancer Inst 104:869–883.

Variable Order In Data File	Description	Format	Notes / Warnings
		1 = Case	
Variable 1	Variable indicating case or control status	2 = Control	
Variable 2	Number assigned to case and controls in a given cluster (i.e. matched set).	3 Digit Number	
		0 = No respiratory disease, or less than five years prior to case death	
Variable 3	before case death	2 = Don't know	
		0 = No respiratory disease	
		1 = Yes, respiratory disease less than five years prior to case death	
	First respiratory disease(excluding asthma and pneumonia) diagnosed before case	2 = Yes, respiratory disease five or more years prior to case death	
Variable 4	death, grouped	9 = Don't know	
		1 = Exercise once or more per day	
		2 = Exercise less than once per day	
Variable 5	Physical activity, grouped	9 = Don't know	
		1 = Less then 18.5 (kg/m2) (Underweight)	
		2 = 18.5 to less than 25 (kg/m2) (Normal Weight)	
		3 = 25 to less than 30 (kg/m2) (Overweight)	
Verieble C		4 = 30 (kg/m2) or more (Obese)	
Variable 6	Body mass index , grouped according to WHO categories	9 = Don't know	
		0 = No family history of lung cancer	
Veriable 7	Family biston, of loss and an	1 = Yes, family history of lung cancer	
Variable 7	Family history of lung cancer	9 = Don't know	
	Overall indicator for combined high risk jobs (Checklist # - 1-Miner/Outside study	0 =No high-risk jobs with ten or more years duration	
Variable 9	Mine,2-Truck Driver,8-Machinery Mechanic,12-Welder,22-Painter), with ten or more	1= Yes, high-risk jobs with ten or more years duration	Checklist numbers refer to job titles in jobs
Variable 8	years of duration	2 = Don't Know	checklist in subject questionnaire
		0 = No, did not work with diesel outside of study mine work	
Variable 0	Outside of study mine diesel work indicator	1= Yes, worked with diesel outside of study mine work	
Variable 9	Outside of study mine diesel work indicator	2 = Don't Know	· · · · · · · · · · · · · · · · · · ·
		2 = Cum. Exp. Lag 15 Quartile 1 (0 to <3.37)/Yes, worked with diesel outside	
		of study mine work	
		3 = Cum. Exp. Lag 15 Quartile 1 (0 to <3.37)/No, did not work with diesel	
		outside study mine work	
		4 = Cum. Exp. Lag 15 Quartile 2 (3.37 to < 71.58)/Don't Know	
		5 = Cum. Exp. Lag 15 Quartile 2 (3.37 to < 71.58)/Yes, worked with diesel	
		outside of study mine work 6 = Cum. Exp. Lag 15 Quartile 2 (3.37 to < 71.58)/No, did not work with	
		diesel outside study mine work	
		7 = Cum. Exp. Lag 15 Quartile 3 (71.58 to < 535.65)/Don't Know 8 = Cum. Exp. Lag 15 Quartile 3 (71.58 to < 535.65)/Yes, worked with diesel	
		outside of study mine work	Quartile ranges are shown for each quartile
	Cumulative REC exposure, lagged 15 years combined with outside study mine diesel	9 = Cum. Exp. Lag 15 Quartile 3 (71.58 to < 535.65)/No, did not work with	$(\mu/m3-years)$ . Quartile cut points created
Variable 10	exposure	diesel outside study mine work	using cases only.
Valiable 10	exposure	0 = 0 Years	using cases only.
		1 = Less then 5 Years	
		2 = 5 to less than 10 years	
	Duration for high risk jobs(Checklist # - 1-Miner/Outside study Mine,2-Truck Driver,8-	3 = 10 to less than 15 years	Checklist numbers refer to job titles in jobs
Variable 11	Machinery Mechanic, 12-Welder, 22-Painter), grouped	4 = 15 or more years	checklist in subject questionnaire
		1 = Vocational Training	
		2 = Less than High School	
		3 = Completed high school or GED	
M. 1.11. 42	ed autor la st	4 = Any College	
Variable 12 Variable 13	Education level Cumulative respirable dust (mg/m3-years).	9 = Don't Know Continuous Value	
Vallable 15	cumulative respirable dust (ing/ins-years).	1 = Quartile one (0 to < 5.66079)	
		2 = Quartile two (5.66079 to < 14.0777 )	Quartile ranges are shown for each quartile
		3 = Quartile three (14.0777 to < 29.5353)	(mg/m3-years). Quartile cut points created
Variable 14	Cumulative respirable dust (mg/m3-years) in quartiles.	4 = Quartile four (≥29.5353 )	using cases only.
			· · · · · · /
	Cumulative weighted asbestos score. (Cumulative exposure(continuous) derived from		
Variable 15	intensity scores (0–3) multiplied by years at each job, summed across jobs.)	Continuous Value	
		0 = No exposure (0)	Quantile management of the sector of the
	Cumulative weighted asherter same in superior (Over 1996) if the second	1 = Quartile one $(0 < to < 1.15)$	Quartile ranges are shown for each quartile.
	Cumulative weighted asbestos score in quartiles. (Quartiles of cumulative exposure	2 = Quartile two (1.15 to < 5.94)	Quartile cut points created using cases only
Variable 16	derived from intensity scores (0–3) multiplied by years at each job, summed across	3 = Quartile three (5.94 to < 13.72)	and excluding those without exposure (equal
Variable 16	jobs.) Cumulative weighted PAH score. (Cumulative exposure(continuous) derived from the	4 = Quartile four (≥ 13.72)	to 0).
	presence or absence of non-diesel PAHs based on job title tasks (0,1) multiplied by		
Variable 17	years at each job, summed across jobs.)	Continuous Value	
	· · · · · · · · · · · · · · · · · · ·	0 = No exposure (0)	1
		1 = Quartile one (0 < - < 1.18)	Quartile ranges are shown for each quartile.
I	Cumulative weighted PAH score in quartiles. (Quartiles of cumulative exposure	2 = Quartile two (1.18 <= - < 5.11)	Quartile cut points created using cases only
	derived from the presence or absence of non-diesel PAHs based on job title tasks (0,1)		and excluding those without exposure (equal
Variable 18	multiplied by years at each job, summed across jobs.)	4 = Quartile four (>= 12.34)	to 0).
	Cumulative weighted cilies core (Cumulative surgery (Customer Advector)		
Verieble 10	Cumulative weighted silica score. (Cumulative exposure (continuous) derived from	Continuous Value	
Variable 19	intensity scores (0–3) multiplied by years at each job, summed across jobs.)	Continuous Value 0 = No exposure (0)	
		1 = Quartile one (0 < - < 4.57)	Quartile ranges are shown for each quartile.
	Cumulative weighted silica score in quartiles. (Quartiles of cumulative exposure	2 = Quartile two (4.57 <= - < 12.56)	Quartile ranges are shown to reach quartile.
	derived from intensity scores (0–3) multiplied by years at each job, summed across	3 = Quartile three (12.56 <= - < 20.50)	and excluding those without exposure (equal
Variable 20	jobs.)	4 = Quartile four (>= 20.50)	to 0).
	Cumulative radon (WL-months) in quartiles. (Cumulative radon(continuous) exposure		······
	derived from estimated levels in WL multiplied by months at each job, summed across		
Variable 21	jobs.)	Continuous Value	
		0 = No exposure (0)	
		1 = Quartile one (0 < - < 0.64)	Quartile ranges are shown for each quartile.
	Cumulative radon (WL-months) in quartiles. (Quartiles of cumulative radon exposure	2 = Quartile two ( 0.64 <= - < 1.87)	Quartile cut points created using cases only
Variable 22	derived from estimated levels in WL multiplied by months at each job, summed across jobs.)	3 = Quartile three ( 1.87 <= - < 2.98) 4 = Quartile four (>= 2.98)	and excluding those without exposure (equal to 0).

\*Silverman DT, Samanic CM, Lubin JH, Blair AE, Stewart PA, Vermeulen R, et al. 2012. The diesel exhaust in miners study: a nested case-control study of lung cancer and diesel exhaust. J Natl Cancer Inst 104:(11):855–868.

		2 = 5 to less than 10 years 3 = 10 to less than 15 years	
		1 = Less then 5 Years	
Variable 31	Any underground study mine work or study mine surface only work indicator	1 = Any underground work at study mines 0 = 0 Years	ł
		0 = Surface work only at study mines	1
Variable 30		2 = Two or more smokers in adult and childhood homes 9 = Don't know	
		1 = One smoker in adult and childhood homes	
Variable 29	Pipe smoking as pipefuls per week, grouped	9 = Don't know 0 = Zero smokers in adult and childhood homes	<u> </u>
		3 = Twenty or more pipefuls per week	
		1 = Less than ten pipefuls per week 2 = Ten to less than twenty pipefuls per week	
VOINABLE 20		0 = No Pipe Smoking	1
Variable 28	Cigar smoking duration in years, grouped	3 = Twenty or more yearssmoking cigars 9 = Don't know	
		2 = Ten to less than twenty years smoking cigars	
		0 = No cigar smoking 1 = Less then ten years smoking cigars	
Variable 27	15 years prior to case death in tertiles	15 = Two or more packs per day//Cum. Exp. Lag 15 Tertile 3 (>=304.23)	cases only.
		14 = Two or more packs per day//Cum. Exp. Lag 15 Tertile 2 (8.37 <= - <304.23)	Tertile ranges are shown for each tertile $(\mu/m3-years)$ . Tertile cut points created using
		13 = Two or more packs per day//Cum. Exp. Lag 15 Tertile 1 (0 <= - < 8.37)	Tortilo ranges are shown for each test
		(>=304.23)	
		<304.23) 12 = One to less than two packs per day/Cum. Exp. Lag 15 Tertile 3	
		11 = One to less than two packs per day/Cum. Exp. Lag 15 Tertile 2 (8.37 <= -	
		8.37)	
		9 = Less than one pack per day/ Cum. Exp. Lag 15 Tertile 3 (>=304.23) 10 = One to less than two packs per day/Cum. Exp. Lag 15 Tertile 1 (0 <= - <	
		8 = Less than one pack per day/ Cum. Exp. Lag 15 Tertile 2 (8.37 <= - <304.23) 0 = Less than one pack per day/ Cum. Exp. Lag 15 Tertile 3 ( $>=204.23$ )	
		7 = Less than one pack per day/ Cum. Exp. Lag 15 Tertile 1 (0 <= - < 8.37)	
		5 = Non-smoker /Cum. Exp. Lag 15 Tertile 2 (8.37 <= - <304.23) 6 = Non-smoker /Cum. Exp. Lag 15 Tertile 3 (>=304.23)	
		4 = Non-smoker/Cum. Exp. Lag 15 Tertile 1 (0 <= - < 8.37)	
		3 = Don't know or occasional smoker /Cum. Exp. Lag 15 Tertile 3 (>=304.23)	
		2 = Don't know or occasional smoker /Cum. Exp. Lag 15 Tertile 2 (8.37 <= - <304.23)	
		8.37)	
		1 = Don't know or occasional smoker /Cum. Exp. Lag 15 Tertile 1 (0 <= - <	
Variable 26	Smoking status (occasional smoking as a separate level) with packs per day, grouped	9 = Don't Know	l
		8 = Current two or more packs per day smoker	
		6 = Current less then one pack per day smoker 7 = Current one to less than two packs per day smoker	
		5 = Former two or more packs per day smoker	
		4 = Former one to less than two packs per day smoker	
		<ul> <li>2 = Occasional smoker</li> <li>3 = Former less then one pack per day smoker</li> </ul>	
-		2 = Occasional smoker	
Variable 25	Smoking status with packs per day, grouped	7 = Former two or more packs per day smoker 8 = Current two or more packs per day smoker 1 = NOIF=SINDREF	
		6 = Current one to less than two packs per day smoker 7 = Former two or more packs per day smoker	
		5 = Former one to less than two packs per day smoker	
		4 = Current less then one pack per day smoker	
		2 = Non-smoker 3 = Former less then one pack per day smoker	
		1 = Don't know of occasionarsmoker 2 = Non-smoker	
Variable 24	Smoking, packs per day, grouped	5 = Two or more packs per day 1 = Don t know of occasional smoker	
		3 = Less than one pack per day 4 = One to less than two packs per day	
		2 = Non-smoker	
Variable 23	Smoking status with packs per day and underground status, grouped	work 1 = Don't know or occasional smoker	l
Variable 22	Empline status with pasks as a day and an demand of the second state	16 = Current two or more packs per day smoker with surface only study mine	
		mine work	
		work 15 = Current two or more packs per day smoker with any underground study	
		14 = Former two or more packs per day smoker with surface only study mine	
		mine work	
		study mine work 13 = Former two or more packs per day smoker with any underground study	
		12 = Current one to less than two packs per day smoker with surface only	
		underground study mine work	
		study mine work 11 = Current one to less than two packs per day smoker with any	
		10 = Former one to less than two packs per day smoker with surface only	
		study mine work	
		work 9 = Former one to less than two packs per day smoker with any underground	
		8 = Current less than one pack per day smoker with surface only study mine	
		mine work	
		work 7 = Current less then one pack per day smoker with any underground study	
		6 = Former less then one pack per day smoker with surface only study mine	
		5 = Former less then one pack per day smoker with any underground study mine work	
		4 = Non-smoker with any underground study mine work	
		3 = Non-smoker with surface only study mine work	
	1	2 = Don't know or occasional smoker with any underground study mine work	

Variable 33	Duration exposed as a trend of the grouped variable	Continuous Value	Trends created using the median of contr within duration groups and assigning resulting value to all cases/controls in a g duration group.
Variable 34	Cumulative REC exposure (µ/m3-years)	Continuous Value	
		1 = Quartile one (0 <= - < 18.74)	
		2 = Quartile two (18.74 <= - < 245.79)	Quartile ranges are shown for each quart
		3 = Quartile three (245.79<= - < 963.91)	(µ/m3-years). Quartile cut points created
Variable 35	Cumulative REC exposure (µ/m3-years) in quartiles	4 = Quartile four (>= 963.91)	using cases only.
			Trends created using the median of cont
			within quartiles and assigning resulting v
Variable 36	Cumulative REC exposure (µ/m3-years) as a trend of the quartiles	Continuous Value	to all cases/controls in a given quartile.
Variable 37	Average REC exposure (µ/m3)	Continuous Value	
		1 = Quartile one (0 <= - <1.37)	
		2 = Quartile two (1.37 <= - <3 2.28)	Quartile ranges are shown for each quart
		3 = Quartile three (32.28<= - < 98.39)	(µ/m3). Quartile cut points created using
Variable 38	Average REC exposure (µ/m3) in quartiles	4 = Quartile four (>= 98.39)	cases only.
Variable 39	Average REC exposure ( $\mu/m3$ ) as a trend of the quartiles	Continuous Value	Trends created using the median of contr within quartiles and assigning resulting v to all cases/controls in a given quartile.
Variable 40	Cumulative REC exposure ( $\mu/m3$ -years), truncated 3 years prior to case death	Continuous Value	
Variable 41	Average REC exposure ( $\mu$ /m <sup>3</sup> ), truncated 3 years prior to case death	Continuous Value	1
Variable 42	Cumulative REC exposure (µ/m3-years), truncated 5 years prior to case death	Continuous Value	
Variable 43	Average REC exposure ( $\mu$ /m <sup>3</sup> ), truncated 5 years prior to case death	Continuous Value	1
Variable 44	Cumulative REC exposure ( $\mu$ /m <sup>3</sup> -years), truncated 7 years prior to case death	Continuous Value	1
Variable 45	Average REC exposure ( $\mu$ /m3), truncated 7 years prior to case death	Continuous Value	
Variable 46	Cumulative REC exposure (µ/m3-years), truncated 9 years prior to case death	Continuous Value	
Variable 47	Average REC exposure ( $\mu/m$ 3), truncated 9 years prior to case death	Continuous Value	1
			1
Variable 48	Cumulative REC exposure ( $\mu$ /m3-years), truncated 11 years prior to case death	Continuous Value	
Variable 49	Average REC exposure ( $\mu$ /m3), truncated 11 years prior to case death	Continuous Value	1
			1
Variable 50	Cumulative REC exposure ( $\mu$ /m3-years), truncated 13 years prior to case death	Continuous Value	
Variable 50	Average REC exposure ( $\mu$ /m3), truncated 13 years prior to case death	Continuous Value	1
	2 f W W		1
Variable 52	Cumulative REC exposure ( $\mu$ /m3-years), truncated 15 years prior to case death	Continuous Value	1
		1 = Quartile one (0 to <3.37)	1
		2 = Quartile two (3.37 to < 71.58)	Quartile ranges are shown for each quart
	Cumulative REC exposure ( $\mu$ /m3-years) truncated 15 years prior to case death in	3 = Quartile three (71.58 to < 535.65)	(µ/m3-years). Quartile cut points created
Variable 53	quartiles	4 = Quartile four (≥ 535.65)	using cases only.
		1 = Quartile one (0 to <107.67)	composition of the second seco
		2 = Quartile two (107.67 to < 444.92)	1
	Cumulative REC exposure ( $\mu$ /m3-years) truncated 15 years prior to case death in	3 = Quartile three (444.92 to < 945.81)	1
Variable 54	quartiles, using cohort cut points	4 = Quartile four (≥945.81)	Quartile ranges are taken from cohort pa
		1 = Tertile one (0 to < 8.37)	Tertile ranges are shown for each tertile
	Cumulative REC exposure ( $\mu$ /m3-years) truncated 15 years prior to case death in	2 = Tertile two (8.37 to <304.23)	( $\mu$ /m3-years). Tertile cut points created u
Variable 55	tertiles	3 = Tertile three (≥304.23)	cases only.
		1 = Quartile one (0 to < 0.86)	/
		2 = Quartile two (0.86 to < 5.78)	Quartile ranges are shown for each quart
		3 = Quartile three (5.78 to < 56.99)	(µ/m3). Quartile cut points created using
Variable 56	Average REC exposure ( $\mu$ /m3), truncated 15 years prior to case death in quartiles	$4 = $ Quartile four ( $\geq$ 56.99)	cases only.
			· · · · · · · · · · · · · · · · · · ·
		1 = Quartile one (0 to <3.37)	
		2 = Quartile two (3.37 to < 71.58)	Quartile ranges are shown for each quart
		2 - Quartice two (5.57 to (71.50)	
		3 = Quartile three (71.58 to < 535.65)	
		3 = Quartile three (71.58 to < 535.65)	( $\mu$ /m3-years). Quartile cut points created
	Cumulative RFC exposure (u/m3-years) truncated 15 years prior to case death in	3 = Quartile three(71.58 to < 535.65) 4 = Quartile four and less than median quartile value(535.65 to <1004.51)	(μ/m3-years). Quartile cut points created using cases only. Fourth quartile mediar
Variable 57	Cumulative REC exposure ( $\mu$ /m3-years) truncated 15 years prior to case death in quartiles, with fourth or too quartile solit by the median of that quartile	3 = Quartile three (71.58 to < 535.65) 4 = Quartile four and less than median quartile value (535.65 to <1004.51) 5 = Quartile four and greate than or equal to median quartile value	(μ/m3-years). Quartile cut points created using cases only. Fourth quartile median created using only cases in the fourth
Variable 57	Cumulative REC exposure ( $\mu$ /m3-years) truncated 15 years prior to case death in quartiles, with fourth or top quartile split by the median of that quartile	3 = Quartile three(71.58 to < 535.65) 4 = Quartile four and less than median quartile value(535.65 to <1004.51)	(μ/m3-years). Quartile cut points created using cases only. Fourth quartile median created using only cases in the fourth quartile.
Variable 57		3 = Quartile three (71.58 to < 535.65) 4 = Quartile four and less than median quartile value (535.65 to <1004.51) 5 = Quartile four and greate than or equal to median quartile value	(μ/m3-years). Quartile cut points created using cases only. Fourth quartile median created using only cases in the fourth quartile. Irrends created using the median of contri-
Variable 57		3 = Quartile three (71.58 to < 535.65) 4 = Quartile four and less than median quartile value (535.65 to <1004.51) 5 = Quartile four and greate than or equal to median quartile value	(μ/m3-years). Quartile cut points created using cases only. Fourth quartile median created using only cases in the fourth quartile. Trends created using the median of cont within quartiles and assigning resulting v
Variable 57		3 = Quartile three (71.58 to < 535.65) 4 = Quartile four and less than median quartile value (535.65 to <1004.51) 5 = Quartile four and greate than or equal to median quartile value	(μ/m3-years). Quartile cut points created using cases only. Fourth quartile median created using only cases in the fourth quartile. Trends created using the median of cont within quartiles and assigning resulting v
Variable 57	quartiles, with fourth or top quartile split by the median of that quartile Cumulative REC exposure ( $\mu$ /m3-years) truncated 15 years prior to case death in	3 = Quartile three (71.58 to < 535.65) 4 = Quartile four and less than median quartile value (535.65 to <1004.51) 5 = Quartile four and greate than or equal to median quartile value	(μ/m3-years). Quartile cut points created using cases only. Fourth quartile median created using only cases in the fourth quartile. Irrends created using the median of cont within quartiles and assigning resulting v to all cases/controls in a given quartile. It case we are also using the median split
	quartiles, with fourth or top quartile split by the median of that quartile	3 = Quartile three (71.58 to < 535.65) 4 = Quartile four and less than median quartile value (535.65 to <1004.51) 5 = Quartile four and greate than or equal to median quartile value	(μ/m3-years). Quartile cut points created using cases only. Fourth quartile median created using only cases in the fourth quartile. Irrends created using the median of cont within quartiles and assigning resulting v to all cases/controls in a given quartile. It case we are also using the median split
	quartiles, with fourth or top quartile split by the median of that quartile Cumulative REC exposure ( $\mu$ /m3-years) truncated 15 years prior to case death in quartiles, with fourth or top quartile split by the median of that quartile as a trend of	3 = Quartile three (71.58 to < 535.65) 4 = Quartile four and less than median quartile value (535.65 to <1004.51) 5 = Quartile four and greate than or equal to median quartile value (21004.51)	(μ/m3-years). Quartile cut points created using cases only. Fourth quartile median created using only cases in the fourth quartile. Irrends created using the median of cont within quartiles and assigning resulting y to all cases/controls in a given quartile. In case we are also using the median split categories of the fourth quartile to created.
	quartiles, with fourth or top quartile split by the median of that quartile Cumulative REC exposure ( $\mu$ /m3-years) truncated 15 years prior to case death in quartiles, with fourth or top quartile split by the median of that quartile as a trend of	3 = Quartile three (71.58 to < 535.65) 4 = Quartile four and less than median quartile value (535.65 to <1004.51) 5 = Quartile four and greate than or equal to median quartile value (21004.51)	(μ/m3-years). Quartile cut points created using cases only. Fourth quartile median created using only cases in the fourth quartile. Irrends created using the median of cont within quartiles and assigning resulting v to all cases/controls in a given quartile. It case we are also using the median split categories of the fourth quartile to created trend.
	quartiles, with fourth or top quartile split by the median of that quartile Cumulative REC exposure ( $\mu$ /m3-years) truncated 15 years prior to case death in quartiles, with fourth or top quartile split by the median of that quartile as a trend of	3 = Quartile three (71.58 to < 535.65) 4 = Quartile four and less than median quartile value (535.65 to <1004.51) 5 = Quartile four and greate than or equal to median quartile value (21004.51)	(μ/m3-years). Quartile cut points created using cases only. Fourth quartile median created using only cases in the fourth quartile. Trends created using the median of cont within quartiles and assigning resulting v to all cases/controls in a given quartile. In case we are also using the median split categories of the fourth quartile to create trend.
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Variable 58 Variable 59 Variable 60 Variable 61 Variable 62 Variable 63 Variable 64 Variable 65 Variable 66 Variable 67 Variable 68	quartiles, with fourth or top quartile split by the median of that quartile         Cumulative REC exposure (µ/m3-years) truncated 15 years prior to case death in quartiles, with fourth or top quartile split by the median of that quartile as a trend of the quartiles.         Cumulative REC exposure (µ/m3-years) truncated 15 years prior to case death as a trend of the quartiles.         Average REC exposure (µ/m3), truncated 15 years prior to case death as a trend of the quartiles.         Average REC exposure (µ/m3), truncated 15 years prior to case death         Average REC exposure (µ/m3), truncated 15 years prior to case death         Average REC exposure (µ/m3), truncated 15 years prior to case death as a trend of the quartiles.         Cumulative REC exposure (µ/m3), truncated 17 years prior to case death         Average REC exposure (µ/m3-years), truncated 17 years prior to case death         Average REC exposure (µ/m3-years), truncated 19 years prior to case death         Average REC exposure (µ/m3-years), truncated 19 years prior to case death         Average REC exposure (µ/m3-years), truncated 19 years prior to case death         Average REC exposure (µ/m3-years), truncated 20 years prior to case death         Average REC exposure (µ/m3-years), truncated 20 years prior to case death         Average REC exposure (µ/m3-years), truncated 21 years prior to case death         Cumulative REC exposure (µ/m3-years), truncated 21 years prior to case death	3 = Quartile three (71.58 to < 535.65) 4 = Quartile four and less than median quartile value (535.65 to <1004.51) 5 = Quartile four and greate than or equal to median quartile value (>1004.51) Continuous Value Continuous Value	(µ/m3-years). Quartile cut points created using cases only. Fourth quartile mediar created using only cases in the fourth quartile. Irends created using the median of cont within quartiles and assigning resulting y to all cases/controls in a given quartile. I case we are also using the median split categories of the fourth quartile to creat trend. Trends created using the median of cont within quartiles and assigning resulting y to all cases/controls in a given quartile. Trends created using the median of cont within quartiles and assigning resulting y to all cases/controls in a given quartile.
Variable 58 Variable 59 Variable 60 Variable 61 Variable 62 Variable 63 Variable 64 Variable 65 Variable 66 Variable 67 Variable 68	quartiles, with fourth or top quartile split by the median of that quartile         Cumulative REC exposure (μ/m3-years) truncated 15 years prior to case death in quartiles, with fourth or top quartile split by the median of that quartile as a trend of the quartiles         Cumulative REC exposure (μ/m3-years) truncated 15 years prior to case death as a trend of the quartiles         Average REC exposure (μ/m3), truncated 15 years prior to case death         Average REC exposure (μ/m3), truncated 15 years prior to case death         Average REC exposure (μ/m3), truncated 15 years prior to case death         Average REC exposure (μ/m3), truncated 15 years prior to case death         Average REC exposure (μ/m3), truncated 17 years prior to case death         Average REC exposure (μ/m3, truncated 17 years prior to case death         Average REC exposure (μ/m3), truncated 17 years prior to case death         Average REC exposure (μ/m3, truncated 19 years prior to case death         Average REC exposure (μ/m3, truncated 19 years prior to case death         Average REC exposure (μ/m3, truncated 19 years prior to case death         Average REC exposure (μ/m3, truncated 19 years prior to case death         Average REC exposure (μ/m3, truncated 19 years prior to case death         Average REC exposure (μ/m3, truncated 19 years prior to case death         Average REC exposure (μ/m3, truncated 19 years prior to case death         Average REC exposure (μ/m3, truncated 19 years prior to case death         Cumulative REC exposure (μ/m	3 = Quartile three (71.58 to < 535.65) 4 = Quartile four and less than median quartile value (535.65 to <1004.51) 5 = Quartile four and greate than or equal to median quartile value (21004.51) Continuous Value Continuous Value	(µ/m3-years). Quartile cut points created using cases only. Fourth quartile mediar created using only cases in the fourth quartile. Irends created using the median of cont within quartiles and assigning resulting y to all cases/controls in a given quartile. I case we are also using the median split categories of the fourth quartile to creat trend. Trends created using the median of cont within quartiles and assigning resulting y to all cases/controls in a given quartile. Trends created using the median of cont within quartiles and assigning resulting y to all cases/controls in a given quartile.
Variable 58 Variable 59 Variable 60 Variable 61 Variable 62 Variable 63 Variable 63 Variable 65 Variable 66 Variable 67 Variable 68 Variable 68 Variable 69	quartiles, with fourth or top quartile split by the median of that quartile         Cumulative REC exposure (μ/m3-years) truncated 15 years prior to case death in quartiles, with fourth or top quartile split by the median of that quartile as a trend of the quartiles         Cumulative REC exposure (μ/m3-years) truncated 15 years prior to case death as a trend of the quartiles         Average REC exposure (μ/m3), truncated 15 years prior to case death as a trend of the quartiles         Average REC exposure (μ/m3), truncated 15 years prior to case death         Average REC exposure (μ/m3), truncated 15 years prior to case death         Average REC exposure (μ/m3), truncated 15 years prior to case death         Average REC exposure (μ/m3), truncated 17 years prior to case death         Average REC exposure (μ/m3), truncated 17 years prior to case death         Average REC exposure (μ/m3), truncated 19 years prior to case death         Average REC exposure (μ/m3), truncated 19 years prior to case death         Average REC exposure (μ/m3), truncated 19 years prior to case death         Average REC exposure (μ/m3), truncated 20 years prior to case death         Average REC exposure (μ/m3), truncated 20 years prior to case death         Average REC exposure (μ/m3), truncated 20 years prior to case death         Average REC exposure (μ/m3), truncated 20 years prior to case death         Average REC exposure (μ/m3), truncated 20 years prior to case death         Average REC exposure (μ/m3), truncated 20 years prior to case death	3 = Quartile three (71.58 to < 535.65) 4 = Quartile four and less than median quartile value (535.65 to <1004.51) 5 = Quartile four and greate than or equal to median quartile value (≥1004.51) Continuous Value Continuous Value	(µ/m3-years). Quartile cut points created using cases only. Fourth quartile mediar created using only cases in the fourth quartile. Irends created using the median of cont within quartiles and assigning resulting y to all cases/controls in a given quartile. I case we are also using the median split categories of the fourth quartile to creat trend. Trends created using the median of cont within quartiles and assigning resulting y to all cases/controls in a given quartile. Trends created using the median of cont within quartiles and assigning resulting y to all cases/controls in a given quartile.
Variable 58 Variable 59 Variable 60 Variable 61 Variable 62 Variable 63 Variable 63 Variable 65 Variable 65 Variable 66 Variable 67 Variable 68 Variable 69 Variable 69	quartiles, with fourth or top quartile split by the median of that quartile         Cumulative REC exposure (µ/m3-years) truncated 15 years prior to case death in quartiles, with fourth or top quartile split by the median of that quartile as a trend of the quartiles.         Cumulative REC exposure (µ/m3-years) truncated 15 years prior to case death as a trend of the quartiles.         Average REC exposure (µ/m3), truncated 15 years prior to case death as a trend of the quartiles.         Average REC exposure (µ/m3), truncated 15 years prior to case death As a trend of the quartiles.         Cumulative REC exposure (µ/m3), truncated 15 years prior to case death as a trend of the quartiles.         Cumulative REC exposure (µ/m3), truncated 15 years prior to case death As a trend of the quartiles.         Cumulative REC exposure (µ/m3), truncated 17 years prior to case death         Average REC exposure (µ/m3-years), truncated 17 years prior to case death         Average REC exposure (µ/m3-years), truncated 19 years prior to case death         Average REC exposure (µ/m3-years), truncated 19 years prior to case death         Average REC exposure (µ/m3-years), truncated 20 years prior to case death         Average REC exposure (µ/m3-years), truncated 20 years prior to case death         Average REC exposure (µ/m3-years), truncated 21 years prior to case death         Average REC exposure (µ/m3-years), truncated 21 years prior to case death         Average REC exposure (µ/m3-years), truncated 21 years prior to case death         Average REC exposure (µ/m3-years), truncated 21 y	3 = Quartile three (71.58 to < 535.65) 4 = Quartile four and less than median quartile value (535.65 to <1004.51) 5 = Quartile four and greate than or equal to median quartile value (>1004.51) Continuous Value Continuous Value	(µ/m3-years). Quartile cut points created using cases only. Fourth quartile mediar created using only cases in the fourth quartile. Irends created using the median of cont within quartiles and assigning resulting y to all cases/controls in a given quartile. I case we are also using the median split categories of the fourth quartile to creat trend. Trends created using the median of cont within quartiles and assigning resulting y to all cases/controls in a given quartile. Trends created using the median of cont within quartiles and assigning resulting.
Variable 57 Variable 58 Variable 59 Variable 60 Variable 61 Variable 62 Variable 63 Variable 63 Variable 65 Variable 65 Variable 66 Variable 67 Variable 68 Variable 69 Variable 70 Variable 70 Variable 71	quartiles, with fourth or top quartile split by the median of that quartile         Cumulative REC exposure (μ/m3-years) truncated 15 years prior to case death in quartiles, with fourth or top quartile split by the median of that quartile as a trend of the quartiles         Cumulative REC exposure (μ/m3-years) truncated 15 years prior to case death as a trend of the quartiles         Average REC exposure (μ/m3), truncated 15 years prior to case death as a trend of the quartiles         Average REC exposure (μ/m3), truncated 15 years prior to case death         Average REC exposure (μ/m3), truncated 15 years prior to case death         Average REC exposure (μ/m3), truncated 15 years prior to case death         Average REC exposure (μ/m3), truncated 17 years prior to case death         Average REC exposure (μ/m3), truncated 17 years prior to case death         Average REC exposure (μ/m3), truncated 19 years prior to case death         Average REC exposure (μ/m3), truncated 19 years prior to case death         Average REC exposure (μ/m3), truncated 19 years prior to case death         Average REC exposure (μ/m3), truncated 20 years prior to case death         Average REC exposure (μ/m3), truncated 20 years prior to case death         Average REC exposure (μ/m3), truncated 20 years prior to case death         Average REC exposure (μ/m3), truncated 20 years prior to case death         Average REC exposure (μ/m3), truncated 20 years prior to case death         Average REC exposure (μ/m3), truncated 20 years prior to case death	3 = Quartile three (71.58 to < 535.65) 4 = Quartile four and less than median quartile value (535.65 to <1004.51) 5 = Quartile four and greate than or equal to median quartile value (≥1004.51) Continuous Value Continuous Value	(μ/m3-years). Quartile cut points created using cases only. Fourth quartile median created using only cases in the fourth quartile. Irends created using the median or conti within quartiles and assigning resulting v to all cases/controls in a given quartile. In case we are also using the median split categories of the fourth quartile to created trend. Trends created using the median of contr within quartiles and assigning resulting v to all cases/controls in a given quartile. Trends created using the median of contr within quartiles and assigning resulting v to all cases/controls in a given quartile. Trends created using the median of contr within quartiles and assigning resulting v to all cases/controls in a given quartile.
Variable 58 Variable 59 Variable 60 Variable 61 Variable 62 Variable 63 Variable 63 Variable 65 Variable 65 Variable 66 Variable 67 Variable 68 Variable 69 Variable 69	quartiles, with fourth or top quartile split by the median of that quartile         Cumulative REC exposure (µ/m3-years) truncated 15 years prior to case death in quartiles, with fourth or top quartile split by the median of that quartile as a trend of the quartiles.         Cumulative REC exposure (µ/m3-years) truncated 15 years prior to case death as a trend of the quartiles.         Average REC exposure (µ/m3), truncated 15 years prior to case death as a trend of the quartiles.         Average REC exposure (µ/m3), truncated 15 years prior to case death As a trend of the quartiles.         Cumulative REC exposure (µ/m3), truncated 15 years prior to case death as a trend of the quartiles.         Cumulative REC exposure (µ/m3), truncated 15 years prior to case death As a trend of the quartiles.         Cumulative REC exposure (µ/m3), truncated 17 years prior to case death         Average REC exposure (µ/m3-years), truncated 17 years prior to case death         Average REC exposure (µ/m3-years), truncated 19 years prior to case death         Average REC exposure (µ/m3-years), truncated 19 years prior to case death         Average REC exposure (µ/m3-years), truncated 20 years prior to case death         Average REC exposure (µ/m3-years), truncated 20 years prior to case death         Average REC exposure (µ/m3-years), truncated 21 years prior to case death         Average REC exposure (µ/m3-years), truncated 21 years prior to case death         Average REC exposure (µ/m3-years), truncated 21 years prior to case death         Average REC exposure (µ/m3-years), truncated 21 y	3 = Quartile three (71.58 to < 535.65) 4 = Quartile four and less than median quartile value (535.65 to <1004.51) 5 = Quartile four and greate than or equal to median quartile value (>1004.51) Continuous Value Continuous Value	(μ/m3-years). Quartile cut points created using cases only. Fourth quartile median created using only cases in the fourth quartile. Irends created using the median or conti within quartiles and assigning resulting v to all cases/controls in a given quartile. In case we are also using the median split categories of the fourth quartile to created trend. Trends created using the median of contr within quartiles and assigning resulting v to all cases/controls in a given quartile. Trends created using the median of contr within quartiles and assigning resulting v to all cases/controls in a given quartile. Trends created using the median of contr within quartiles and assigning resulting v to all cases/controls in a given quartile.

		2 = 20-<40 ug/m3	
		3 = 40-<80 ug/m3	
		4 = 80-<160 ug/m3	
		5 = 160-<320 ug/m3	
		6 = 320-<640 ug/m3	
		7 = 640-<1280 ug/m3	
		8 = 1280-<2560 ug/m3	
Variable 74	Cumulative REC exposure (µ/m3), truncated 15 years prior to case death in categories	9 = >=2560 ug/m3	
	Cumulative REC exposure ( $\mu/m3$ ), truncated 15 years prior to case death as a trend of		Trends created using the median of controls within catgeories and assigning resulting
Variable 75	the catgeorical variable	Continuous Value	value to all cases/controls in a given category.
		$2 = 2 - 4 \text{ ug/m}^3$	
		3 = 4-<8 ug/m3	
		4 = 8-<16 ug/m3	
		5 = 16-<32 ug/m3	
		6 = 32-<64 ug/m3	
		7 = 64-<128 ug/m3	
		8 = 128-<256 ug/m3	
Variable 76	Average REC exposure (µ/m3), truncated 15 years prior to case death in categories	9 = >=256 ug/m3	
			Trends created using the median of controls
V	Average REC exposure ( $\mu$ /m3), truncated 15 years prior to case death as a trend of the		within catgeories and assigning resulting
Variable 77	catgeorical variable	Continuous Value	value to all cases/controls in a given category. Balanced clusters have a case and at least one
		0 = Not a valid cluster - Subjects without study mine work in trona mines or in	control. This variable must be used in
l I		unbalanced clusters after exclusion	conjunction with variables 79 and 80 for
		1 = Valid cluster - Subjects with study mine work in trona mines in balanced	exclusion purposes or those variables will be
Variable 78	Eligible cluster indicator - subjects from trona mines	clusters	incorrect.
			Trends created using the median of eligible
l I			trona cluster controls within quartiles and
			assigning resulting value to all cases/controls
			in a given quartile.
V. (11) 70	Average REC exposure ( $\mu$ /m3), truncated 15 years prior to case death as a trend of the	Cardianana Malua	Must exclude ineligible clusters using variable
Variable 79	quartiles, for eligible trona clusters only	Continuous Value	78 (trona_clust) in order to use this variable
			Trends created using the median of eligible
			trona cluster controls within quartiles and
			assigning resulting value to all cases/controls
			in a given quartile.
	Cumulative RFC exposure (u/m3-vears) truncated 15 years prior to case death as a		
Variable 80	Cumulative REC exposure ( $\mu/m3$ -years) truncated 15 years prior to case death as a trend of the quartiles, for eligible trona clusters only	Continuous Value	Must exclude ineligible clusters using variable 78 (trona_clust) in order to use this variable
Variable 80			Must exclude ineligible clusters using variable 78 (trona_clust) in order to use this variable Balanceo clusters nave a case and at least one
Variable 80		0 = Not a valid cluster - Subjects without study mine work in potash mines or	Must exclude ineligible clusters using variable 78 (trona_clust) in order to use this variable suancee clusters nave a case and at least one control. This variable must be used in
Variable 80		0 = Not a valid cluster - Subjects without study mine work in potash mines or in unbalanced clusters after exclusion	Must exclude ineligible clusters using variable 78 (trona_clust) in order to use this variable Balanced clusters nave a case and at least one control. This variable must be used in conjunction with variables 82 and 82 for
	trend of the quartiles, for eligible trona clusters only	0 = Not a valid cluster - Subjects without study mine work in potash mines or in unbalanced clusters after exclusion 1 = Valid cluster - Subjects with study mine work in potash mines in balanced	Must exclude ineligible clusters using variable 78 (trona_clust) in order to use this variable Balanced clusters nave a case and at reast one control. This variable must be used in conjunction with variables 82 and 82 for exclusion purposes or those variables will be
Variable 80 Variable 81		0 = Not a valid cluster - Subjects without study mine work in potash mines or in unbalanced clusters after exclusion	Must exclude ineligible clusters using variable 78 (trona_clust) in order to use this variable Balanced clusters nave a case and at least one control. This variable must be used in conjunction with variables 82 and 82 for exclusion purposes or those variables will be incorrect.
	trend of the quartiles, for eligible trona clusters only	0 = Not a valid cluster - Subjects without study mine work in potash mines or in unbalanced clusters after exclusion 1 = Valid cluster - Subjects with study mine work in potash mines in balanced	Must exclude ineligible clusters using variable 78 (trona_clust) in order to use this variable Balanced clusters nave a case and at reast one control. This variable must be used in conjunction with variables 82 and 82 for exclusion purposes or those variables will be incorrect. Trends created using the median of eligible
	trend of the quartiles, for eligible trona clusters only	0 = Not a valid cluster - Subjects without study mine work in potash mines or in unbalanced clusters after exclusion 1 = Valid cluster - Subjects with study mine work in potash mines in balanced	Must exclude ineligible clusters using variable 78 (trona_clust) in order to use this variable Balanceo clusters nave a case and at least one control. This variable must be used in conjunction with variables 82 and 82 for exclusion purposes or those variables will be incorrect. Trends created using the median of eligible potash cluster controls within quartiles and
	trend of the quartiles, for eligible trona clusters only	0 = Not a valid cluster - Subjects without study mine work in potash mines or in unbalanced clusters after exclusion 1 = Valid cluster - Subjects with study mine work in potash mines in balanced	Must exclude ineligible clusters using variable 78 (trona_clust) in order to use this variable Balancec clusters nave a case and at least one control. This variable must be used in conjunction with variables 82 and 82 for exclusion purposes or those variables will be incorrect. Trends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls
	trend of the quartiles, for eligible trona clusters only	0 = Not a valid cluster - Subjects without study mine work in potash mines or in unbalanced clusters after exclusion 1 = Valid cluster - Subjects with study mine work in potash mines in balanced	Must exclude ineligible clusters using variable 78 (trona_clust) in order to use this variable Balanceo clusters nave a case and at least one control. This variable must be used in conjunction with variables 82 and 82 for exclusion purposes or those variables will be incorrect. Trends created using the median of eligible potash cluster controls within quartiles and
Variable 81	trend of the quartiles, for eligible trona clusters only Eligible cluster indicator - subjects from potash mines Average REC exposure (μ/m3), truncated 15 years prior to case death as a trend of the	0 = Not a valid cluster - Subjects without study mine work in potash mines or in unbalanced clusters after exclusion 1 = Valid cluster - Subjects with study mine work in potash mines in balanced clusters	Must exclude ineligible clusters using variable 78 (trona_clust) in order to use this variable Balanced clusters nave a case and at least one control. This variable must be used in conjunction with variables 82 and 82 for exclusion purposes or those variables will be incorrect. Trends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable
Variable 81	trend of the quartiles, for eligible trona clusters only Eligible cluster indicator - subjects from potash mines	0 = Not a valid cluster - Subjects without study mine work in potash mines or in unbalanced clusters after exclusion 1 = Valid cluster - Subjects with study mine work in potash mines in balanced	Must exclude ineligible clusters using variable 78 (trona_clust) in order to use this variable Balanced clusters have a case and at least one conjunction with variables 82 and 82 for exclusion purposes or those variables will be incorrect. Trends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile.
	trend of the quartiles, for eligible trona clusters only Eligible cluster indicator - subjects from potash mines Average REC exposure (μ/m3), truncated 15 years prior to case death as a trend of the	0 = Not a valid cluster - Subjects without study mine work in potash mines or in unbalanced clusters after exclusion 1 = Valid cluster - Subjects with study mine work in potash mines in balanced clusters	Must exclude ineligible clusters using variable 78 (trona_clust) in order to use this variable Balanced clusters nave a case and at least one control. This variable must be used in conjunction with variables 82 and 82 for exclusion purposes or those variables will be incorrect. Trends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable
Variable 81	trend of the quartiles, for eligible trona clusters only Eligible cluster indicator - subjects from potash mines Average REC exposure (μ/m3), truncated 15 years prior to case death as a trend of the	0 = Not a valid cluster - Subjects without study mine work in potash mines or in unbalanced clusters after exclusion 1 = Valid cluster - Subjects with study mine work in potash mines in balanced clusters	Must exclude ineligible clusters using variable 78 (trona_clust) in order to use this variable Balanced clusters have a case and at least one control. This variable must be used in conjunction with variables 82 and 82 for exclusion purposes or those variables will be incorrect. Trends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 81 (potash_clust) in order to use this variable Trends created using the median of eligible potash cluster controls within quartiles and
Variable 81	trend of the quartiles, for eligible trona clusters only Eligible cluster indicator - subjects from potash mines Average REC exposure (μ/m3), truncated 15 years prior to case death as a trend of the	0 = Not a valid cluster - Subjects without study mine work in potash mines or in unbalanced clusters after exclusion 1 = Valid cluster - Subjects with study mine work in potash mines in balanced clusters	Must exclude ineligible clusters using variable 78 (trona_clust) in order to use this variable Balanced clusters nave a case and at least one control. This variable must be used in conjunction with variables 82 and 82 for exclusion purposes or those variables will be incorrect. Trends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 81 (potash_clust) in order to use this variable Trends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls
Variable 81	trend of the quartiles, for eligible trona clusters only Eligible cluster indicator - subjects from potash mines Average REC exposure (μ/m3), truncated 15 years prior to case death as a trend of the	0 = Not a valid cluster - Subjects without study mine work in potash mines or in unbalanced clusters after exclusion 1 = Valid cluster - Subjects with study mine work in potash mines in balanced clusters	Must exclude ineligible clusters using variable 78 (trona_clust) in order to use this variable Balanced clusters have a case and at least one control. This variable must be used in conjunction with variables 82 and 82 for exclusion purposes or those variables will be incorrect. Trends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 81 (potash_clust) in order to use this variable Trends created using the median of eligible potash cluster controls within quartiles and
Variable 81	trend of the quartiles, for eligible trona clusters only Eligible cluster indicator - subjects from potash mines Average REC exposure (μ/m3), truncated 15 years prior to case death as a trend of the quartiles, for eligible potash clusters only	0 = Not a valid cluster - Subjects without study mine work in potash mines or in unbalanced clusters after exclusion 1 = Valid cluster - Subjects with study mine work in potash mines in balanced clusters	Must exclude ineligible clusters using variable 78 (trona_clust) in order to use this variable balanced clusters have a case and at least one control. This variable must be used in conjunction with variables 82 and 82 for exclusion purposes or those variables will be incorrect. Trends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 81 (potash_clust) in order to use this variable Trends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile.
Variable 81 Variable 82	trend of the quartiles, for eligible trona clusters only Eligible cluster indicator - subjects from potash mines Average REC exposure (μ/m3), truncated 15 years prior to case death as a trend of the	0 = Not a valid cluster - Subjects without study mine work in potash mines or in unbalanced clusters after exclusion 1 = Valid cluster - Subjects with study mine work in potash mines in balanced clusters	Must exclude ineligible clusters using variable 78 (trona_clust) in order to use this variable Balanced clusters nave a case and at least one control. This variable must be used in conjunction with variables 82 and 82 for exclusion purposes or those variables will be incorrect. Trends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 81 (potash_clust) in order to use this variable Trends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls
Variable 81 Variable 82	trend of the quartiles, for eligible trona clusters only Eligible cluster indicator - subjects from potash mines Average REC exposure (μ/m3), truncated 15 years prior to case death as a trend of the quartiles, for eligible potash clusters only Cumulative REC exposure (μ/m3-years) truncated 15 years prior to case death as a	0 = Not a valid cluster - Subjects without study mine work in potash mines or in unbalanced clusters after exclusion 1 = Valid cluster - Subjects with study mine work in potash mines in balanced clusters Continuous Value	Must exclude ineligible clusters using variable 78 (trona_clust) in order to use this variable balanced clusters have a case and at least one control. This variable must be used in conjunction with variables 82 and 82 for exclusion purposes or those variables will be incorrect. Trends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 81 (potash_clust) in order to use this variable potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable asigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 81(potash_clust) in order to use this variable
Variable 81	trend of the quartiles, for eligible trona clusters only Eligible cluster indicator - subjects from potash mines Average REC exposure (μ/m3), truncated 15 years prior to case death as a trend of the quartiles, for eligible potash clusters only Cumulative REC exposure (μ/m3-years) truncated 15 years prior to case death as a	0 = Not a valid cluster - Subjects without study mine work in potash mines or in unbalanced clusters after exclusion 1 = Valid cluster - Subjects with study mine work in potash mines in balanced clusters Continuous Value Continuous Value 0 = Not a valid cluster - Subjects without any underground study mine work	Must exclude ineligible clusters using variable 78 (trona_clust) in order to use this variable Balanced clusters nave a case and at least one control. This variable must be used in conjunction with variables 82 and 82 for exclusion purposes or those variables will be incorrect. Trends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 81 (potash_clust) in order to use this variable Trends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 81(potash_clust) in order to use this variable 81(potash_clust) in order to use this variable 81(potash_clust) in order to use this variable 81alanced clusters have a case and at least one
Variable 81 Variable 82	trend of the quartiles, for eligible trona clusters only Eligible cluster indicator - subjects from potash mines Average REC exposure (μ/m3), truncated 15 years prior to case death as a trend of the quartiles, for eligible potash clusters only Cumulative REC exposure (μ/m3-years) truncated 15 years prior to case death as a	0 = Not a valid cluster - Subjects without study mine work in potash mines or in unbalanced clusters after exclusion 1 = Valid cluster - Subjects with study mine work in potash mines in balanced clusters Continuous Value Continuous Value 0 = Not a valid cluster - Subjects without any underground study mine work or in unbalanced clusters after exclusion	Must exclude ineligible clusters using variable 78 (trona_clust) in order to use this variable balanced clusters nave a case and at least one control. This variable must be used in conjunction with variables 82 and 82 for exclusion purposes or those variables will be incorrect. Trends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 81 (potash_clust) in order to use this variable Trends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 81 (potash_clust) in order to use this variable potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 81(potash_clust) in order to use this variable
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Variable 81 Variable 82 Variable 83	trend of the quartiles, for eligible trona clusters only         Eligible cluster indicator - subjects from potash mines         Average REC exposure (μ/m3), truncated 15 years prior to case death as a trend of the quartiles, for eligible potash clusters only         Cumulative REC exposure (μ/m3-years) truncated 15 years prior to case death as a trend of the quartiles, for eligible potash clusters only         Eligible cluster indicator - subjects with any underground study mine work         Cumulative REC exposure (μ/m3-years) as a trend of the quartiles, for eligible any	0 = Not a valid cluster - Subjects without study mine work in potash mines or 1 = Valid cluster - Subjects with study mine work in potash mines in balanced clusters  Continuous Value  0 = Not a valid cluster - Subjects without any underground study mine work or in unbalanced cluster - Subjects with any underground study mine work in balanced clusters  1 = Valid cluster - Subjects with any underground study mine work in balanced clusters	Must exclude ineligible clusters using variable Balanced clusters have a case and at least one control. This variable must be used in conjunction with variables 82 and 82 for exclusion purposes or those variables will be incorrect. Trends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 81 (potash_clust) in order to use this variable 17 rends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 81 (potash_clust) in order to use this variable 81 potash_clust) in order to use this variable 81 Balanced clusters have a case and at least one control. This variable must be used in conjunction with variables 84-94 for exclusion purposes or those variables will be incorrect. Trends created using the median of eligible any underground cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 84-94 for exclusion purposes or those variables will be incorrect. Trends created using the median of eligible any underground cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 84(any_ug_clust) in order to use this variable 84(any_ug_clus
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Variable 81 Variable 82 Variable 83	trend of the quartiles, for eligible trona clusters only         Eligible cluster indicator - subjects from potash mines         Average REC exposure (μ/m3), truncated 15 years prior to case death as a trend of the quartiles, for eligible potash clusters only         Cumulative REC exposure (μ/m3-years) truncated 15 years prior to case death as a trend of the quartiles, for eligible potash clusters only         Eligible cluster indicator - subjects with any underground study mine work         Cumulative REC exposure (μ/m3-years) as a trend of the quartiles, for eligible any	0 = Not a valid cluster - Subjects without study mine work in potash mines or 1 = Valid cluster - Subjects with study mine work in potash mines in balanced clusters  Continuous Value  0 = Not a valid cluster - Subjects without any underground study mine work or in unbalanced cluster - Subjects with any underground study mine work in balanced clusters  1 = Valid cluster - Subjects with any underground study mine work in balanced clusters	Must exclude ineligible clusters using variable salanced clusters have a case and at least one control. This variable must be used in conjunction with variables 82 and 82 for exclusion purposes or those variables will be incorrect. Trends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 81 (potash_clust) in order to use this variable Trends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 81 (potash_clust) in order to use this variable 11 ends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 81(potash_clust) in order to use this variable 12 morder to use this variable 13 goven quartile. Must exclude ineligible clusters using variable any underground cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 84(any_ug_clust) in order to use this variable 84(any_ug_clust) in order to use this variable 84(any_uderground cluster controls within any underground cluster controls within any underground cluster controls within any underground cluster suing variable 84(any_ug_clust) in order to use this variable 84(any_uderground cluster controls within any underground cluster controls within any underground cluster controls within any underground cluster controls within
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Variable 81 Variable 82 Variable 83	trend of the quartiles, for eligible trona clusters only         Eligible cluster indicator - subjects from potash mines         Average REC exposure (μ/m3), truncated 15 years prior to case death as a trend of the quartiles, for eligible potash clusters only         Cumulative REC exposure (μ/m3-years) truncated 15 years prior to case death as a trend of the quartiles, for eligible potash clusters only         Eligible cluster indicator - subjects with any underground study mine work         Cumulative REC exposure (μ/m3-years) as a trend of the quartiles, for eligible any	0 = Not a valid cluster - Subjects without study mine work in potash mines or 1 = Valid cluster - Subjects with study mine work in potash mines in balanced clusters  Continuous Value  0 = Not a valid cluster - Subjects without any underground study mine work or in unbalanced cluster - Subjects with any underground study mine work in balanced clusters  1 = Valid cluster - Subjects with any underground study mine work in balanced clusters	Must exclude ineligible clusters using variable Saltoncal clusters have a case and at least one control. This variable must be used in conjunction with variables 82 and 82 for exclusion purposes or those variables will be incorrect. Trends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 81 (potash_clust) in order to use this variable Trends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 81 (potash_clust) in order to use this variable 01 potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 81(potash_clust) in order to use this variable 01 potash_clust) in order to use this variable 81(potash_clust) in order to use this variable 81(potash_clust) in order to use this variable 01 potash_clust on order to use this variable 02 potash_clust on order to use this variable 03 potention with variables 84-94 for exclusion purposes or those variables will be incorrect. Trends created using the median of eligible any underground cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 84(any_ug_clust) in order to use this variable any underground cluster controls within any underground cluster controls within 03 potentions in a given quartile. 04 potentions in a given quartile. 04 potentions in a given quartile. 04 potentions in a given quartile. 05 potentions in a given
Variable 81 Variable 82 Variable 83	trend of the quartiles, for eligible trona clusters only         Eligible cluster indicator - subjects from potash mines         Average REC exposure (μ/m3), truncated 15 years prior to case death as a trend of the quartiles, for eligible potash clusters only         Cumulative REC exposure (μ/m3-years) truncated 15 years prior to case death as a trend of the quartiles, for eligible potash clusters only         Eligible cluster indicator - subjects with any underground study mine work         Cumulative REC exposure (μ/m3-years) as a trend of the quartiles, for eligible any	0 = Not a valid cluster - Subjects without study mine work in potash mines or 1 = Valid cluster - Subjects with study mine work in potash mines in balanced clusters  Continuous Value  0 = Not a valid cluster - Subjects without any underground study mine work or in unbalanced cluster - Subjects with any underground study mine work in balanced clusters  1 = Valid cluster - Subjects with any underground study mine work in balanced clusters	Must exclude ineligible clusters using variable Balanced clusters have a case and at least one control. This variable must be used in conjunction with variables 82 and 82 for exclusion purposes or those variables will be incorrect. Trends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 81 (potash_clust) in order to use this variable 17 rends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 81 (potash_clust) in order to use this variable 18 rends created using the median of eligible potash cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 81 (potash_clust) in order to use this variable 81 (potash_clust) in order controls within quartiles and assigning resulting value to all cases/controls in a given quartile. Must exclude ineligible clusters using variable 84 (any_ugclust) in order to use this variable 84 (any_ugclust) in order to use this variable 84 (any_uderground cluster controls within quartiles and assigning resulting value to all any underground cluster controls within quartiles and assigning resulting value to all 31 rends created using the median of eligible 31 any underground cluster controls within 31 quartiles and assigning resulting value to all 32 rends created using the median of eligible 32 rends created using the median of eligible 33 vanderground cluster controls within 34 vanderground cluster controls within 34

			Trends created using the median of eligible any underground cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile.
Variable 87	Average REC exposure ( $\mu/m3$ )as a trend of the quartiles, for eligible any underground clusters	Continuous Value	Must exclude ineligible clusters using variable 84(any_ug_clust) in order to use this variable
			Trends created using the median of eligible any underground cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile.
Variable 88	Average REC exposure ( $\mu/m3$ ), truncated 15 years prior to case death as a trend of the quartiles, for eligible any underground clusters	Continuous Value	Must exclude ineligible clusters using variable 84(any_ug_clust) in order to use this variable
		1 = Quartile one (0 <= - < 298.23) 2 = Quartile two (298.23 <= - < 674.81)	Quartile ranges are shown for each quartile $(\mu/m3-years)$ . Quartile cut points created using eligible any underground cluster cases only.
Variable 89	Cumulative REC exposure ( $\mu/m3$ -years) in quartiles, for eligible any underground clusters	a = Quartic three (67.81 <- < 1464.56) 4 = Quartile four (>= 1464.56)	Must exclude ineligible clusters using variable 84(any_ug_clust) in order to use this variable
		1 = Quartile one (0 <= - < 81.35) 2 = Quartile two (81.35 <= - <325.34)	Quartile ranges are shown for each quartile (µ/m3-years). Quartile cut points created using eligible any underground cluster cases only.
Variable 90	Cumulative REC exposure ( $\mu$ /m3-years) truncated 15 years prior to case death in quartiles, for eligible any underground clusters	2 = Quartile two (31.35 <= < \$25.34) 3 = Quartile three (325.34<= - < 878.37) 4 = Quartile four (>= 878.37)	Must exclude ineligible clusters using variable 84(any_ug_clust) in order to use this variable
		1 = Quartile one (0 <= - <39.13) 2 = Quartile two (39.13 <= - < 70.95) 3 = Quartile three (70.95 <= - < 146.70)	Quartile ranges are shown for each quartile (µ/m3). Quartile cut points created using eligible any underground cluster cases only. Must exclude ineligible clusters using variable
Variable 91	Average REC exposure (µ/m3) in quartiles, for eligible any underground clusters	4 = Quartile four (>= 146.70)	84(any_ug_clust) in order to use this variable
	Average REC exposure (μ/m3), truncated 15 years prior to case death in quartiles, for	1 = Quartile one (0 <= - < 7.87) 2 = Quartile two (7.87<= - < 48.76) 3 = Quartile three (48.76 <= - < 103.50)	Quartile ranges are shown for each quartile (µ/m3). Quartile cut points created using eligible any underground cluster cases only. Must exclude ineligible clusters using variable
Variable 92	eligible any underground clusters	4 = Quartile four (>= 103.50) U = U Years 1 = Less then 5 Years	84(any_ug_clust) in order to use this variable
Variable 93	Duration exposed, grouped , for eligible any underground clusters	2 = 5 to less than 10 years 3 = 10 to less than 15 years 4 = 15 or more years	Must exclude ineligible clusters using variable 84(any_ug_clust) in order to use this variable
			Trends created using the median of eligible any underground cluster controls within duration groups and assigning resulting value to all cases/controls in a given duration group.
Variable 94	Duration exposed as a trend of the grouped variable , for eligible any underground clusters	Continuous Value	Must exclude ineligible clusters using variable 84(any_ug_clust) in order to use this variable
Variable 95	Eligible cluster indicator - subjects with surface only study mine work	0 = Not a valid cluster - Subjects without surface only study mine work or in unbalanced clusters after exclusion 1 = Valid cluster - Subjects with surface only study mine work in balanced clusters	Balanceo clusters have a case and at least one control. This variable must be used in conjunction with variables 96-105 for exclusion purposes or those variables will be incorrect.
			Trends created using the median of eligible surface only cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile.
Variable 96	Cumulative REC exposure ( $\mu/m3$ -years) as a trend of the quartiles, for eligible surface only clusters	Continuous Value	Must exclude ineligibleclusters using variable 95(surf_only_clust) in order to use this variable
			Trends created using the median of eligible surface only cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile.
Variable 97	Cumulative REC exposure ( $\mu/m3$ -years) truncated 15 years prior to case death as a trend of the quartiles, for eligible surface only clusters	Continuous Value	Must exclude ineligible clusters using variable 95(surf_only_clust) in order to use this variable
			Trends created using the median of eligible surface only cluster controls within quartiles and assigning resulting value to all cases/controls in a given quartile.
Variable 98	Average REC exposure ( $\mu/m3)$ as a trend of the quartiles, for eligible surface only clusters	Continuous Value	Must exclude ineligible clusters using variable 95(surf_only_clust) in order to use this variable

unitable 90         Average HC exposure (µ/mL) translet 15 years pro to case data h as a tend of the case of the case				
Average RCE exposure (µ/m), uncoded 55 years plot to cate doth as a steed of quarties, for eights surface only doubts         Sport _ xyy, xui and are to using its curvalate 100         Continuous Value         Sport _ xyy, xui and are the using curvalate 100         Continuous Value         Sport _ xyy, xui and are the using curvalate 100         Continuous Value         Continuous Value         Continue 100 - <->>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>				
Image: set in the set	Variable 99		Continuous Value	
sarage to 10       cumulative BIC exposure (u/m1 years) in quarties, for slighte surface only durint in a field sur				Quartile ranges are shown for each quartile $(\mu/m3-years)$ . Quartile cut points created using eligible surface only cluster cases only.
warsabe 101         (w/m-syere)	Variable 100	Cumulative REC exposure ( $\mu/m3$ -years) in quartiles, for eligible surface only clusters	2 = Quartile two (6.51 <= -< 12.53) 3 = Quartile three (12.53 <= - < 22.46)	
Consistence				Quartile ranges are shown for each quartile (µ/m3-years). Quartile cut points created using eligible surface only cluster cases only.
variable 102     Average REC exposure (µ/m3) in quartiles, for eligible surface only duters     4     a Quartile fore (0 <= < 0.86) 2 = Quartile true (0.55 << - < 1.91)	Variable 101		2 = Quartile two (0.70 <= - < 4.37) 3 = Quartile three (4.37 <= - < 14.34)	
Variable 102     Average REC exposure (µ/m3) in quartiles, for eligible surface only clusters     2 = Quartile four (>= 1.91)     Must exclude ineligible clusters using vori variable       Variable 102     Average REC exposure (µ/m3) in quartiles, for eligible surface only clusters     4 = Quartile four (>= 1.91)     Outrile ranges are shown for each quartil (µ/m3), Quartile cut points rested using eligible surface only cluster case only.       Variable 103     eligible surface only clusters     2 = Quartile one (0 <= < 0.57)				
variable 103     eligible surface only clusters     1 - Quartile two (0 <- < 0.57) 2 - Quartile two (0,57 <- < < 0.36) 3 - Quartile two (0,57 <- < < > < < > < < > < > < > < > < > <	Variable 102	Average REC exposure ( $\mu/m3$ ) in quartiles, for eligible surface only clusters	2 = Quartile two (0.86 <= - < 0.95) 3 = Quartile three (0.95 <= - < 1.91)	
Average REC exposure (µ/m3), truncated 15 years prior to case death in quartiles, for eligible surface only clusters     Average REC exposure (µ/m3), truncated 15 years prior to case death in quartiles, for eligible surface only clusters     Must exclude ineligible clusters using vorial set of the grouped, for eligible surface only clusters       Variable 104     Duration exposed, grouped, for eligible surface only clusters     1 - toes then 5 Years.     Must exclude ineligible clusters using vorial set on the grouped of the grouped variable, for eligible surface only clusters     4 - 15 or more years     Must exclude ineligible clusters using vorial set on the grouped variable, for eligible surface only clusters       Variable 105     Duration exposed as a trend of the grouped variable, for eligible surface only cluster     Continuous Value     Must exclude ineligible clusters using vorial set on the grouped variable, for eligible surface only cluster       Variable 106     Eligible cluster indicator - Subjects (cases) with a contributing lung cancer cause of the grouped variable, for eligible surface case     0 - Not an eligible cluster - Cases with a non-contributing lung cancer cause of the set on control     Balanced clusters after exclusion and the set of cluster set on control       Variable 106     Eligible cluster indicator - Subjects (cases) with a contributing lung cancer cause     0 - Not an eligible cluster - Cases with a non-contributing lung cancer cause in balanced     Balanced clusters have a case and at least ic ontrol       Variable 107     Eligible cluster indicator - Subjects (cases) with a contributing lung cancer cause     1 - Male     Balanced clusters have a case and at least ic ontrol   <				
Variable 104     Duration exposed, grouped, for eligible surface only clusters     1 = Less then 5 Years     Must exclude ineligible dusters using variable       Variable 104     Duration exposed, grouped, for eligible surface only clusters     4 = 15 or more years     Trends, created using the median of eligible surface only cluster ontrols within duration group.       Variable 105     Duration exposed as a trend of the grouped variable , for eligible surface only clusters     Continuous Value     Must exclude ineligible dusters using variable       Variable 105     Duration exposed as a trend of the grouped variable , for eligible surface only clusters     Continuous Value     Must exclude ineligible dusters using varia 95(surf_only_clust) in order to use this variable       Variable 105     Duration exposed as a trend of the grouped variable , for eligible surface only clusters     Continuous Value     Must exclude ineligible dusters using varia 95(surf_only_clust) in order to use this variable       Variable 106     Eligible cluster indicator - Subjects (cases) with a contributing lung cancer cause     0 = Not an eligible cluster - Cases with a non-contributing lung cancer causes in balanced     Balanced dusters fare ecusion       Variable 106     Eligible cluster indicator - Subjects (cases) with a contributing lung cancer cause     Subjects in unbalanced dusters fare ecusion     Balanced dusters have a case and at least control       Variable 107     Eligible cluster indicator - Subjects using protective equipment     clusters.     Sex reported from questionnaire       Variable 108     Gender of	Variable 103		2 = Quartile two (0.57 <= - < 0.86) 3 = Quartile three (0.86 <= - < 1.36) 4 = Quartile four (>= 1.36)	
Variable 105       Duration exposed as a trend of the grouped variable , for eligible surface only clusters       Continuous Value       Must exclude ineligible cluster susing variable and signing resulting value to all cases/controls in a given duration group.         Variable 105       Duration exposed as a trend of the grouped variable , for eligible surface only clusters       Continuous Value       Must exclude ineligible cluster is using variable and eligible cluster is using variable         Variable 106       Eligible cluster indicator - Subjects (cases) with a contributing lung cancer cause       0 = Not an eligible cluster - Cases with a non-contributing lung cancer cause or subjects in unbalanced clusters after exclusion 1 = Eligible cluster - Cases with contributing lung cancer cause or subjects in unbalanced clusters after exclusion       Balanced clusters have a case and at least control         Variable 107       Eligible cluster indicator - Subjects using protective equipment       1 = Eligible cluster - Subjects using protective equipment or subjects in unbalanced clusters after exclusion       Balanced clusters have a case and at least control         Variable 108       Gender of subject - reported       1 = Male       Sex reported from questionnaire         Variable 109       Analytic age of subject (Death or Interview)       Continuous Value       For subjects that are dead, this is age at intervie for subjects that are dead, this is age at intervie a collection.         Variable 109       Analytic age of subject (Death or Interview)       Continuous Value       Dirthonown 1         Variable 109 </td <td>Variable 104</td> <td>Duration exposed grouped, for eligible surface only clusters</td> <td>1 = Less then 5 Years 2 = 5 to less than 10 years 3 = 10 to less than 15 years</td> <td></td>	Variable 104	Duration exposed grouped, for eligible surface only clusters	1 = Less then 5 Years 2 = 5 to less than 10 years 3 = 10 to less than 15 years	
Variable 105       Duration exposed as a trend of the grouped variable , for eligible surface only clusters       Continuous Value       95(surf_only_clust) in order to use this variable         Variable 105       Duration exposed as a trend of the grouped variable , for eligible surface only clusters       0 = Not an eligible cluster - Cases with a non-contributing lung caner cause or subjects in unbalanced clusters after exclusion       1 = Eligible cluster - Cases with contributing lung caner causes in balanced       Balanced clusters have a case and at least in control         Variable 106       Eligible cluster indicator - Subjects (cases) with a contributing lung caneer cause       subjects in unbalanced clusters after exclusion       1 = Eligible cluster - Cases with contributing lung caneer cause in balanced       Balanced clusters have a case and at least in control         Variable 107       Eligible cluster indicator - Subjects using protective equipment       1 = Male       Balanced clusters have a case and at least in clusters         Variable 108       Gender of subject - reported       2 = Female       Sex reported from questionnaire         Variable 109       Analytic age of subject (Death or Interview)       Continuous Value       For subjects       For subjects that are dead, this is age at intervie         Variable 109       Analytic age of subject (Death or Interview)       Continuous Value       0 = Unknown       0 = Unknown         1 = White       0 = Unknown       1 = White       0 = Unknown       0 = Unknown <td< td=""><td></td><td></td><td></td><td>Trends created using the median of eligible surface only cluster controls within duration groups and assigning resulting value to all</td></td<>				Trends created using the median of eligible surface only cluster controls within duration groups and assigning resulting value to all
Variable 106       Eligible cluster indicator - Subjects (cases) with a contributing lung cancer cause       subjects in unbalanced clusters after exclusion 1 = Eligible cluster - Cases with contributing lung cancer cause       Balanced clusters have a case and at least - control         Variable 106       Eligible cluster indicator - Subjects (cases) with a contributing lung cancer cause       clusters - Subjects using protective equipment or subjects using protective equipment in balanced clusters       Balanced clusters have a case and at least - control         Variable 107       Eligible cluster indicator - Subjects using protective equipment       clusters       Balanced clusters have a case and at least - control         Variable 108       Gender of subject - reported       1 = Amale       Sex reported from questionnaire         Variable 109       Analytic age of subject (Death or Interview)       Continuous Value       For subjects that are dead, this is age at intervie deat. The age is based on the analytic         Variable 109       Analytic age of subject (Death or Interview)       Continuous Value       birthdate derived during data collection.         0 = Unknown       1 = White       0 = Unknown       1 = White       birthdate derived during data collection.	Variable 105	Duration exposed as a trend of the grouped variable , for eligible surface only clusters	Continuous Value	
Variable 107       Eligible cluster indicator - Subjects using protective equipment       1 = Eligible cluster - Subjects using protective equipment in balanced       Balanced clusters have a case and at least in control         Variable 108       Gender of subject - reported       1 = Male       Sex reported from questionnaire         Variable 108       Gender of subject - reported       2 = Female       Sex reported from questionnaire         Variable 109       Analytic age of subject (Death or Interview)       Continuous Value       For subjects that are dead, this is age at intervie For subjects that are dead, this is age at intervie for subjects that are dead, this is age at intervie for subjects that are dead, this is age at intervie for subjects that are dead, this is age at intervie for subjects that are dead, this is age at intervie for subjects that are dead, this is age at intervie for subjects that are dead, this is age at intervie for subjects that are dead, this is age at intervie for subjects that are dead, this is age at intervie for subjects that are dead, this is age at intervie for subjects that are dead, this is age at intervie death. The age is based on the analytic is able to all the derived during data collection.         Variable 109       Analytic age of subject (Death or Interview)       0 = Unknown 1 = White	Variable 106	Eligible cluster indicator - Subjects (cases) with a contributing lung cancer cause	subjects in unbalanced clusters after exclusion 1 = Eligible cluster - Cases with contributing lung caner causes in balanced	Balanced clusters have a case and at least one
Variable 108     Gender of subject - reported     2 = Female     Sex reported from questionnaire       Variable 109     Analytic age of subject (Death or Interview)     For subject (Death or Interview)     For subject still allve this is age at intervier for subject still all the	Variable 107		1 = Eligible cluster - Subjects using protective equipment in balanced clusters	Balanced clusters have a case and at least one control
Variable 109     Analytic age of subject (Death or Interview)     Continuous Value     For subjects that are dead, this is age at death. The age is based on the analytic birthdate derived during data collection.       Variable 109     Analytic age of subject (Death or Interview)     0 = Unknown 1 = White	Variable 108	Gender of subject - reported		Sex reported from questionnaire
1 = White	Variable 109		Continuous Value	For subjects still alive this is age at interview. For subjects that are dead, this is age at death. The age is based on the analytic
3 = Hispanic 4 = American Indian			1 = White 2 = Black 3 = Hispanic 4 = American Indian	
Selected Race         S = Asian         The race used at data collection and subsequently in matching.           Variable 111         Case/Control Randomized ID number         6 = Other         subsequently in matching to case/control data			6 = Other	subsequently in matching.

#### Table 2.2. Odds ratios (ORs) and 95% confidence intervals (Cls) for smoking status/smoking intensity by location of employment\*

Smoking	OR (9	95% Cl), No. of case subjects/No. of control s			
status/smoking intensity (packs per day	) Surface only†, average REC intensity (0-8 μg/m³ REC)	Ever underground†, average REC intensity (1-423 μg/m³ REC)	All subjects‡	AIC Surf/Ever underground	AIC All subjects
ORIGINAL STUDY					
Never smoker	1.0 (referent), 5/87	0.90 (0.26 to 3.09), 9/91	1.0 (referent), 14/178		
Former, < 1	1.36 (0.24 to 7.59), 2/31	2.51 (0.78 to 8.11), 17/62	2.87 (1.30 to 6.33), 19/93		
Former, 1 to < 2	6.66 (2.07 to 21.50), 14/40	1.97 (0.61 to 6.37), 16/68	3.56 (1.72 to 7.40), 30/108		
Former, ≥ 2	16.30 (3.55 to 74.82), 6/7	2.70 (0.72 to 10.12), 9/29	5.40 (2.23 to 13.06), 15/36		
Current, < 1	5.22 (1.16 to 23.39), 4/15	5.71 (1.63 to 20.01), 12/21	5.91 (2.47 to 14.10), 16/36		
Current, 1 to < 2	13.34 (4.50 to 39.53), 26/41	4.51 (1.50 to 13.58), 32/78	7.36 (3.71 to 14.57), 58/119		
Current, ≥ 2	26.60 (7.14 to 99.08), 12/9	7.13 (2.12 to 23.99), 17/27	12.41 (5.57 to 27.66), 29/36		
Unknown§	2.86 (0.71 to 11.64), 5/24	2.65 (0.76 to 9.24), 12/36	3.10 (1.33 to 7.26), 17/60		
Replication					
Never smoker	1.0 (referent), 5/87	0.904 (0.264 to 3.091), 9/91	1.0 (referent), 14/178	505.065	503.688
Former, < 1	1.356 (0.242 to 7.587), 2/31	2.514 (0.779 to 8.114), 17/62	2.871 (1.302 to 6.332), 19/93	B and C are same model, from	
Former, 1 to < 2	6.663 (2.065 to 21.499), 14/40	1.968 (0.608 to 6.373), 16/68	3.562 (1.715 to 7.400), 30/108	same logistic regression model	
Former, ≥ 2	16.297 (3.550 to 74.820), 6/7	2.697 (0.719 to 10.117), 9/29	5.400 (2.232 to 13.061), 15/36		
Current, < 1	5.218 (1.164 to 23.386), 4/15	5.710 (1.630 to 20.005), 12/21	5.905 (2.473 to 14.104), 16/36		
Current, 1 to < 2	13.342 (4.504 to 39.526), 26/41	4.510 (1.497 to 13.585), 32/78	7.356 (3.714 to 14.567), 58/119		
Current, ≥ 2	26.598 (7.140 to 99.083), 12/9	7.130 (2.119 to 23.986), 17/27	12.409 (5.568 to 27.660), 29/36		
Unknown§	2.864 (0.705 to 11.640), 5/24	2.645 (0.757 to 9.238), 12/36	3.102 (1.325 to 7.264), 17/60		
LAG 0					
Never smoker	1.0 (referent), 5/87	1.123 (0.314 to 4.010), 9/91	1.0 (referent), 14/178	513.978	511.994
Former, < 1	1.218 (0.222 to 6.670), 2/31	3.147 (0.946 to 10.474), 17/62	2.748 (1.265 to 5.970), 19/93	010.010	011.004
Former, 1 to < 2	6.278 (1.973 to 19.976), 14/40	2.646 (0.809 to 8.658), 16/68	3.601 (1.753 to 7.399), 30/108		
Former, $\geq 2$	15.126 (3.399 to 67.320), 6/7	3.520 (0.927 to 13.357), 9/29	5.459 (2.290 to 13.013), 15/36		
Current, < 1	5.474 (1.222 to 24.533), 4/15	6.398 (1.764 to 23.209), 12/21	5.655 (2.381 to 13.431), 16/36		
Current, 1 to < 2	12.693 (4.343 to 37.098), 26/41	5.340 (1.716 to 16.612), 32/78	6.974 (3.559 to 13.664), 58/119		
Current, $\geq 2$	24.881 (6.731 to 91.969), 12/9	8.643 (2.498 to 29.912), 17/27	11.733 (5.308 to 25.938), 29/36		
Unknown§	2.874 (0.719 to 11.279), 5/24	3.125 (0.863 to 11.318), 12/36	3.015 (1.309 to 6.943), 17/60		
LAG 3	1.0 ( (			F4 4 700	F40 700
Never smoker	1.0 (referent), 5/87	1.252 (0.354 to 4.424), 9/91	1.0 (referent), 14/178	514.796	512.799
Former, < 1	1.235 (0.225 to 6.770), 2/31	3.514 (1.068 to 11.563), 17/62	2.761 (1.269 to 6.004), 19/93		
Former, 1 to $< 2$	6.280 (1.978 to 19.938), 14/40	2.846 (0.870 to 9.312), 16/68	3.533 (1.723 to 7.244), 30/108		
Former, $\geq 2$	14.646 (3.302 to 64.954), 6/7	3.960 (1.055 to 14.864), 9/29	5.453 (2.284 to 13.015), 15/36		
Current, < 1	5.238 (1.163 to 23.593), 4/15	7.192 (2.042 to 25.334), 12/21	5.620 (2.363 to 13.371), 16/36		
Current, 1 to $< 2$	12.398 (4.252 to 36.150), 26/41	5.897 (1.917 to 18.144), 32/78	6.877 (3.512 to 13.465), 58/119		
Current, $\geq 2$	24.120 (6.513 to 89.326), 12/9	9.248 (2.659 to 32.168), 17/27	11.323 (5.126 to 25.011), 29/36		
Unknown§	2.778 (0.699 to 11.048), 5/24	3.389 (0.940 to 12.216), 12/36	2.937 (1.275 to 6.768), 17/60		

LAG 5					
Never smoker	1.0 (referent), 5/87	1.369 (0.385 to 4.872), 9/91	1.0 (referent), 14/178	512.403	509.87
Former, < 1	1.260 (0.230 to 6.911), 2/31	3.718 (1.118 to 12.371), 17/62	2.705 (1.244 to 5.884), 19/93		
Former, 1 to < 2	6.425 (2.012 to 20.517), 14/40	3.033 (0.918 to 10.020), 16/68	3.482 (1.695 to 7.153), 30/108		
Former, ≥ 2	14.209 (3.205 to 62.991), 6/7	4.168 (1.092 to 15.910), 9/29	5.242 (2.195 to 12.516), 15/36		
Current, < 1	5.440 (1.204 to 24.571), 4/15	7.918 (2.234 to 28.069), 12/21	5.731 (2.419 to 13.575), 16/36		
Current, 1 to < 2	12.102 (4.128 to 35.482), 26/41	6.229 (2.018 to 19.223), 32/78	6.683 (3.403 to 13.125), 58/119		
Current, ≥ 2	21.856 (5.854 to 81.598), 12/9	10.138 (2.922 to 35.174), 17/27	10.917 (4.933 to 24.159), 29/36		
Unknown§	2.778 (0.695 to 11.099), 5/24	3.601 (0.987 to 13.143), 12/36	2.864 (1.243 to 6.602), 17/60		
LAG 7					
Never smoker	1.0 (referent), 5/87	1.246 (0.346 to 4.495), 9/91	1.0 (referent), 14/178	508.723	506.205
Former, < 1	1.261 (0.230 to 6.922), 2/31	3.456 (1.036 to 11.526), 17/62	2.722 (1.246 to 5.949), 19/93		
Former, 1 to < 2	6.391 (1.995 to 20.472), 14/40	2.796 (0.841 to 9.297), 16/68	3.501 (1.700 to 7.209), 30/108		
Former, ≥ 2	14.007 (3.153 to 62.217), 17/27	3.916 (1.020 to 15.036), 9/29	5.326 (2.224 to 12.753), 15/36		
Current, < 1	5.075 (1.119 to 23.019), 4/15	7.972 (2.238 to 28.405), 12/21	5.921 (2.496 to 14.046), 16/36		
Current, 1 to < 2	12.096 (4.112 to 35.580), 26/41	5.883 (1.888 to 18.331), 32/78	6.828 (3.469 to 13.438), 58/119		
Current, ≥ 2	21.793 (5.834 to 81.405), 12/9	9.635 (2.747 to 33.801), 17/27	11.210 (5.076 to 24.757), 29/36		
Unknown§	2.750 (0.686 to 11.031), 5/24	3.290 (0.889 to 12.172), 12/36	2.854 (1.235 to 6.596), 17/60		
LAG 9					
Never smoker	1.0 (referent), 5/87	1.068 (0.299 to 3.823), 9/91	1.0 (referent), 14/178	509.492	507.116
Former, < 1	1.288 (0.234 to 7.095), 2/31	3.143 (0.953 to 10.362), 17/62	2.849 (1.299 to 6.249), 19/93		
Former, 1 to < 2	6.605 (2.059 to 21.189), 14/40	2.536 (0.776 to 8.290), 16/68	3.671 (1.777 to 7.583), 30/108		
Former, ≥ 2	14.950 (3.347 to 66.775), 6/7	3.495 (0.920 to 13.275), 9/29	5.561 (2.324 to 13.310), 15/36		
Current, < 1	5.184 (1.148 to 23.405), 4/15	7.155 (1.992 to 25.693), 12/21	6.088 (2.552 to 14.520), 16/36		
Current, 1 to < 2	12.367 (4.202 to 36.403), 26/41	5.512 (1.797 to 16.908), 32/78	7.246 (3.663 to 14.332), 58/119		
Current, ≥ 2	22.989 (6.157 to 85.831), 12/9	8.383 (2.429 to 28.929), 17/27	11.569 (5.222 to 25.631), 29/36		
Unknown§	2.787 (0.967 to 11.151), 5/24	2.996 (0.829 to 10.820), 12/36	2.959 (1.278 to 6.848), 17/60		
LAG 11					
Never smoker	1.0 (referent), 5/87	0.975 (0.280 to 3.392), 9/91	1.0 (referent), 14/178	507.01	504.882
Former, < 1	1.239 (0.223 to 6.878), 2/31	2.925 (0.900 to 9.502), 17/62	2.866 (1.302 to 6.309), 19/93		
Former, 1 to < 2	6.547 (2.042 to 20.988), 14/40	2.241 (0.690 to 7.278), 16/68	3.592 (1.731 to 7.455), 30/108		
Former, ≥ 2	15.421 (3.432 to 69.302), 6/7	3.381 (0.897 to 12.743), 9/29	5.867 (2.423 to 14.210), 15/36		
Current, < 1	4.991 (1.106 to 22.517), 4/15	6.607 (1.886 to 23.144), 12/21	6.016 (2.513 to 14.399), 16/36		
Current, 1 to < 2	12.644 (4.276 to 37.388), 26/41	5.118 (1.689 to 15.505), 32/78	7.313 (3.691 to 14.487), 58/119		
Current, ≥ 2	23.015 (6.129 to 86.420), 12/9	7.787 (2.288 to 26.511), 17/27	11.717 (5.271 to 26.044), 29/36		
Unknown§	2.859 (0.711 to 11.492), 5/24	2.750 (0.777 to 9.735), 12/36	2.976 (1.279 to 6.923), 17/60		
LAG 13					
Never smoker	1.0 (referent), 5/87	0.846 (0.243 to 2.947), 9/91	1.0 (referent), 14/178	506.041	503.833
Former, < 1	1.353 (0.244 to 7.491), 2/31	2.521 (0.781 to 8.136), 17/62	2.943 (1.336 to 6.484), 19/93	2.017	0.628
Former, 1 to < 2	6.472 (2.014 to 20.801), 14/40	2.017 (0.628 to 6.485), 16/68	3.686 (1.769 to 7.681), 30/108		
Former, ≥ 2	16.238 (3.617 to 72.905), 6/7	2.711 (0.721 to 10.191), 9/29	5.667 (2.347 to 13.686), 15/36		
Current, < 1	5.202 (1.158 to 23.358), 4/15	5.593 (1.589 to 19.686), 12/21	6.074 (2.536 to 14.548), 16/36		

Current, 1 to < 2 Current, ≥ 2 Unknown§	13.297 (4.488 to 39.401), 26/41 26.049 (6.932 to 97.887), 12/9 2.974 (0.735 to 12.041), 5/24	4.529 (1.504 to 13.636), 32/78 7.108 (2.113 to 23.908), 17/27 2.466 (0.699 to 8.703), 12/36	7.621 (3.829 to 15.170), 58/119 12.742 (5.688 to 28.543), 29/36 3.113 (1.328 to 7.299), 17/60		
LAG 15					
Never smoker	1.0 (referent), 5/87	0.904 (0.264 to 3.091), 9/91	1.0 (referent), 14/178	505.065	503.688
Former, < 1	1.356 (0.242 to 7.587), 2/31	2.514 (0.779 to 8.114), 17/62	2.871 (1.302 to 6.332), 19/93		
Former, 1 to < 2	6.663 (2.065 to 21.499), 14/40	1.968 (0.608 to 6.373), 16/68	3.562 (1.715 to 7.400), 30/108		
Former, ≥ 2	16.297 (3.550 to 74.820), 6/7	2.697 (0.719 to 10.117), 9/29	5.400 (2.232 to 13.061), 15/36		
Current, < 1	5.218 (1.164 to 23.386), 4/15	5.710 (1.630 to 20.005), 12/21	5.905 (2.473 to 14.104), 16/36		
Current, 1 to < 2	13.342 (4.504 to 39.526), 26/41	4.510 (1.497 to 13.585), 32/78	7.356 (3.714 to 14.567), 58/119		
Current, ≥ 2	26.598 (7.140 to 99.083), 12/9	7.130 (2.119 to 23.986), 17/27	12.409 (5.568 to 27.660), 29/36		
Unknown§	2.864 (0.705 to 11.640), 5/24	2.645 (0.757 to 9.238), 12/36	3.102 (1.325 to 7.264), 17/60		
LAG 17					
Never smoker	1.0 (referent), 5/87	0.973 (0.292 to 3.241), 9/91	1.0 (referent), 14/178	504.531	503.53
Former, < 1	1.512 (0.270 to 8.479), 2/31	2.671 (0.845 to 8.445), 17/62	2.906 (1.315 to 6.418), 19/93	001.001	000.00
Former, 1 to < 2	7.625 (2.322 to 25.034), 14/40	12.113 (0.673 to 6.636), 16/68	3.726 (1.801 to 7.706), 30/108		
Former, $\geq 2$	17.357 (3.728 to 80.811), 6/7	3.065 (0.846 to 11.110), 9/29	5.738 (2.372 to 13.878), 15/36		
Current, < 1	6.408 (1.417 to 28.976), 4/15	6.399 (1.860 to 22.017), 12/21	6.380 (2.653 to 15.338), 16/36		
Current, 1 to < 2	15.557 (5.136 to 47.125), 26/41	5.016 (1.694 to 14.854), 32/78	7.823 (3.933 to 15.564), 58/119		
Current, $\geq 2$	30.700 (8.077 to 116.696), 12/9	8.054 (2.458 to 26.391), 17/27	13.212 (5.914 to 29.513), 29/36		
Unknown§	3.175 (0.778 to 12.950), 5/24	3.106 (0.909 to 10.617), 12/36	3.367 (1.437 to 7.888), 17/60		
LAG 19				500.000	505 750
Never smoker	1.0 (referent), 5/87	1.057 (0.321 to 3.485), 9/91	1.0 (referent), 14/178	506.906	505.752
Former, < 1	1.502 (0.268 to 8.419), 2/31	2.910 (0.930 to 9.105), 17/62	2.941 (1.334 to 6.483), 19/93		
Former, 1 to $< 2$	7.765 (2.365 to 25.497), 14/40	2.282 (0.730 to 7.133), 16/68	3.745 (1.810 to 7.749), 30/108		
Former, ≥ 2	16.946 (3.675 to 78.136), 6/7	3.322 (0.930 to 11.865), 9/29	5.714 (2.380 to 13.715), 15/36		
Current, < 1	6.493 (1.440 to 29.289), 4/15	6.236 (1.820 to 21.362), 12/21	6.134 (2.563 to 14.680), 16/36		
Current, 1 to $< 2$	15.507 (5.120 to 46.965), 26/41	5.352 (1.815 to 15.781), 32/78	7.777 (3.909 to 15.473), 58/119		
Current, ≥ 2	30.934 (8.164 to 117.212), 12/9	8.327 (2.543 to 27.265), 17/27	13.011 (5.821 to 29.083), 29/36		
Unknown§	3.274 (0.803 to 13.352), 5/24	3.278 (0.967 to 11.114), 12/36	3.396 (1.451 to 7.949), 17/60		
LAG 20					
Never smoker	1.0 (referent), 5/87	1.312 (0.399 to 4.319), 9/91	1.0 (referent), 14/178	514.565	512.393
Former, < 1	1.234 (0.223 to 6.829), 2/31	3.549 (1.128 to 11.167), 17/62	2.696 (1.235 to 5.885), 19/93		
Former, 1 to < 2	6.481 (2.025 to 20.746), 14/40	2.849 (0.908 to 8.936), 16/68	3.484 (1.702 to 7.133), 30/108		
Former, ≥ 2	14.002 (3.135 to 62.533), 6/7	4.113 (1.153 to 14.675), 9/29	5.363 (2.261 to 12.725), 15/36		
Current, < 1	5.604 (1.266 to 24.815), 4/15	7.350 (2.173 to 24.852), 12/21	5.649 (2.394 to 13.334), 16/36		
Current, 1 to < 2	13.232 (4.472 to 39.152), 26/41	6.244 (2.132 to 18.287), 32/78	7.101 (3.614 to 13.952), 58/119		
Current, ≥ 2	25.474 (6.824 to 95.089), 12/9	10.411 (3.173 to 34.158), 17/27	12.141 (5.475 to 26.924), 29/36		
Unknown§	3.064 (0.766 to 12.262), 5/24	3.831 (1.132 to 12.960), 12/36	3.160 (1.361 to 7.335), 17/60		

LAG 21					
Never smoker	1.0 (referent), 5/87	1.417 (0.436 to 4.613), 9/91	1.0 (referent), 14/178	513.108	510.588
Former, < 1	1.245 (0.224 to 6.916), 2/31	3.963 (1.284 to 12.232), 17/62	2.754 (1.259 to 6.026), 19/93		
Former, 1 to < 2	6.425 (2.005 to 20.589), 14/40	3.239 (1.063 to 9.869), 16/68	3.571 (1.744 to 7.313), 30/108		
Former, ≥ 2	13.577 (3.029 to 60.849), 6/7	4.638 (1.323 to 16.264), 9/29	5.434 (2.291 to 12.886), 15/36		
Current, < 1	5.807 (1.314 to 25.654), 4/15	7.954 (2.368 to 26.719), 12/21	5.720 (2.420 to 13.518), 16/36		
Current, 1 to < 2	13.350 (4.514 to 39.483), 26/41	7.072 (2.446 to 20.449), 32/78	7.304 (3.697 to 14.432), 58/119		
Current, ≥ 2	26.426 (7.079 to 98.644), 12/9	11.754 (3.609 to 38.282), 17/27	12.538 (5.637 to 27.890), 29/36		
Unknown§	2.994 (0.752 to 11.917), 5/24	4.393 (1.320 to 14.621), 12/36	3.260 (1.406 to 7.562), 17/60		
LAG 23					
Never smoker	1.0 (referent), 5/87	1.448 (0.446 to 4.701), 9/91	1.0 (referent), 14/178	516.865	514.745
Former, < 1	1.211 (0.218 to 6.716), 2/31	3.987 (1.292 to 12.297), 17/62	2.703 (1.238 to 5.903), 19/93		
Former, 1 to < 2	6.302 (1.976 to 20.101), 14/40	3.260 (1.070 to 9.928), 16/68	3.516 (1.721 to 7.186), 30/108		
Former, ≥ 2	14.257 (3.176 to 64.001), 6/7	4.615 (1.316 to 16.184), 9/29	5.410 (2.270 to 12.892), 15/36		
Current, < 1	5.700 (1.287 to 25.252), 4/15	8.112 (2.426 to 27.124), 12/21	5.700 (2.411 to 13.479), 16/36		
Current, 1 to < 2	12.954 (4.407 to 38.078), 26/41	6.923 (2.402 to 19.956), 32/78	7.070 (3.595 to 13.904), 58/119		
Current, ≥ 2	25.478 (6.812 to 95.301), 12/9	11.419 (3.557 to 36.656), 17/27	11.955 (5.385 to 26.540), 29/36		
Unknown§	3.011 (0.758 to 11.964), 5/24	4.333 (1.306 to 14.379), 12/36	3.195 (1.375 to 7.420), 17/60		
LAG 25					
Never smoker	1.0 (referent), 5/87	1.341 (0.412 to 4.363), 9/91	1.0 (referent), 14/178	514.747	512.715
Former, < 1	1.217 (0.218 to 6.780), 2/31	3.744 (1.212 to 11.571), 17/62	2.729 (1.245 to 5.979), 19/93		
Former, 1 to < 2	6.289 (1.981 to 19.964), 14/40	3.045 (0.998 to 9.288), 16/68	3.546 (1.734 to 7.250), 30/108		
Former, ≥ 2	14.024 (3.143 to 62.573), 6/7	4.351 (1.237 to 15.307), 9/29	5.454 (2.293 to 12.972), 15/36		
Current, < 1	5.759 (1.307 to 25.372), 4/15	7.533 (2.243 to 25.298), 12/21	5.707 (2.416 to 13.482), 16/36		
Current, 1 to < 2	12.802 (4.360 to 37.595), 26/41	6.612 (2.291 to 19.079), 32/78	7.176 (3.648 to 14.116), 58/119		
Current, ≥ 2	27.272 (7.286 to 102.085), 12/9	10.632 (3.318 to 34.070), 17/27	12.295 (5.528 to 27.346), 29/36		
Unknown§	2.968 (0.747to 11.797), 5/24	4.220 (1.268 to 14.043), 12/36	3.275 (1.411 to 7.600), 17/60		

\* REC = respirable elemental carbon.

<sup>+</sup> ORs relative to never smokers who worked only surface jobs, adjusted for cumulative REC, lagged 15 years (quartiles: 0 to  $<3 \mu$  g/m 3 -y; 3 to  $<72 \mu$  g/m 3 -y, 72 to  $<536 \mu$  g/m 3 -y,  $\geq 536 \mu$  g/m 3 -y), history of respiratory disease 5 or more years before date of death/reference date, and history of a high-risk job for lung cancer for at least 10 years. *P value for interaction between smoking status and location of employment based on likelihood ratio test* = *.082*.

 $\ddagger$  ORs for intensity smoked relative to never smokers, adjusted for cumulative REC, lagged 15 years (quartiles: 0 to <3  $\mu$  g/m 3 -y; 3 to <72  $\mu$  g/m 3 -y, 72 to <536  $\mu$  g/m 3 -y,  $\ge$  536  $\mu$  g/m 3 -y), location of employment (surface only, ever underground), history of respiratory disease 5 or more years before date of death/reference date, and history of a high-risk job for lung cancer for at least 10 years.

§ Unknown includes subjects with unknown smoking status, and subjects considered occasional smokers, who smoked at least 100 cigarettes during their lifetimes, but never smoked regularly ( ≥ 1 cigarette per day for at least 6 months).

Table 2.3. Odds ratios	s) and 95% confidence intervals (Cls) for average and cumulative REC and total duration RE،	C exposure*
	(s) and 95% connuence intervals (Cis) for average and cumulative REC and total duration RE	c exposi

Exposure metric	Case subject	Control subject	OR (95% Cl)	<b>P</b> trend	AIC
ORIGINAL AVERAGE REC					
Average REC intensity, quartiles, unlagged, µg/m <sup>3</sup>					
0 to < 1	49	166	1.0 (referent)	.025	
1 to <32	50	207	1.03 (0.50 to 2.09)		
32 to < 98	49	145	1.88 (0.76 to 4.66)		
≥ 98	50	148	2.40 (0.89 to 6.47)		
Quartiles, lagged 15 years, µg/m <sup>3</sup>					
0 to < 1	47	190	1.0 (referent)	.062	
1 to < 6	52	187	1.11 (0.59 to 2.07)		
6 to < 57	49	141	1.90 (0.90 to 3.99)		
≥ 57	50	148	2.28 (1.07 to 4.87)		
REPLICATION AVERAGE REC					
Average REC intensity, quartiles, unlagged, µg/m <sup>3</sup>					
0 to < 1	49	166	1.0 (referent)		512.334
1 to <32	50	207	1.027 (0.503 to 2.094)		
32 to < 98	49	145	1.881 (0.759 to 4.663)		
≥ 98	50	148	2.398 (0.889 to 6.465)		
Quartiles, lagged 15 years, µg/m³					
0 to < 1	47	190	1.0 (referent)		513.61
1 to < 6	52	187	1.109 (0.593 to 2.073)		
6 to < 57	49	141	1.899 (0.904 to 3.988)		
≥ 57	50	148	2.280 (1.067 to 4.872)		
LAG 0 AVERAGE REC					
0 to < 1	49	166	1.0 (referent)		512.334
1 to <32	50	207	1.027 (0.503 to 2.094)		
32 to < 98	49	145	1.881 (0.759 to 4.663)		
≥ 98	50	148	2.398 (0.889 to 6.465)		
LAG 3 AVERAGE REC			. ,		
0 to < 1.01	49	137	1.0 (referent)		510.057
1.01 to <28.39	50	227	0.494 (0.245 to 0.996)		
28.39 to < 84.05	49	143	0.990 (0.409 to 2.395)		
≥ 84.05	50	159	1.005 (0.380 to 2.653)		
LAG 5 AVERAGE REC					
0 to < 0.94	46	125	1.0 (referent)		512.184
0.94 to <21.40	53	229	0.513 (0.271 to 0.970)		
21.40 to < 80.22	49	145	0.935 (0.401 to 2.178)		
≥ 80.22	50	167	0.888 (0.359 to 2.199)		
LAG 7 AVERAGE REC			· · · · · · · · · · · · · · · · · · ·		
0 to < 0.94	49	132	1.0 (referent)		513.421
0.94 to <14.95	50	207	0.509 (0.273 to 0.949)		

≥ 79.51	50	159	0.819 (0.344 to 1.954)	
LAG 9 AVERAGE REC	50	155	0.819 (0.344 (0 1.934)	
0 to < 0.94	49	151	1.0 (referent)	514.492
0.94 to <14.95	50	191	0.716 (0.385 to 1.331)	514.452
14.95 to < 79.51	49	167	1.140 (0.511 to 2.544)	
≥ 79.51	50	149	1.491 (0.634 to 3.510)	
LAG 11 AVERAGE REC	50	145	1.451 (0.054 (0.5.510)	
0 to < 0.91	43	152	1.0 (referent)	514.073
0.91 to <9.34	56	205	0.629 (0.342 to 1.157)	014.070
9.34 to < 73.04	49	159	1.071 (0.487 to 2.354)	
≥ 73.04	50	150	1.284 (0.574 to 2.869)	
LAG 13 AVERAGE REC	30	150	1.204 (0.574 to 2.005)	
0 to < 0.91	48	183	1.0 (referent)	508.809
0.91 to <7.88	51	191	0.716 (0.383 to 1.338)	000.000
7.88 to < 69.22	49	156	1.528 (0.707 to 3.304)	
≥ 69.22	50	136	2.346 (1.052 to 5.231)	
LAG 15 AVERAGE REC	30	150	2.540 (1.052 to 5.251)	
0 to < 0.86	46	179	1.0 (referent)	513.707
0.86 to <5.78	53	198	1.029 (0.547 to 1.937)	010.101
5.78 to < 56.99	49	198	1.826 (0.870 to 3.832)	
≥ 56.99	50	148	2.195 (1.028 to 4.686)	
LAG 17 AVERAGE REC	30	140	2.135 (1.020 to 4.000)	
0 to < 0.59	49	180	1.0 (referent)	510.482
0.59 to <3.24	50	200	0.872 (0.443 to 1.719)	0.0.10
3.24 to < 55.28	49	154	1.500 (0.703 to 3.201)	
≥ 55.28	50	132	2.471 (1.131 to 5.397)	
LAG 19 AVERAGE REC		101		
0	53	184	1.0 (referent)	504.438
0 to <2.21	46	199	0.658 (0.326 to 1.330)	
2.21 to < 49.17	49	154	1.699 (0.810 to 3.563)	
≥ 49.17	50	129	2.914 (1.334 to 6.364)	
LAG 20 AVERAGE REC			- ( ,	
0	58	203	1.0 (referent)	510.341
0 to <1.91	41	169	0.803 (0.389 to 1.660)	
1.91 to < 42.38	49	157	1.552 (0.781 to 3.085)	
≥ 42.38	50	137	2.264 (1.109 to 4.622)	
LAG 21 AVERAGE REC			, , , , , , , , , , , , , , , , , , ,	
0	62	232	1.0 (referent)	513.044
0 to <1.74	37	144	1.207 (0.581 to 2.507)	
1.74 to < 33.98	49	142	1.811 (0.929 to 3.532)	
≥ 33.98	50	148	2.252 (1.098 to 4.615)	
LAG 23 AVERAGE REC				
0	77	261	1.0 (referent)	515.879
0 to <0.94	20	93	0.826 (0.379 to 1.803)	
0.94 to < 18.33	51	155	1.131 (0.715 to 2.398)	

≥ 18.33	50	157	1.530 (0.800 to 2.925)	
LAG 25 AVERAGE REC				
0	88	297	1.0 (referent)	517.149
0 to <0.64	11	45	1.244 (0.470 to 3.290)	
0.64 to < 10.93	49	160	1.357 (0.725 to 2.541)	
≥ 10.93	50	164	1.504 (0.800 to 2.827)	
ORIGINAL CUMULATIVE REC				
Cumulative REC, quartiles, unlagged, µg/m <sup>3</sup>				
0 to < 19	49	151	1.0 (referent)	.083
19 to < 246	50	214	0.87(0.48 to 1.59)	
246 to < 964	49	147	1.50 (0.67 to 3.36)	
≥ 964	50	154	1.75 (0.77 to 3.97)	
Quartiles, lagged 15 years, µg/m³-y				
0 to < 3	49	158	1.0 (referent)	0.001
3 to < 72	50	228	0.74 (0.40 to 1.38)	
72 to < 536	49	157	1.54 (0.74 to 3.20)	
≥ 536	50	123	2.83 (1.28 to 6.26)	
REPLICATION CUMULATIVE REC				
Cumulative REC, quartiles, unlagged, µg/m³				
0 to < 19	49	151	1.0 (referent)	. 513.978
19 to < 246	4 <i>9</i> 50	214	0.871 (0.476 to 1.594)	. 515.576
246 to < 964	49	147	1.501 (0.671 to 3.356)	
≥ 964	50	154	1.745 (0.767 to 3.967)	
Quartiles, lagged 15 years, µg/m³-y	50	154	1.743 (0.767 to 5.567)	
0 to < 3	49	158	1.0 (referent)	. 505.065
3 to < 72	50	228	0.740 (0.398 to 1.375)	
72 to < 536	49	157	1.538 (0.740 to 3.195)	
≥ 536	50	123	2.831 (1.279 to 6.263)	
_ 550	50	123	2.031 (1.273 to 0.203)	
LAG 0 CUMULATIVE REC				
0 to < 19	49	151	1.0 (referent)	513.978
19 to < 246	50	214	0.871 (0.476 to 1.594)	
246 to < 964	49	147	1.501 (0.671 to 3.356)	
≥ 964	50	154	1.745 (0.767 to 3.967)	
LAG 3 CUMULATIVE REC				
0 to < 15.45	49	145	1.0 (referent)	514.796
15.45 to < 194.21	50	212	0.793 (0.440 to 1.429)	
194.21 to < 922.97	49	155	1.185 (0.539 to 2.602)	
≥ 922.97	50	154	1.503 (0.669 to 3.376)	
LAG 5 CUMULATIVE REC				
0 to < 11.56	49	130	1.0 (referent)	512.403
11.56 to < 167.50	50	222	0.615 (0.344 to 1.100)	
167.50 to < 880.23	49	166	0.919 (0.419 to 2.018)	

≥ 880.23	50	148	1.250 (0.550 to 2.839)	
LAG 7 CUMULATIVE REC				
0 to < 9.38	49	127	1.0 (referent)	508.723
9.38 to < 158.64	50	229	0.563 (0.313 to 1.010)	
158.64 to < 859.49	49	174	0.875 (0.392 to 1.954)	
≥ 859.49	50	136	1.388 (0.598 to 3.220)	
LAG 9 CUMULATIVE REC				
0 to < 7.69	49	140	1.0 (referent)	509.492
7.69 to < 146.98	50	222	0.732 (0.412 to 1.299)	
146.98 to < 750.96	49	171	1.110 (0.509 to 2.423)	
≥ 750.96	50	133	1.954 (0.854 to 4.470)	
LAG 11 CUMULATIVE REC				
0 to < 6.88	49	138	1.0 (referent)	507.01
6.88 to < 120.34	50	231	0.666 (0.368 to 1.204)	
120.34 to < 662.47	49	166	1.139 (0.524 to 2.474)	
≥ 662.47	50	131	2.103 (0.935 to 4.731)	
LAG 13 CUMULATIVE REC				
0 to < 5.79	49	154	1.0 (referent)	506.041
5.79 to < 91.22	50	227	0.813 (0.446 to 1.484)	
91.22 to < 582.64	49	153	1.699 (0.815 to 3.540)	
≥ 582.64	50	132	2.879 (1.314 to 6.309)	
LAG 15 CUMULATIVE REC				
0 to < 3.37	49	158	1.0 (referent)	505.065
3.37 to < 71.58	50	228	0.740 (0.398 to 1.375)	
71.58 to < 535.65	49	157	1.538 (0.740 to 3.195)	
≥ 535.65	50	123	2.831 (1.279 to 6.263)	
LAG 17 CUMULATIVE REC				
0 to < 1.81	49	173	1.0 (referent)	504.531
1.81 to < 32.74	50	204	0.870 (0.450 to 1.682)	
32.74 to < 479.34	49	163	1.955 (0.932 to 4.100)	
≥ 479.34	50	126	3.400 (1.505 to 7.679)	
LAG 19 CUMULATIVE REC				
0	53	184	1.0 (referent)	506.906
0 to < 23.06	46	189	0.770 (0.392 to 1.512)	
23.06 to < 398.05	49	165	1.839 (0.863 to 3.920)	
≥ 398.05	50	128	2.689 (1.235 to 5.853)	
LAG 20 CUMULATIVE REC				
0	58	203	1.0 (referent)	514.565
0 to < 14.13	41	139	1.161 (0.591 to 2.278)	

33	133	1.175 (0.568 to 2.431)	
66	191	1.980 (0.959 to 4.089)	
62	232	1.0 (referent)	513.108
37	114	0.522 (0.763 to 3.033)	
49	179	1.456 (0.725 to 2.925)	
50	141	2.359 (1.137 to 4.891)	
77	261	1.0 (referent)	516.865
22	68	1.141 (0.552 to 2.357)	
49	181	1.152 (0.625 to 2.122)	
50	156	1.626 (0.818 to 3.232)	
88	297	1.0 (referent)	514.747
11	38	0.866 (0.329 to 2.281)	
49	184	1.343 (0.741 to 2.433)	
50	147	1.942 (0.984 to 3.831)	
48	165	1.0 (referent)	0.043
51	169	1.16 (0.53 to 2.55)	
20	95	0.88 (0.38 to 2.03)	
31	107	0.93 (0.39 to 2.21)	
48	130	2.09(90.89 to 4.90)	
48	165	1.0 (referent)	
		· · ·	
		· · /	
	107		
48	130	2.087 (0.890 to 4.895)	
	66 62 37 49 50 77 22 49 50 88 11 49 50 88 11 49 50 88 11 49 50 88 11 49 50 31 48	66       191         62       232         37       114         49       179         50       141         77       261         22       68         49       181         50       156         88       297         11       38         49       184         50       147         48       165         51       169         20       95         31       107         48       165         51       169         20       95         31       107         48       165         51       169         20       95         31       107         48       165         51       169         20       95         31       107	66 $191$ $1.980 (0.959  to  4.089)$ $62$ $232$ $1.0  (referent)$ $37$ $114$ $0.522 (0.763  to  3.033)$ $49$ $179$ $1.456 (0.725  to  2.925)$ $50$ $141$ $2.359 (1.137  to  4.891)$ $77$ $261$ $1.0  (referent)$ $22$ $68$ $1.141 (0.552  to  2.357)$ $49$ $181$ $1.152 (0.625  to  2.122)$ $50$ $156$ $1.626 (0.818  to  3.232)$ $88$ $297$ $1.0  (referent)$ $11$ $38$ $0.866 (0.329  to  2.281)$ $49$ $184$ $1.343 (0.741  to  2.433)$ $50$ $147$ $1.942 (0.984  to  3.831)$ $48$ $165$ $1.0  (referent)$ $51$ $169$ $1.16 (0.53  to  2.55)$ $20$ $95$ $0.88 (0.38  to  2.03)$ $31$ $107$ $0.93  (to  2.21)$ $48$ $165$ $1.0  (referent)$ $51$ $169$ $1.159 (0.527  to  2.548)$ $20$ $95$ $0.883 (0.383  to  2.034)$ $31$ $107$ $0.927 (0.389  to  2.211)$

\* P values based on two-sided Wald test for linear trend; adjusted for smoking status/mine location combination (surface work only/never smoker, surface work only/former smoker/<1 pack per day, surface work only/former smoker/1 to <2 packs per day, surface work only/former smoker/<2 packs per day, surface work only/current smoker/<1 pack per day, surface work only/current smoker/1 to <2 packs per day, surface work only/current smoker/<1 pack per day, surface work only/current smoker/1 to <2 packs per day, surface work only/current smoker/<1 pack per day, surface work only/current smoker/1 to <2 packs per day, surface work only/current smoker/<1 pack per day, surface work only/current smoker/<1 pack per day, ever underground work/never smoker, ever underground work/unknown/occasional smoker, ever underground work/former smoker/<1 pack per day, ever underground work/former smoker/<1 pack per day, ever underground work/former smoker/1 to <2 pack s per day, ever underground work/current smoker/1 to <2 pack s per day, ever underground work/current smoker/1 to <2 pack s per day, ever underground work/current smoker/1 to <2 pack s per day, ever underground work/current smoker/<1 pack per day, ever underground work/current smoker/1 to <2 pack s per day, ever underground work/current smoker/1 to <2 pack s per day, ever underground work/current smoker/1 to <2 pack s per day, ever underground work/current smoker/1 to <2 pack s per day, ever underground work/current smoker/1 to <2 pack s per day, ever underground work/current smoker/1 to <2 pack s per day, ever underground work/current smoker/1 to <2 pack s per day, ever underground work/current smoker/2 pack s per day, ever underground work/current

<sup>+</sup> The number of case subjects in the referent group for the 15-year lagged average REC analysis is 2 fewer than that in the unlagged analysis because rounded cut points are presented. The unrounded cut points are <0.86 and <1.37 μ g/m 3, respectively.

‡ Unexposed includes all subjects who worked surface jobs with either negligible or bystander exposure to REC, regardless of duration.

Table 2.4. Odds ratios (ORs) and 95% confidence intervals (Cls) for average and cumulative REC and total duration REC exposure for subjects who ever worked underground jobs\*

Exposure metric	Case subject	Control subject	OR (95% Cl)	<b>P</b> trend	AIC
ORIGINAL AVERAGE REC					
Average REC intensity, quartiles, unlagged, µg/m³					
0 to < 39	29	89	1.0 (referent)	.010	
39 to < 71	29	57	1.91 (0.91 to 4.01)		
71 to < 147	29	66	2.38 (1.04 to 5.44)		
≥ 147	29	52	3.69 (1.40 to 9.70)		
Quartiles, lagged 15 years, µg/m³					
0 to < 8	29	81	1.0 (referent)	.001	
8 to < 49	29	73	1.04 (0.45 to 2.43)		
49 to < 104	29	58	2.19 (0.87 to 5.53)		
≥ 104	29	52	5.43 (1.92 to 15.31)		
REPLICATION AVERAGE REC					
Average REC intensity, quartiles, unlagged, µg/m <sup>3</sup>					
0 to < 39	29	89	1.0 (referent)		247.131
39 to < 71	29	57	1.905 (0.905 to 4.010)		
71 to < 147	29	66	2.383 (1.043 to 5.443)		
≥ 147	29	52	3.692 (1.405 to 9.703)		
Quartiles, lagged 15 years, µg/m³					
0 to < 8	29	81	1.0 (referent)		242.225
8 to < 49	29	73	1.041 (0.446 to 2.430)		
49 to < 104	29	58	2.191 (0.868 to 5.529)		
≥ 104	29	52	5.427 (1.924 to 15.305)		
LAG 0 AVERAGE REC					
0 to < 39.13	29	89	1.0 (referent)		247.131
39.13 to < 70.95	29	57	1.905 (0.905 to 4.010)		
70.95 to < 146.70	29	66	2.383 (1.043 to 5.443)		
≥ 146.70	29	52	3.692 (1.405 to 9.703)		
LAG 3 AVERAGE REC					
0 to < 34.68	29	82	1.0 (referent)		247.725
34.63 to < 67.32	29	62	1.662 (0.775 to 3.566)		
67.32 to < 147.22	29	58	2.429 (1.027 to 5.746)		
≥ 147.22	29	62	3.714 (1.388 to 9.940)		
LAG 5 AVERAGE REC			,		
0 to < 29.99	29	67	1.0 (referent)		250.649
			1.081 (0.496 to 2.355)		
29.99 to < 62.61	30	68			
29.99 to < 62.61 62.61 to < 146.01	30 28	68 75	1.465 (0.633 to 3.391)		

#### LAG 7 AVERAGE REC

0 to < 26.02	2	29 6	6	1.0 (referent)	252.61
				210 (1010101)	202.01
26.02 to < 61.25	2	29 6	7 1.	.001 (0.453 to 2.215)	
61.25 to < 141.67	2	29 73	3 1.	483 (0.652 to 3.371)	
≥ 141.67	2	29 58	8 <b>2</b> .	230 (0.813 to 6.113)	
LAG 9 AVERAGE REC					
0 to < 26.19	2	29 7	6	1.0 (referent)	248.616
26.19 to < 61.28	2	29 63	2 1.	.520 (0.650 to 3.555)	
61.28 to < 146.08	2	29 72		.176 (0.944 to 5.017)	
≥ 146.08		29 54		055 (1.345 to 12.225)	
LAG 11 AVERAGE REC					
0 to < 16.00	2	29 74	4	1.0 (referent)	251.178
16.00 to < 57.11		29 69	91.	.142 (0.449 to 2.904)	
57.11 to < 137.98		29 6		.901 (0.781 to 4.630)	
≥ 137.98		29 5		459 (0.912 to 6.632)	
LAG 13 AVERAGE REC	-		-		
0 to < 9.84	2	29 7	9	1.0 (referent)	242.24
9.84 to < 55.15		29 7		.054 (0.426 to 2.610)	
55.15 to < 126.00		29 6		.260 (0.875 to 5.834)	
≥ 126.00		29 50		550 (1.927 to 15.987)	
LAG 15 AVERAGE REC	-			(1.1.2.) to 10.001)	
0 to < 7.87	2	.9 8	1	1.0 (referent)	242.225
7.87 to < 48.76		29 7		.041 (0.446 to 2.430)	
48.76 to < 103.50		29 5		191 (0.868 to 5.529)	
≥ 103.50		29 5		427 (1.924 to 15.305)	
LAG 17 AVERAGE REC	-		- 5.	127 (1.52 ) (0 15.505)	
0 to < 5.25	2	29 81	0	1.0 (referent)	247.903
5.25 to < 40.79		29 6		.910 (0.349 to 2.375)	
40.79 to < 92.13		29 6		.396 (0.540 to 3.612)	
≥ 92.13		29 5		.129 (1.245 to 7.864)	
LAG 19 AVERAGE REC	-		5 5.		
0 to < 0.38	2	29 59	9	1.0 (referent)	249.289
0.38 to < 27.97		29 7		.343 (0.107 to 1.106)	210.200
27.97 to < 72.63		29 7		.604 (0.199 to 1.832)	
≥72.62		29 5		215 (0.440 to 3.357)	
LAG 20 AVERAGE REC	-	5	, <u> </u>	225 (01440 (0 51557)	
0	3	33 69	9	1.0 (referent)	246.79
0 to < 20.13		25 6		.284 (0.082 to 0.979)	
20.13 to < 65.24		29 7		.353 (0.108 to 1.152)	
≥ 65.24		29 54		236 (0.451 to 3.386)	
- 03.24	2	., .,	- 1.	230 (0.431 (0 3.300)	

#### LAG 21 AVERAGE REC

LAG 21 AVERAGE REC				
0	36	76	1.0 (referent)	249.087
0 to < 17.22	22	63	0.307 (0.090 to 1.047)	
17.22 to < 60.97	29	67	0.674 (0.215 to 2.112)	
≥ 60.97	29	58	1.248 (0.463 to 3.367)	
LAG 23 AVERAGE REC				
0	45	89	1.0 (referent)	248.869
0 to < 5.97	13	34	0.307 (0.090 to 1.048)	
5.96 to < 47.89	29	80	0.335 (0.116 to 0.963)	
≥ 47.89	29	61	0.821 (0.314 to 2.145)	
LAG 25 AVERAGE REC				
0	51	106	1.0 (referent)	246.651
0 to < 3.60	7	31	0.141 (0.030 to 0.671)	
3.60 to < 38.77	29	62	0.580 (0.199 to 1.692)	
≥ 38.77	29	65	1.166 (0.468 to 2.907)	
ORIGINAL CUMALATIVE REC				
Cumulative REC, quartiles, unlagged, µg/m <sup>3</sup> -y				
0 to < 298	29	81	1.0 (referent)	.123
298 to < 675	29	63	1.45 (0.68 to 3.11)	
675 to < 1465	29	57	1.81 (0.84 to 3.89)	
≥ 1465	29	63	1.93 (0.90 to 4.15)	
Quartiles, lagged 15 years, µg/m³-y				
0 to < 81	29	92	1.0 (referent)	.004
81 to < 325	29	52	2.46 (1.01 to 6.01)	
325 to < 878	29	69	2.41 (1.00 to 5.82)	
≥ 878	29	51	5.10 (1.88 to 13.87)	
REPLICATION CUMULATIVE REC				
Cumulative REC, quartiles, unlagged, µg/m <sup>3</sup> -y				
0 to < 298	29	81	1.0 (referent)	. 251.909
298 to < 675	29	63	1.452 (0.677 to 3.114)	
675 to < 1465	29	57	1.810 (0.842 to 3.892)	
≥ 1465	29	63	1.933 (0.901 to 4.147)	
Quartiles, lagged 15 years, µg/m <sup>3</sup> -y				
0 to < 81	29	92	1.0 (referent)	. 243.631
81 to < 325	29	52	2.462 (1.008 to 6.014)	
325 to < 878	29	69	2.411 (1.000 to 5.816)	
≥ 878	29	51	5.100 (1.875 to 13.872)	

#### LAG 0 CUMULATIVE REC

LAG U CUMULATIVE REC				
0 to < 298.23	29	81	1.0 (referent)	. 251.909
298.23 to < 674.81	29	63	1.452 (0.677 to 3.114)	
674.81 to < 1464.57	29	57	1.810 (0.842 to 3.892)	
≥ 1464.57	29	63	1.933 (0.901 to 4.147)	
LAG 3 CUMULATIVE REC				
0 to < 278.49	29	78	1.0 (referent)	. 252.058
278.49 to < 584.93	29	63	1.652 (0.765 to 3.567)	
584.93 to < 1286.53	29	55	1.948 (0.888 to 4.272)	
≥ 1286.53	29	68	1.801 (0.827 to 3.921)	
LAG 5 CUMULATIVE REC				
0 to < 197.24	29	66	1.0 (referent)	254.036
197.24 to < 581.35	29	75	1.060 (0.495 to 2.272)	
581.35 to < 1196.05	29	53	1.439 (0.661 to 3.134)	
≥ 1196.05	29	70	1.407 (0.638 to 3.100)	
LAG 7 CUMULATIVE REC				
0 to < 181.57	29	68	1.0 (referent)	253.366
181.57 to < 541.85	29	73	1.154 (0.528 to 2.522)	
541.85 to < 1132.85	29	54	1.643 (0.750 to 3.600)	
≥ 1132.85	29	69	1.535 (0.673 to 3.503)	
LAG 9 CUMULATIVE REC				
0 to < 169.95	29	70	1.0 (referent)	251.925
169.95 to < 524.02	29	79	1.164 (0.523 to 2.589)	
524.02 to < 1094.24	29	54	1.669 (0.751 to 3.706)	
≥ 1094.24	29	61	1.989 (0.842 to 4.698)	
LAG 11 CUMULATIVE REC				
0 to < 149.69	29	80	1.0 (referent)	248.77
149.68 to < 455.69	29	66	1.414 (0.648 to 3.085)	
455.69 to < 1075.87	29	63	1.657 (0.711 to 3.860)	
≥ 1075.87	29	55	3.039 (1.234 to 7.484)	
LAG 13 CUMULATIVE REC				
0 to < 109.93	29	83	1.0 (referent)	246.238
109.93 to < 424.20	29	70	1.470 (0.666 to 3.246)	
424.20 to < 966.28	29	58	2.173 (0.913 to 5.170)	
≥ 966.28	29	53	3.879 (1.505 to 9.999)	
LAG 15 CUMULATIVE REC				
0 to < 81.35	29	92	1.0 (referent)	243.631
81.35 to < 325.34	29	52	2.462 (1.008 to 6.014)	
325.34 to < 878.37	29	69	2.411 (1.000 to 5.816)	
≥ 878.37	29	51	5.100 (1.875 to 13.872)	
LAG 17 CUMULATIVE REC				
0 to < 18.92	29	75	1.0 (referent)	246.773
18.92 to < 305.13	29	77	1.056 (0.404 to 2.756)	
305.13 to < 740.92	29	60	2.088 (0.749 to 5.819)	
≥ 740.92	29	52	3.277 (1.160 to 9.254)	

#### LAG 19 CUMULATIVE REC

LAG 19 COMOLATIVE REC				
0 to < 3.79	29	67	1.0 (referent)	250.954
3.79 to < 159.71	29	74	0.917 (0.312 to 2.693)	
159.71 to < 582.65	29	70	1.352 (0.454 to 4.028)	
≥ 582.65	29	53	2.247 (0.736 to 6.862)	
LAG 20 CUMULATIVE REC				
0	33	69	1.0 (referent)	249.564
0 to < 144.54	25	76	0.409 (0.141 to 1.184)	
144.54 to < 491.47	29	62	0.904 (0.316 to 2.585)	
≥ 491.47	29	57	1.163 (0.396 to 3.416)	
LAG 21 CUMULATIVE REC				
0	36	76	1.0 (referent)	251.17
0 to < 117.99	22	65	0.474 (0.164 to 1.363)	
117.99 to < 441.50	29	63	0.988 (0.345 to 2.829)	
≥ 441.50	29	60	1.241 (0.435 to 3.538)	
LAG 23 CUMULATIVE REC				
0	43	89	1.0 (referent)	251.283
0 to < 56.15	13	46	0.337 (0.113 to 1.009)	
56.15 to < 310.87	29	63	0.577 (0.201 to 1.652)	
≥ 310.87	29	66	0.746 (0.270 to 2.058)	
LAG 25 CUMULATIVE REC				
0	51	106	1.0 (referent)	249.108
0 to < 22.38	7	33	0.288 (0.084 to 0.987)	
22.38 to < 170.01	29	55	1.140 (0.430 to 3.019)	
≥ 170.01	29	70	0.859 (0.318 to 2.317)	
Duration of REC exposure, y				
< 5	37	92	1.0 (referent)	.062
5 to < 10	14	39	1.18 (0.52 to 2.68)	
10 to < 15	25	60	0.84 (0.39 to 1.82)	
≥ 15	40	73	2.08 (1.01 to 4.27)	
REPLICATION DURATION REC				
< 5	37	92	1.0 (referent)	. 249.418
5 to < 10	14	39	1.180 (0.519 to 2.680)	
10 to < 15	25	60	0.842 (0.389 to 1.824)	
≥ 15	40	73	2.079 (1.011 to 4.274)	

\* P values based on two-sided Wald test for linear trend. Adjusted for smoking status (never smoker, unknown/occasional smoker, former smoker/<1 pack per day, former smoker/1 to <2 packs per day, former smoker/ $\geq$  2 pack s per day, current smoker/<1 pack per day, current smoker/1 to <2 packs per day, current smoker/ $\geq$  2 packs per day, current smoker/ $\geq$  2 packs per day, current smoker/ $\geq$  2 packs per day); history of respiratory disease 5 or more years before date of death/reference date; and history of a high-risk job for lung cancer for at least 10 years. REC = respirable elemental carbon.

+ Eight case subjects and 148 control subjects were excluded because they no longer belonged to a complete matched set after analysis was restricted to

**Table 2.5.** Odds ratios (ORs) and 95% confidence intervals (Cls) for average and cumulative REC and total duration REC exposure for subjects who ever worked surface jobs\*

Exposure metric	Case subject	Control subject	OR (95% Cl)	<b>P</b> trend	AIC
ORIGINAL AVERAGE REC					
Average REC intensity, quartiles, unlagged, µg/m <sup>3</sup>					
0 to < 0.86	13	24	1.0 (referent)	.983	
0.86 to < 0.95	13	21	1.29 (0.18 to 9.33)		
0.95 to < 1.9	13	19	7.24 (0.23 to 228.53)		
≥ 1.9	14	36	3.28 (0.09 to 123.50)		
Quartiles, lagged 15 years, µg/m³					
0 to < 0.6	13	38	1.0 (referent)	.659	
0.6 to < 0.9	13	17	4.38 (0.56 to 34.24)		
0.9 to < 1.4	13	12	5.67 (0.77 to 42.06)		
≥ 1.4	14	33	1.31 (0.14 to 12.01)		
REPLICATION AVERAGE REC					
Average REC intensity, quartiles, unlagged, µg/m <sup>3</sup>					
0 to < 0.86	13	24	1.0 (referent)		95.568
0.86 to < 0.95	13	21	1.294 (0.179 to 9.333)		
0.95 to < 1.9	13	19	7.238 (0.229 to 228.518)		
≥ 1.9	14	36	3.282 (0.087 to 123.494)		
Quartiles, lagged 15 years, µg/m³					
0 to < 0.6	13	38	1.0 (referent)		92.619
0.6 to < 0.9	13	17	4.377 (0.560 to 34.237)		
0.9 to < 1.4	13	12	5.672 (0.765 to 42.059)		
≥ 1.4	14	33	1.310 (0.143 to 12.004)		
LAG 0 AVERAGE REC					
0 to < 0.86	13	24	1.0 (referent)		95.568
0.86 to < 0.95	13	21	1.294 (0.179 to 9.333)		
0.95 to < 1.91	13	19	7.238 (0.229 to 228.518)		
≥ 1.91	14	36	3.282 (0.087 to 123.494)		
LAG 3 AVERAGE REC			. ,		

0.75 to < 0.94	12	21	0.601 (0.087 to 4.161)	
0.94 to < 1.56	13	18	2.183 (0.228 to 20.894)	
≥ 1.56	14	38	0.419 (0.024 to 7.425)	
LAG 5 AVERAGE REC				
0 to < 0.74	14	23	1.0 (referent)	. 96.24
0.74 to < 0.92	12	23	1.150 (0.187 to 7.084)	
0.92 to < 1.55	14	16	1.979 (0.291 to 13.469)	
≥ 1.55	13	38	0.706 (0.075 to 6.686)	
LAG 7 AVERAGE REC				
0 to < 0.66	13	22	1.0 (referent)	. 95.292
0.66 to < 0.91	11	21	0.625 (0.114 to 3.435)	
0.91 to < 1.50	16	20	1.094 (0.216 to 5.545)	
≥ 1.50	13	37	0.330 (0.047 to 2.333)	
LAG 9 AVERAGE REC				
0 to < 0.61	14	29	1.0 (referent)	. 94.822
0.61 to < 0.91	10	19	0.802 (0.136 to 4.735)	
0.91 to < 1.48	15	18	2.107 (0.427 to 10.389)	
≥ 1.48	14	34	0.584 (0.088 to 3.875)	
LAG 11 AVERAGE REC				
0 to < 0.60	13	32	1.0 (referent)	. 94.194
0.60 to < 0.91	12	20	1.471 (0.278 to 7.789)	
0.91 to < 1.38	14	14	4.402 (0.668 to 29.003)	
≥ 1.38	14	34	1.468 (0.180 to 11.987)	
LAG 13 AVERAGE REC				
0 to < 0.60	13	36	1.0 (referent)	. 93.715
0.60 to < 0.91	13	18	4.042 (0.504 to 32.423)	
0.91 to < 1.38	13	12	4.575 (0.641 to 32.677)	
≥ 1.38	14	34	1.499 (0.174 to 12.900)	
LAG 15 AVERAGE REC				
0 to < 0.57	13	38	1.0 (referent)	. 92.519
0.57 to < 0.86	14	18	6.533 (0.725 to 58.903)	
0.86 to < 1.37	12	11	4.066 (0.551 to 30.022)	
≥ 1.37	14	33	0.993 (0.112 to 8.816)	
LAG 17 AVERAGE REC				

0	18	31	1.0 (referent)	. 95.874
0 to < 3.37	9	16	0.694 (0.048 to 10.120)	
3.37 to < 12.46	12	24	0.275 (0.044 to 1.737)	
≥ 12.46	14	29	0.348 (0.044 to 2.763)	
LAG 19 AVERAGE REC				
0	20	41	1.0 (referent)	. 97.894
0 to < 0.55	6	12	1.442 (0.104 to 20.008)	
0.55 to < 1.01	13	18	1.506 (0.259 to 8.753)	
≥ 1.01	14	29	0.765 (0.054 to 10.890)	
LAG 20 AVERAGE REC				
0	21	43	1.0 (referent)	. 95.055
0 to < 0.54	6	6	62.536 (0.231 to >999.999)	
0.54 to < 1.01	12	23	1.035 (0.127 to 8.440)	
≥ 1.01	14	28	1.201 (0.093 to 15.472)	
LAG 21 AVERAGE REC				
0	22	49	1.0 (referent)	. 94.503
0 to < 0.49	4	4	>999.999 (<0.001 to >999.999)	
0.49 to < 1.01	13	21	1.272 (0.168 to 9.648)	
≥ 1.01	14	26	1.816 (0.181 to 18.185)	
LAG 23 AVERAGE REC				
0	26	50	1.0 (referent)	. 92.19
0 to < 0.08	0	0		
0.08 to < 0.99	13	19	0.282 (0.035 to 2.310)	
≥ 0.99	14	31	3.487 (0.437 to 27.792)	
LAG 25 AVERAGE REC				
0	28	55	1.0 (referent)	. 95.063
0	0	0		
0 to < 0.86	11	25	0.577 (0.084 to 3.980)	
≥ 0.86	14	20	1.884 (0.323 to 10.989)	
ORIGINAL CUMULATIVE REC				

# **ORIGINAL CUMULATIVE REC**

Cumulative REC, quartiles, unlagged, µg/m <sup>3</sup> -y	
0 to < 6.5	13

17

1.0 (referent)

.294

6.5 to < 12.5 12.5 to < 22.5 ≥ 22.5 Quartiles, lagged 15 years, $\mu$ g/m <sup>3</sup> -y 0 to < 0.7 0.7 to < 4.4 4.4 to < 14.3	13 13 14 13 13 13	27 23 33 29 9 32	0.78 (0.18 to 3.43) 0.60 (0.14 to 2.53) 0.40 (0.07 to 2.40) 1.0 (referent) 3.98 (0.69 to 23.02) 0.76 (0.12 to 4.98)	.117
≥ 14.3	14	30	0.42 (0.05 to 3.59)	
REPLICATION CUMULATIVE REC Cumulative REC, quartiles, unlagged, µg/m <sup>3</sup> -y				
0 to < 6.5	13	17	1.0 (referent)	. 96.968
6.5 to < 12.5	13	27	0.779 (0.177 to 3.429)	
12.5 to < 22.5	13	23	0.596 (0.140 to 2.525)	
≥ 22.5	14	33	0.395 (0.065 to 2.402)	
Quartiles, lagged 15 years, μg/m³-y				
0 to < 0.7	13	29	1.0 (referent)	. 90.784
0.7 to < 4.4	13	9	3.981 (0.689 to 23.016)	
4.4 to < 14.3	13	32	0.764 (0.117 to 4.981)	
≥ 14.3	14	30	0.424 (0.050 to 3.588)	
LAG 0 CUMULATIVE REC				
0 to < 6.50	13	17	1.0 (referent)	. 96.968
6.50 to < 12.52	13	27	0.779 (0.177 to 3.429)	
12.52 to < 22.46	13	23	0.596 (0.140 to 2.525)	
≥ 22.46	14	33	0.395 (0.065 to 2.402)	
LAG 3 CUMULATIVE REC				
0 to < 4.86	14	16	1.0 (referent)	. 93.891
4.86 to < 11.82	13	26	0.876 (0.185 to 4.161)	
11.82 to < 21.92	12	24	0.277 (0.056 to 1.370)	
≥ 21.92	14	34	0.224 (0.037 to 1.368)	
LAG 5 CUMULATIVE REC				
0 to < 4.28	14	17	1.0 (referent)	. 93.52
4.28 to < 10.30	13	22	1.833 (0.391 to 8.585)	

10.29 to < 21.92	12	29	0.253 (0.046 to 1.404)	
≥ 21.92	14	32	0.324 (0.052 to 2.027)	
LAG 7 CUMULATIVE REC				
0 to < 4.28	14	22	1.0 (referent)	. 94.687
4.28 to < 8.91	13	19	1.574 (0.322 to 7.700)	
8.91 to < 21.07	12	28	0.532 (0.119 to 2.383)	
≥ 21.07	14	31	0.241 (0.036 to 1.593)	
LAG 9 CUMULATIVE REC				
0 to < 3.37	13	23	1.0 (referent)	. 95.306
3.37 to < 7.28	14	19	2.101 (0.372 to 11.858)	
7.28 to < 19.98	12	29	0.717 (0.158 to 3.259)	
≥ 19.98	14	29	0.396 (0.067 to 2.350)	
LAG 11 CUMULATIVE REC				
0 to < 3.28	14	27	1.0 (referent)	. 95.609
3.28 to < 6.94	13	18	1.281 (0.284 to 5.786)	
6.94 to < 18.19	12	25	0.905 (0.186 to 4.407)	
≥ 18.19	14	30	0.318 (0.049 to 2.082)	
LAG 13 CUMULATIVE REC				
0 to < 1.61	13	27	1.0 (referent)	. 92.517
1.61 to < 6.57	14	13	2.587 (0.405 to 16.534)	
6.57 to < 16.22	12	30	0.599 (0.068 to 5.245)	
≥ 16.22	14	30	0.345 (0.040 to 3.174)	
LAG 15 CUMULATIVE REC				
0 to < 0.70	13	29	1.0 (referent)	. 90.784
0.70 to < 4.37	13	9	3.981 (0.689 to 23.016)	
4.37 to < 14.34	13	32	0.764 (0.117 to 4.981)	
≥ 14.34	14	30	0.424 (0.050 to 3.588)	
LAG 17 CUMULATIVE REC				
0	18	31	1.0 (referent)	. 96.051
0 to < 3.37	8	15	0.414 (0.063 to 2.741)	
3.37 to < 12.46	13	25	0.486 (0.060 to 3.950)	
≥ 12.46	14	29	0.266 (0.039 to 1.812)	
LAG 19 CUMULATIVE REC				
0	20	41	1.0 (referent)	. 96.271

0 to < 2.67	7	8	3.186 (0.337 to 30.124)		
2.67 to < 10.97	12	22	1.152 (0.178 to 7.443)		
≥ 10.97	14	29	0.690 (0.086 to 5.549)		
LAG 20 CUMULATIVE REC					
0	21	43	1.0 (referent)		96.863
0 to < 1.92	5	6	2.681 (0.222 to 32.389)		
1.92 to < 9.96	13	23	1.463 (0.235 to 9.089)		
≥ 9.96	14	28	0.645 (0.085 to 4.902)		
LAG 21 CUMULATIVE REC					
0	22	49	1.0 (referent)		93.235
0 to < 1.68	5	1	>999.999 (<0.001 to >999.999)		
1.68 to < 8.92	13	24	1.291 (0.212 to 7.853)		
≥ 8.92	13	26	0.790 (0.099 to 6.328)		
LAG 23 CUMULATIVE REC					
0	26	50	1.0 (referent)		95.218
0 to < 0.01	0	0			
0.01 to < 6.82	13	19	1.725 (0.270 to 11.014)		
≥ 6.82	14	31	0.623 (0.118 to 3.278)		
LAG 25 CUMULATIVE REC					
0	28	55	1.0 (referent)		93.613
0	0	0			
0 to < 5.08	11	16	4.295 (0.445 to 41.451)		
≥ 5.08	14	29	0.530 (0.093 to 3.040)		
ORIGINAL DURATION REC					
Duration of REC exposure, y					
Unexposed‡	34	61	1.0 (referent)		
0 to < 5	10	17	1.44 (0.26 to 8.17)	.152	
5 to < 10	5	12	0.74 (0.10 to 5.21)		
10 to < 15	3	3	0.55 (0.05 to 6.17)		
≥ 15	1	7	0.22 (0.01 to 3.67)		

# **REPLICATION DURATION REC**

# Duration of REC exposure, y

Unexposed‡	34	61	1.0 (referent)	97.578
0 to < 5	10	17	1.443 (0.255 to 8.166)	
5 to < 10	5	12	0.736 (0.104 to 5.212)	
10 to < 15	3	3	0.546 (0.048 to 6.169)	
≥ 15	1	7	0.216 (0.013 to 3.665)	

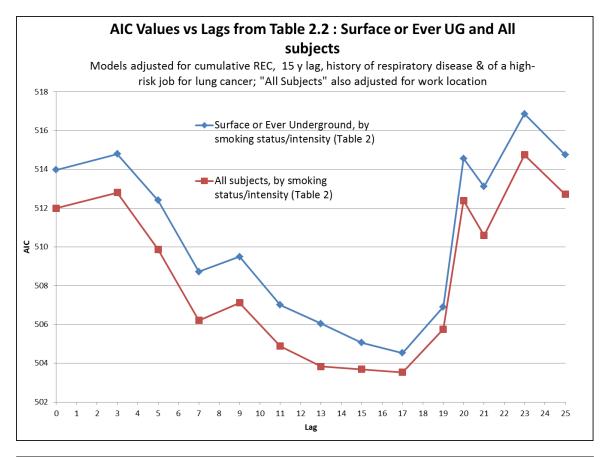
\* P values based on two-sided Wald test for linear trend. Adjusted for smoking status (never smoker, unknown/occasional smoker, former smoker/<1 pack per day, former smoker/1 to <2 pack s per day, former smoker/ $\geq$  2 pack s per day, current smoker/<1 pack per day, current smoker/ $\geq$  2 pack s per day); history of respiratory disease 5 or more years before date of death/reference date; and history of a high-risk job for lung cancer for at least 10 years. REC = respirable elemental carbon.

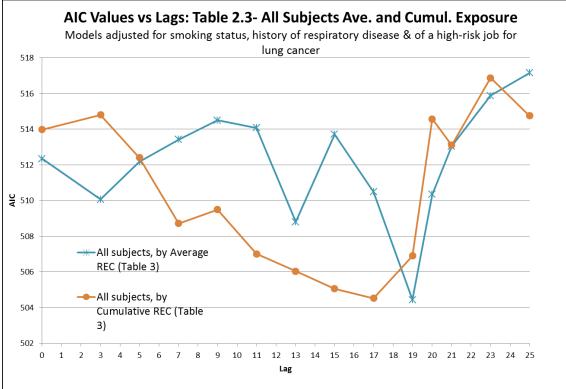
<sup>+</sup> Twenty-one case subjects and 154 control subjects were excluded because they no longer belonged to a complete matched set after analysis was restricted to surface workers.

‡ Unexposed includes subjects who worked surface jobs with either negligible or bystander exposure to REC.

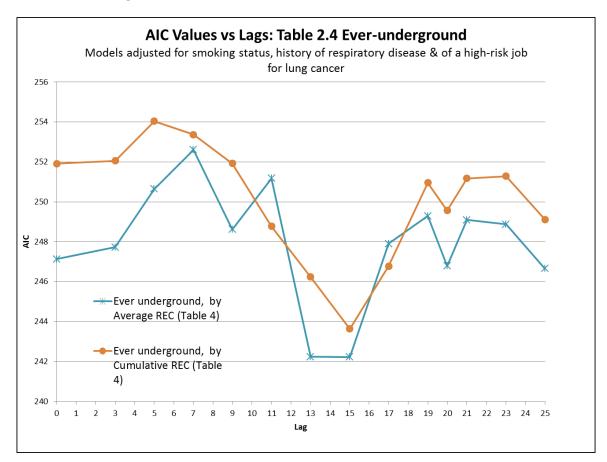
Note: Average REC Lag analysis revealed that SE is about 1 in majority of the results, so results are unreliable.

Note: Cumulative REC Lag analysis revealed that SE is about 1 for lag 13, lag 15 lag 17, lag 19, lag20, lag21, lag23 and lag25 results, so results are unreliable.





#### Table 2.6 AIC Values vs Lags



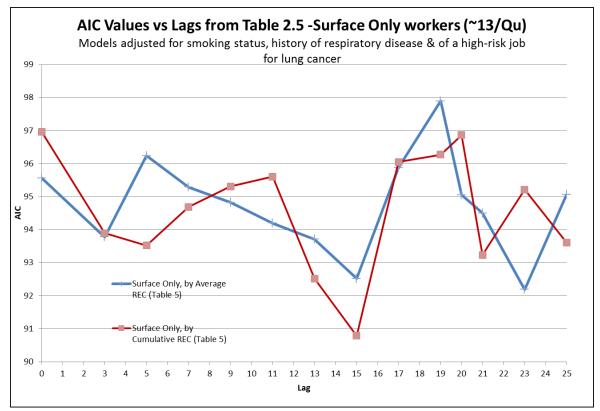


Table 2.7. Odds ratios (ORs) and 95% confidence intervals (Cls) by potential risk factors for lung canc	er*
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Perturbation         One solids         Control layors         Differential         Differential<	Table 2.7. Odds ratios (ORs) and 95% confidence intervals (Cls) by potenti	al risk factors fo	r lung cancer* Original Results			HEI Replication		
Explorement Normal scale pattern Normal scale pattern Normal scale pattern 	Potential risk factor	Case subject	-	OR (95% Cl)			OR (95% Cl)	
0 soly249090900 (20 to 150)2490900 (20 to 150)3 soly333 <t< td=""><td></td><td></td><td></td><td>, ,</td><td></td><td></td><td></td></t<>				, ,				
Six Chy67006100 </td <td>No</td> <td>100</td> <td>365</td> <td>1.0 (referent)</td> <td>100</td> <td>365</td> <td>1.0 (referent)</td>	No	100	365	1.0 (referent)	100	365	1.0 (referent)	
shy         shy <td>•</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	•							
University Interpretation of the state of a s								
Hence No Section of periodic price of periodic per							· · · ·	
No.         Sol (0) (0) (0) (0) (0) (0) (0) (0) (0) (0)		25	90	1.14 (0.07 to 1.92)	25	50	1.150 (0.074 (0 1.910)	
c) y berne subir berne subir s		86	473	1.0 (referent)	86	473	1.0 (referent)	
Univode Family hatery of used Family hatery o								
Interval <th< td=""><td>≥5 y before death/reference date</td><td>28</td><td>58</td><td>2.15 (1.21 to 3.82)</td><td>28</td><td>58</td><td>2.150 (1.212 to 3.815)</td></th<>	≥5 y before death/reference date	28	58	2.15 (1.21 to 3.82)	28	58	2.150 (1.212 to 3.815)	
No.         15         5.22         1.0 (referent)         15         7.4         1.50 (referent)           Uninous         15         1.50 (referent)         15         1.50 (referent)         15         1.50 (referent)           Uninous         1.50 (referent)         15         1.50 (referent)         16         1.50 (referent)         16           Uninous         1.50 (referent)         1.50 (referent) <td></td> <td>58</td> <td>119</td> <td>2.94 (1.87 to 4.63)</td> <td>58</td> <td>119</td> <td>2.943 (1.869 to 4.632)</td>		58	119	2.94 (1.87 to 4.63)	58	119	2.943 (1.869 to 4.632)	
YesY								
Unione16.0 (soft e.2.a)2056.0 (soft e.2.a)2056.0 (soft e.2.a)Remeating of gam and and soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)Remeating of gam and and soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)Soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)Networks of c.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)Networks of c.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)Networks of c.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)Soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)Network of c.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)Soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)Network of c.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)Soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)Network of c.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.2.a)16.0 (soft e.								
Caparameter of gene         176         564         1.0 (referent)           Cal         1.0								
Normatics of signs         10         64         0.00 (0.550 1.89)         8         4.40         0.10 (0.550 1.80)         8         4.40         0.00 (0.550 1.80)         8         4.40 (0.00 0.43)         0.10 (0.550 1.80)         10         10         0.10 (0.550 1.80)         10         10         0.10 (0.550 1.80)         10         10         10         10         10         10         10         10         10         10         10         10         10         10         10         10		27	50	1.05 (0.50 to 2.05)	27	50	1.040 (0.550 to 2.020)	
Sho 2x3Sho 2x3<		176	564	1.0 (referent)	176	564	1.0 (referent)	
203441.0 (0.42 to A.7)544.0 (0.23 b.42 to A.7)Denkers of optidus prevely </td <td>-</td> <td>8</td> <td></td> <td></td> <td>8</td> <td></td> <td></td>	-	8			8			
Unknown(b)(b)(	10 to <20		16	1.46 (0.49 to 4.39)		16	1.462 (0.487 to 4.385)	
Pipe service, in. of pipeting are week it         Service								
Nonsolve of logan15344710 (referent)15345710 to 2011390.800 (0.450 to 15%)10 to 205330.500 (0.15 to 15%)16340.680 (0.15% to 15%)10 to 205350.680 (0.15 to 15%)5350.680 (0.15% to 15%)10 to 205350.500 (0.15 to 15%)5350.686 (0.17% to 15%)10 to 2033350.080 (0.15 to 15%)5350.686 (0.17% to 15%)10 to 20159 (1.070 - 300) (0.15 to 15%)1635350.686 (0.17% to 15%)10 to 20159 (1.070 - 300) (0.15 to 15%)1616161610 to 20200 (0.15 to 15%)159 (1.070 - 300)159 (1.070 - 300)124 (0.247 to 370 (0.15%)10 to 20200 (0.15 to 15%)160 (0.16% to 15%)160 (0.16% to 15%)160 (0.16% to 15%)10 to 20200 (0.16% to 15%)100 (0.16% to 15%)100 (0.16% to 15%)110 (0.16% to 15%)10 to 20200 (0.16% to 15%)100 (0.16% to 15%)100 (0.16% to 15%)110 (0.16% to 13%)10 to 20200 (0.16% to 15%)100 (0.16% to 15%)110 (0.16% to 13%)110 (0.16% to 13%)10 to 2010 to 20% to 15% to		6	30	0.64 (0.24 to 1.67)	6	30	0.635 (0.242 to 1.667)	
-10     -10     -20 <td></td> <td>150</td> <td>497</td> <td>1.0 (referent)</td> <td>150</td> <td>407</td> <td>10 (referent)</td>		150	497	1.0 (referent)	150	407	10 (referent)	
10 to 2006240.660 (0.25 to 1.77)6240.068 (0.260 to 1.78)2323250 (0.150 to 1.50)250 (0.150 to 1.50)250 (0.150 to 1.50)250 (0.150 to 1.50)10 moders inders inders inders inders inder inders inder inders inder in								
2-053.50.90 (a) 18 to 1.3953.50.495 (a) 126 to 1.57)Number of smokers living in participant's childhood/adult home!0.495 (a) 126 to 1.53)Number of smokers living in participant's childhood/adult home!0.10 (referent)1.30 (a) 1.27							· · · ·	
Numbers living in participant's childhood/adult home!         Uniferential         1 service in the								
Osnokers         28         164         1.01 (refreent)         28         164         1.0 (refreent)           23 mokers         70         230         1.43 (0.84 to 2.46)         70         230         1.42 (0.24 to 3.30)           24 mokers         70         230         1.43 (0.84 to 2.46)         70         230         1.42 (0.83 to 2.435)           25 (molevangh)         71         30 (of 50 to 1.13)         70         258         70         <	Unknown	23	81		23			
1 shoker         75         201         1 99 (1 20 0 3.0)         75         201         1 994 (1 20 1 3.0)           2 shoker         75         201         1 300 (0.87 0 2.43 0.0)         75         201         1 329 (0.87 0 2.43 0.0)           Dedy mass inder (bg/m')*         7         201         2	Number of smokers living in participant's childhood/adult home*							
22 moders702301.430 (0.84 to 2.44)702.301.427 (0.837 to 2.435)Unknow711.30 (6.7 to 2.53)701.42 (0.837 to 2.435)701.427 (0.837 to 2.435)Body mass index (tg/m*)7770 <th 70<="" <="" td=""><td></td><td></td><td></td><td>. ,</td><td></td><td></td><td></td></th>	<td></td> <td></td> <td></td> <td>. ,</td> <td></td> <td></td> <td></td>				. ,			
Unknown25711.30 (n67 to 2.50)711.307 (n67 to 2.51)Body mass index (lg/m)*1060625.0 to 2.0 (nderweight)7126.80.75 (n.5 to 1.11)7126.80.75 (n.5 to 1.11)7126.81.46 (n.5 to 1.5 to 1.11) <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>								
Body musi index (bg/m <sup>1</sup> )         0         6         0         6           135. (underweight)         105         255         1.0 (referent)         105         258         1.0 (referent)           135. (underweight)         14         59         0.72 (0.35 to 1.11)         71         258         0.75 (0.51 to 1.12)           23.0 (0.0 (overweight)         14         59         0.72 (0.35 to 1.43)         14         59         0.72 (0.35 to 1.43)           23.0 (0.0 (overweight)         14         45         0.72 (0.35 to 1.43)         14         1.0 (referent)           23.0 (0.0 (overweight)         12         11         1.0 (referent)         23         130         1.0 (referent)           24.0 (0.5 to 1.32)         14         1.05 (0.70 to 3.3)         13         141         1.05 (0.70 to 3.3)           10. (referent)         12         24         8         1.0 (referent)         22         1.88         1.0 (referent)           10. (referent)         12         1.0 (referent)         12         1.48         0.458 (0.70 to 3.5)         14         1.458 (0.70 to 3.5)           10. (referent)         10         22         1.88         1.0 (referent)         1.89         1.48         1.48         0.58         0.58								
-1.5 (not-weight)060625.10 - 25.0 (notweight)10525.81.0 (referent)10525.81.0 (referent)25.01 - 20.0 (notweight)7.125.80.75 (r.5.1 to.1.1)7.125.80.72 (r.0.53 to.1.43)25.00 (robes)1.4250.72 (r.0.53 to.1.43)1.4250.72 (r.0.53 to.1.43)25.00 (robes)1.4250.72 (r.0.53 to.1.43)1.425.80.72 (r.0.53 to.1.43)Dynical activity231.10 (robes)1.6 (robes)231.10 (robes)1.6 (robes)Exercise 21/4231.10 (robes)1.6 (robes)1.6 (robes)1.6 (robes)1.6 (robes)Unknown1.0 (robes)1.6 (robes)1.6 (robes)1.6 (robes)1.6 (robes)1.6 (robes)1.6 (robes)Vaciding 1.4 (robes)2.28.81.0 (robes)1.6 (robes)<	_	25	/1	1.50 (0.07 to 2.52)	25	/1	1.257 (0.007 to 2.521)	
18.5 to 25.0 (normal weight-referent)1052851.0 (referent)25.0 to 30.0 (verweight)14590.73 (0.35 to 1.1)712860.72 (0.35 to 1.16)23.0 (obes)14590.73 (0.35 to 1.45)18480.523 (0.23 to 1.85)Physical citivity1010101010Evercise 2/41625151.46 (0.87 to 2.48)132411.558 (0.869 to 2.48)Unknow1625151.46 (0.87 to 2.48)132411.558 (0.740 to 3.89)Educativity31.0 (referent)33411.558 (0.740 to 3.89)Educativity31.0 (referent)33411.558 (0.740 to 3.89)Educativity31.0 (referent)33411.588 (0.740 to 3.89)Educativity31.0 (referent)481.64 (0.63 to 3.21)441.64 (0.63 to 3.21)Unknow1002.51.04 (0.63 to 1.32)1.441.04 (0.63 to 1.32)441.04 (0.66 to 1.97)Unknow102.51.04 (0.63 to 1.45)1.341.04 (0.66 to 1.97)1.04 (0.65 to 1.45)No cob_G1.41.71.04 (0.63 to 1.45)1.341.04 (0.66 to 1.97)1.04 (0.65 to 1.45)Unknow1.41.0 (referent)1.0 (referent)1.04 (0.65 to 1.45)1.04 (0.65 to 1.45)1.04 (0.65 to 1.45)No cob_G1.41.0 (referent)1.0 (referent)1.0 (referent)<		0	6		0	6		
320 (beered)       14       59       0.727 (0.33 to 1.494)         Urbanoon       8       48       0.022 (0.23 to 1.19)       8       48       0.523 (0.23 to 1.19)         Physical activity*       10       1.0 (orferent)       112       515       1.458 (0.260 to 1.250)         Exercise 31/4       162       515       1.46 (0.87 to 2.45)       122       515       1.458 (0.260 to 2.48)         Educatori       1       1.66 (0.70 to 3.85)       13       41       1.654 (0.70 to 3.85)         Educatori       1       1.0 (orferent)       13       43       51       1.469 (0.53 to 5.22)         Inglis school       1.00       1.00       1.00 (0.651 to 1.27)       14       35       1.489 (0.63 to 5.22)         Inglis school       1.00       1.00 (0.651 to 1.28)       100       32       1.09 (0.651 to 1.27)         Unknown       1.00       2.5       1.09 (0.651 to 1.28)       10       2.5       1.09 (0.651 to 1.28)         Unknown       1.00       2.6       1.00 (0.651 to 1.28)       10       1.09 (0.650 to 1.28)         Unknown       1.00       1.00 (0.651 to 1.28)       10       1.00 (0.650 to 1.28)       1.00 (0.650 to 1.28)       1.00 (0.650 to 1.28)       1.00 (0.650 to 1.28)       1.00 (0.650 t	18.5 to <25.0 (normal weight=referent)	105		1.0 (referent)	105		1.0 (referent)	
Unknow         8         48         0.52 (0.23 to 1.18)           Physical action         33         110         1.0 (referent)         23         110         1.0 (referent)           Exercise 4.1/0         162         515         1.46 (0.87 to 2.45)         13         41         1.05 (0.70 to 3.80)           Exercise 4.1/0         162         515         1.46 (0.87 to 2.45)         13         41         1.05 (0.70 to 3.80)           Chancado         162         183         1.0 (referent)         18         41         1.05 (0.70 to 3.80)           Vocational school         14         35         1.0 (referent)         18         1.46           Vocational school/FDD         48         1.0 (referent)         18         1.04         1.04 (0.63 to 3.52)           Unknon         100         25         1.0 (referent)         18         1.04 (0.65 to 3.75)           Unknon         100         25         1.0 (referent)         18         10         1.04 (0.65 to 3.75)           Unknon         13         10         1.0 (referent)         13         13         13         13         13         13         13         14         1.04 (0.65 to 3.75)           Unknon         13         20         <								
Physical activity!         No.         No.         No.         No.           Feercise 21/0         162         515         1.46 (0.87 to 2.45)         162         515         1.458 (0.867 to 2.48)           Feercise 21/0         13         41         1.46 (0.87 to 2.45)         13         41         1.65 (0.20 to 3.85)           Education 1         13         41         1.65 (0.20 to 3.85)         14         35         1.489 (0.63 to 3.522)           May college         2         8         1.0 (referent)         14         35         1.489 (0.63 to 3.522)           High shoul/GED         100         325         1.09 (0.63 to 3.52)         14         35         1.489 (0.63 to 3.522)           Unknown         1.0         25         1.09 (0.63 to 1.58)         100         325         1.09 (0.63 to 1.57)           Sto 300         325         1.09 (0.63 to 1.58)         10         32         1.09 (0.63 to 1.58)           Sto 300         31         127         0.73 (0.45 to 1.55)         31         13         0.03 (0.62 to 1.48)           Sto 406         31         127         0.73 (0.45 to 1.29)         31         80         0.73 (0.45 to 1.29)           Sto 40.5         31         20         1.08 (0.55 to 1.								
Exercise 2/d23101.0 (referent)23101.0 (referent)Exercise 2/d1625151.46 (0.87 to 2.48)13411.65 (0.70 to 3.8)Unknown13411.65 (0.70 to 3.8)13411.65 (0.70 to 4.8)Alve Colleg22881.0 (referent)22881.0 (referent)Vocational shool/GED481.6 (0.63 to 3.52)481.6 (0.63 to 3.52)481.6 (0.63 to 3.52)High school/GED481.6 (0.63 to 3.52)481.6 (0.63 to 3.52)481.6 (0.63 to 3.52)Kasthan high school1421.09 (0.61 to 1.73)481.6 (0.63 to 3.18)103251.094 (0.66 to 1.575)Linknown14421.09 (0.65 to 3.18)103251.094 (0.65 to 1.575)131.0 (referent)No exposure72.541.0 (referent)742.541.0 (referent)34329329 (0.59 to 1.45)So Co A.6311.230.56 (0.51 to 1.45)311.170.733 (0.429 to 1.28)1.94 (0.629 to 1.42)So Co A.6311.230.56 (0.51 to 1.45)311.230.589 (0.59 to 1.41)1.94 (0.629 to 1.42)So Co A.6311.230.56 (0.51 to 1.45)311.07 (0.629 to 1.42)1.94 (0.629 to 1.42)So Co A.6311.230.56 (0.51 to 1.45)311.07 (0.629 to 1.42)So Co A.6311.24 (0.76 to 2.29)311.07 (76 to 2.29)So Co A.6311.23		8	48	0.52 (0.23 to 1.19)	8	48	0.523 (0.230 to 1.185)	
Eventors //d1621511.46 (0.87 to 2.45)1625151.488 (0.88 to 2.488)Unknown13411.55 (0.70 to 3.89)14165 (0.70 to 3.89)Any colleg2881.0 (referent)14351.49 (0.51 to 3.52)14351.49 (0.51 to 3.52)Vocational school /GD14351.49 (0.51 to 3.52)14351.49 (0.51 to 1.72)481.750.937 (0.51 to 1.72)Unknown100251.09 (0.61 to 1.96)100251.09 (0.61 to 1.96)100251.09 (0.61 to 1.96)Rakon, quartiles (Working Level Months)/***101.270.73 (0.42 to 1.27)1.00 (referent)1.00 (r		22	110	10 (referent)	22	110	1.0 (referent)	
Inhom13141.5513141.651.651.65								
Any college         22         88         1.0 (referent)         22         88         1.0 (referent)           Vocational School         44         35         1.49 (0.50 to 3.52)         1.44         45         0.50 to 3.52           High school/GED         48         1.76         0.94 (0.5t to 1.72)         48         1.76         0.937 (0.511 to 1.72)           Less than high school         1.00         2.32         1.09 (0.5t to 1.52)         1.44         42         1.044 (0.650 to 3.52)           Radon quartiles (Working Level Months)!#**          7         7.45         1.00 (referent)         7         4.24         1.04 (0.650 to 1.52)         1.10         1.073 (0.429 to 1.25)           No exposite         31         1.17         0.70 (0.43 to 1.25)         31         1.23         0.050 to 1.44           1.9 to -3.0         31         0.31         0.31         0.33         0.050 to 1.44           1.9 to -3.0         31         0.31         0.31         0.33         0.050 to 1.44           2.3 do and to 1.50         31         0.31         0.31         0.31         0.31         0.31         0.31         0.31         0.050 to 1.44         3.3         0.050 to 1.04         1.050 to 2.01         1.050 to 2.01		13	41		13	41		
Vacational school         14         35         1.4.90 (0.63 to 3.2)         14.8         0.6.63 to 3.2)           High school/GED         00         0.25         0.09 (0.61 to 1.98)         0.00         325         0.199 (0.61 to 1.98)           Less than ligh school         0.00         0.25         0.190 (0.61 to 1.98)         0.00         325         0.199 (0.61 to 1.98)           Carlon, quartiles (Working Level Months) #**         V <thv< th="">         V         V</thv<>								
High schol/GED         48         176         0.94 (0.51 to 1.72)         48         176         0.937 (0.511 to 1.72)           Less than high schol         100         325         1.09 (0.61 to 1.98)         100         325         1.094 (0.661 to 1.975)           Less than high schol         14         42         1.40 (0.62 to 1.81)         14         42         1.404 (0.631 to 1.82)           Rador, quartiles (Working Level Months)1#**         7         7.30 (0.43 to 1.25)         31         117         0.733 (0.42 to 1.24)           No exposite         31         117         0.730 (0.43 to 1.25)         31         117         0.733 (0.42 to 1.24)           0.6 to 1.9         31         80         0.107 (0.62 to 1.44)         31         80         1.077 (0.62 to 1.44)           0.6 to 1.9         31         80         0.107 (0.62 to 1.44)         31         80         1.077 (0.62 to 1.44)           2.0         30         1.80 (0.63 to 1.84)         31         80         1.077 (0.62 to 1.44)           2.0         402         1.02 (0.76 to 2.29)         1.81 (0.76 to 2.09         1.81 (0.76 to 2.09         1.91 (0.76 to 2.09           3.0         405         1.20 (0.97 to 1.10)         19         92         0.729 (0.411 to 1.29) <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>								
Les than high school         100         325         1.09 (0.61 to 1.98)         100         325         1.094 (0.66 to 1.97)           Rador, quartiles (Working Level Months) [#**            1         420 (0.62 to 3.18)         14         42         1.094 (0.66 to 1.97)           No exposure         74         254         1.0 (referent)         733 (0.42 to 1254)           0.10 <0.63 to 1.93         31         123         0.08 (0.63 to 1.84)         31         80         1.077 (0.629 to 1.484)           2.30         31         80         1.30 (0.63 to 1.84)         31         80         1.077 (0.629 to 1.484)           3.40         0.12 (referent)         11         90         1.31 (0.75 to 1.290)         131         90         1.316 (0.75 to 1.291)           Abers to summe         122         1.00 (referent)         122         1.00 (referent)         111 to (.59 to 2.01)         131         0.680 (0.41 to 1.29)         132         0.680 (0.41 to 1.29)         133         10.00 (referent)         111 to (.50 to 2.01) <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>								
Inhom         14         140 (0.62 to 3.18)         14         14         140 (0.619 to 3.18)           Radon, quarilies (Working Level Months) (#**                00 exposure         74         254         1.0 (referent)         73         0.83 to 1.03 (0.35 to 1.48)         13         0.83 (0.55 to 1.48)         13         0.83 (0.55 to 1.48)         13         0.83 (0.55 to 1.48)         134         0.23 (0.55 to 1.29)         134         0.23 (0.425 to 1.28)         134         0.10 (reforent)         134         0.23 (0.415 to 2.29)         134         0.23 (0.55 to 1.29)         134         0.10 (reforent)         134         0.10 (reforent)         134         0.10 (reforent)         134         0.11 (reforent)         134         0.12 (0.55 to 2.29)         137         0.30 (0.84 to 1.29)         134         135         0.55 (0.12 (0.41 (0.42 (0								
Radon, quartiles (Working Level Months) f#**         Vol	-							
>0 to <0.6	Radon, quartiles (Working Level Months)¶#**			. ,			. ,	
0.65 c .1.9       31       123       0.86 (0.51 c .1.45)       31       123       0.859 (0.509 t 0 .1.48)         1.9 t o .3.0       31       92       1.32 (0.76 t o .2.9)       31       92       1.31 (0.75 t o .2.9)         Asbets, quartiles!!!*              31       92       1.32 (0.76 t o .2.9)       31       92       0.31 (0.75 t o .2.9)       31       92       1.31 (0.75 t o .2.9)       31       92       1.31 (0.75 t o .2.9)       31       92       0.32 (0.75 t o .2.9)       31       92       0.72 (0.41 t o 1.29)       91       92       0.72 (0.41 t o 1.29)       91       92       0.72 (0.41 t o 1.29)       91       93       0.80 (0.44 t o 1.48)       193       73       0.80 (0.44 t o 1.48)       193       1.03 (0.55 t o .2.0)       10       10.83 (0.55 t o .2.0)       10       10       1.03 (0.55 t o .2.0)       10       10       1.03 (0.55 t o .2.0)       10.83 (0.55 t o .2.0)       10.53 (0.54 t o .2.0)       <		74	254	1.0 (referent)	74	254	1.0 (referent)	
19 to <3.0	>0 to <0.6	31	117	0.73 (0.43 to 1.25)	31	117	0.733 (0.429 to 1.254)	
23.0       31       92       1.32 (0.76 to 2.29)       31       92       1.316 (0.75 to 2.29)         Asbestos, quartiles*** <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>								
Asbestos, quarilles*1**         Value         Valu							· · · ·	
No exposure         122         402         1.0 (referent)         122         402         1.0 (referent)           >0 to <1.1		31	92	1.32 (0.70 (0 2.23)	31	92	1.510 (0.756 t0 2.291)	
>0 to <1.119401.12 (0.59 to 2.10)19401.115 (0.59 to 2.10)1.1 to <5.9		122	402	1.0 (referent)	122	402	1.0 (referent)	
1.1 to <5.9								
±3.7       19       59       1.08 (0.59 to 2.01)       19       59       1.08 (0.585 to 2.006)         Slica, quartilest¶t+ <td>1.1 to &lt;5.9</td> <td></td> <td>92</td> <td></td> <td>19</td> <td>92</td> <td></td>	1.1 to <5.9		92		19	92		
Silica, quartiles*1**         Voe exposure         48         169         1.0 (referent)           >0 to <4.6	5.9 to <13.7	19	73	0.81 (0.44 to 1.48)	19	73	0.808 (0.442 to 1.479)	
No exposure         48         169         1.0 (referent)         48         169         1.0 (referent)           >0 to <4.6		19	59	1.08 (0.59 to 2.01)	19	59	1.083 (0.585 to 2.006)	
$\begin{array}{c c c c c c c } >0 \ to < 4.6 & 37 & 111 & 0.68 & 0.25 \ to 1.90 & 37 & 111 & 0.682 & 0.245 \ to 1.902 \\ 4.6 \ to < 12.6 \ to < 20.5 & 37 & 155 & 0.56 & 0.19 \ to 1.61 & 37 & 155 & 0.558 & 0.194 \ to 1.610 \\ 12.6 \ to < 20.5 & 38 & 86 & 1.07 & 0.37 \ to 3.14 & 38 & 86 & 1.072 & 0.366 \ to 3.144 \\ 220.5 & 38 & 145 & 0.78 & 0.26 \ to 2.32 & 38 & 16 & 1.072 & 0.366 \ to 3.144 \\ 220.5 & 38 & 145 & 0.78 & 0.26 \ to 2.32 & 38 & 16 & 0.772 & 0.266 \ to 2.31 & 0.78 & 0.26 \ to 2.32 & 0.78 & 0.268 \ to 2.31 &$								
4.6 to <12.6								
12.6 to <20.5								
≥20.5       38       145       0.78 (0.26 to 2.32)       38       145       0.782 (0.264 to 2.316)         PAHs from non-disel sourses, quartiles <sup>1</sup> ft <sup>1+</sup> v       v         No exposure       10       398       1.00 (referent)       120       398       1.01 (referent)         >0 to <1.2       0.10       120       398       1.00 (referent)       19       49       1.028 (0.554 to 1.907)         1.2 to <5.1       0.23       74       0.940 (0.53 to 1.68)       20       74       0.944 (0.529 to 1.684)       210       0.944 (0.529 to 1.684)       21.23       20       64       1.06 (0.59 to 1.92)       20       64       0.660 (0.59 to 1.92)       20       64       1.068 (0.58 to 1.92)       20       64       1.068 (0.59 to 1.92)       20       64       1.068 (0.59 to 1.92)       20       64       1.068 (0.59 to 1.92)       20       64       1.068 (0.58 to 1.92)       20       64       1.068 (0.59 to 1.92)       20       64       1.068 (0.58 to 1.92)       20								
PAHs from non-diesel sourses, quartiles†¶†         Vo								
No exposure         120         398         1.0 (referent)         120         398         1.0 (referent)           >0 to <1.2				. ,			. ,	
1.2 to <5.1	-	120	398		120	398	1.0 (referent)	
5.1 to <12.3				. ,				
≥12.3     20     64     1.06 (0.59 to 1.92)     20     64     1.063 (0.588 to 1.920)       Cumulative respirable dust, quartiles, mg/m³-y*1§5       0 to <5.66								
Cumulative respirable dust, quartiles, mg/m³-y*1§§         49         142         1.0 (referent)         49         142         1.0 (referent)           5.66 to <14.08								
0 to <5.66         49         142         1.0 (referent)         49         142         1.0 (referent)           5.66 to <14.08	_	20	ъ4	1.00 (0.59 to 1.92)	20	64	1.063 (0.588 to 1.920)	
5.66 to <14.08         50         184         0.91 (0.52 to 1.57)         50         184         0.905 (0.523 to 1.567)           14.08 to <29.54		49	147	1.0 (referent)	49	142	1.0 (referent)	
14.08 to <29.54 49 194 0.86 (0.49 to 1.52) 49 194 0.862 (0.488 to 1.522)								

\* P values based on two-sided Wald test for linear trend; PAH = polycyclic hydrocarbon; WL = Working Level; WLM = Working Level Months.
† Adjusted for smoking status/mine location combination (surface work only/never smoker, surface work only/unknown/occasional smoker, surface work only/former smoker/<1 pack per day, surface work only/former smoker/1 to <2 pack s per day, surface work only/former smoker/ ≥ 2 pack s per day, surface work only/former smoker/</p>

current smoker/<1 pack s per day, surface work only/current smoker/1 to <2 pack s per day, surface work only/current smoker/ ≥ 2 pack s per day, ever underground

work/never smoker, ever underground work/unknown/occasional smoker, ever underground work/former smoker/<1 pack per day, ever underground work/former

smoker/1 to <2 pack s per day, ever underground work/former smoker/ ≥ 2 pack s per day, ever underground work/current smoker/<1 pack per day, ever underground work/current smoker/1 to <2 packs per day, ever underground work/current smoker/ ≥ 2 pack s per day).

+ Other high-risk occupations for lung cancer (ie, miner who worked outside the study mines, truck driver, welder, machinery mechanic, painter).

#### HEI Diesel Epidemiology Panel

§ History of respiratory disease excluding asthma, pneumonia, and bronchitis.

Adjusted for cigarette smoking and education.

¶ Pertains only to exposures at study mines.

# Quartiles of cumulative radon exposure derived from estimated levels in WL multiplied by months at each job, summed across jobs. Thus, exposure to radon is

expressed in units of VLM. One WL = 130 000 MeV alpha energy per liter of air, and one WLM is equivalent to 1 WL exposure for 170 hours. \*\* Adjusted for smoking status: unknown, never smoker, occasional smoker, former smoker/<1 pack per day, former smoker/1 to <2 pack s per day, current smoker/<1 pack per day, current smoker/<1 pack per day, current smoker/<2 pack s per day, current smoker/<1 pack per day.

\* + Quartiles of cumulative exposure derived from the presence or absence of non-diesel PAHs based on job title tasks (0,1) multiplied by years at each job, summed across jobs.

§§ Respirable dust in milligrams per cubic meter multiplied by years of exposure.

#### Table 2. 8. Odds ratios (ORs) and 95% confidence intervals (Cls) for smoking status/smoking intensity by location of employment\*

-	OR (95% Cl)	, No. of case subjects/No. of c	ontrol subjects			
Smoking	Surface only <sup>†</sup> , average REC	Ever underground <sup>+</sup> , average	•	Surface only <sup>†</sup> , average REC intensity	Ever underground <sup>+</sup> , average REC	:
status/smoking intensity (packs per		REC intensity (1-423 μg/m³	All subjects			All subjects
day)	intensity (0-8 μg/m³ REC)	REC)		(0-8 μg/m³ REC)	intensity (1-423 μg/m <sup>3</sup> REC)	
Never smoker	1.0 (referent), 5/87	0.90 (0.26 to 3.09), 9/91	1.0 (referent), 14/178	1.0 (referent), 5/87	0.904 (0.264 to 3.091), 9/91	1.0 (referent), 14/178
Former, < 1	1.36 (0.24 to 7.59), 2/31	2.51 (0.78 to 8.11), 17/62	2.87 (1.30 to 6.33), 19/93	1.356 (0.242 to 7.587), 2/31	2.514 (0.779 to 8.114), 17/62	2.871 (1.302 to 6.332), 19/93
Former, 1 to < 2	6.66 (2.07 to 21.50), 14/40	1.97 (0.61 to 6.37), 16/68	3.56 (1.72 to 7.40), 30/108	6.663 (2.065 to 21.499), 14/40	1.968 (0.608 to 6.373), 16/68	3.562 (1.715 to 7.400), 30/108
Former, ≥ 2	16.30 (3.55 to 74.82), 6/7	2.70 (0.72 to 10.12), 9/29	5.40 (2.23 to 13.06), 15/36	16.297 (3.550 to 74.820), 6/7	2.697 (0.719 to 10.117), 9/29	5.400 (2.232 to 13.061), 15/36
Current, < 1	5.22 (1.16 to 23.39), 4/15	5.71 (1.63 to 20.01), 12/21	5.91 (2.47 to 14.10), 16/36	5.218 (1.164 to 23.386), 4/15	5.710 (1.630 to 20.005), 12/21	5.905 (2.473 to 14.104), 16/36
Current, 1 to < 2	13.34 (4.50 to 39.53), 26/41	4.51 (1.50 to 13.58), 32/78	7.36 (3.71 to 14.57), 58/119	13.342 (4.504 to 39.526), 26/41	4.510 (1.497 to 13.585), 32/78	7.356 (3.714 to 14.567), 58/119
Current, ≥ 2	26.60 (7.14 to 99.08), 12/9	7.13 (2.12 to 23.99), 17/27	12.41 (5.57 to 27.66), 29/36	26.598 (7.140 to 99.083), 12/9	7.130 (2.119 to 23.986), 17/27	12.409 (5.568 to 27.660), 29/36
Unknown §	2.86 (0.71 to 11.64), 5/24	2.65 (0.76 to 9.24), 12/36	3.10 (1.33 to 7.26), 17/60	2.864 (0.705 to 11.640), 5/24	2.645 (0.757 to 9.238), 12/36	3.102 (1.325 to 7.264), 17/60

\* REC = respirable elemental carbon.

<sup>+</sup> ORs relative to never smokers who worked only surface jobs, adjusted for cumulative REC, lagged 15 years (quartiles: 0 to <3  $\mu$  g/m<sup>3</sup>-y; 3 to <72  $\mu$  g/m<sup>3</sup>-y, 72 to

<536 µ g/m<sup>3</sup>-y, ≥ 536 µ g/m<sup>3</sup>-y), history of respiratory disease 5 or more years before date of death/reference date, and history of a high-risk job for lung cancer for

at least 10 years. P value for interaction between smoking status and location of employment based on likelihood ratio test = .082.

‡ ORs for intensity smoked relative to never smokers, adjusted for cumulative REC, lagged 15 years (quartiles: 0 to <3 μ g/m<sup>3</sup>-γ; 3 to <72 μ g/m<sup>3</sup>-γ, 72 to <536 μ g/

 $m^3 - y$ ,  $\ge 536 \mu g/m^3 - y$ ), location of employment (surface only, ever underground), history of respiratory disease 5 or more years before date of death/reference date, and history of a high-risk job for lung cancer for at least 10 years.

§ Unknown includes subjects with unknown smoking status, and subjects considered occasional smokers, who smoked at least 100 cigarettes during their lifetimes, but never smoked regularly (≥ 1 cigarette per day for at least 6 months).

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Frable 2.9.         Odds ratios (ORs) and 95% confidence intervals (Cls) for average and cumulative REC and total duration REC exposure*				Replication				
Exposure metric	Case subject	Control subject	OR (95% Cl)	<b>P</b> trend	Case subject	Control subject	OR (95% Cl)	<b>P</b> trend
Average REC intensity, quartiles, unlagged, µg/m <sup>3</sup>								
0 to < 1	49†	166	1.0 (referent)	.025	49	166	1.0 (referent)	
1 to <32	50	207	1.03 (0.50 to 2.09)		50	207	1.027 (0.503 to 2.094)	
32 to < 98	49	145	1.88 (0.76 to 4.66)		49	145	1.881 (0.759 to 4.663)	
≥ 98	50	148	2.40 (0.89 to 6.47)		50	148	2.398 (0.889 to 6.465)	
Quartiles, lagged 15 years, µg/m³								
0 to < 1	47†	190	1.0 (referent)	.062	47	190	1.0 (referent)	
1 to < 6	52	187	1.11 (0.59 to 2.07)		52	187	1.109 (0.593 to 2.073)	
6 to < 57	49	141	1.90 (0.90 to 3.99)		49	141	1.899 (0.904 to 3.988)	
≥ 57	50	148	2.28 (1.07 to 4.87)		50	148	2.280 (1.067 to 4.872)	
Cumulative REC, quartiles, unlagged, µg/m <sup>3</sup> -y								
0 to < 19	49	151	1.0 (referent)	.083	49	151	1.0 (referent)	
19 to < 246	50	214	0.87(0.48 to 1.59)		50	214	0.871 (0.476 to 1.594)	
246 to < 964	49	147	1.50 (0.67 to 3.36)		49	147	1.501 (0.671 to 3.356)	
≥ 964	50	154	1.75 (0.77 to 3.97)		50	154	1.745 (0.767 to 3.967)	
Quartiles, lagged 15 years, µg/m³-y								
0 to < 3	49	158	1.0 (referent)	0.001	49	158	1.0 (referent)	
3 to < 72	50	228	0.74 (0.40 to 1.38)		50	228	0.740 (0.398 to 1.375)	
72 to < 536	49	157	1.54 (0.74 to 3.20)		49	157	1.538 (0.740 to 3.195)	
≥ 536	50	123	2.83 (1.28 to 6.26)		50	123	2.831 (1.279 to 6.263)	
Duration of REC exposure, y								
Unexposed‡	48	165	1.0 (referent)	0.043	48	165	1.0 (referent)	
0 to < 5	51	169	1.16 (0.53 to 2.55)		51	169	1.159 (0.527 to 2.548)	
5 to < 10	20	95	0.88 (0.38 to 2.03)		20	95	0.883 (0.383 to 2.034)	
10 to < 15	31	107	0.93 (0.39 to 2.21)		31	107	0.927 (0.389 to 2.211)	
≥ 15	48	130	2.09(0.89 to 4.90)		48	130	2.087 (0.890 to 4.895)	

.. ..

\* P values based on two-sided Wald test for linear trend; adjusted for smoking status/mine location combination (surface work only/never smoker, surface work only/unknown/occasional smoker, surface work only/former smoker/<1 pack per day, surface work only/former smoker/1 to <2 packs per day, surface work only/ former smoker/ ≥ 2 pack s per day, surface work only /current smoker/<1 pack per day, surface work only/current smoker/1 to <2 packs per day, surface work only/ current smoker/≥ 2 packs per day, ever underground work/never smoker, ever underground work/unknown/occasional smoker, ever underground work/former smoker/<1 pack per day, ever underground work/former smoker/1 to <2 pack s per day, ever underground work/former smoker/  $\geq$  2 pack s per day, ever underground work/current smoker/<1 pack per day, ever underground work/current smoker/1 to <2 pack s per day, ever underground work/current smoker/ ≥ 2 pack s per day); history of respiratory disease 5 or more years before date of death/reference date; and history of a high-risk job for lung cancer for at least 10 years. REC = respirable elemental carbon.

<sup>+</sup> The number of case subjects in the referent group for the 15-year lagged average REC analysis is 2 fewer than that in the unlagged analysis because rounded cut points are presented. The unrounded cut points are <0.86 and <1.37  $\mu$  g/m 3, respectively.

‡ Unexposed includes all subjects who worked surface jobs with either negligible or bystander exposure to REC, regardless of duration.

Table 2.10. Odds ratios (ORs) and 95% confidence intervals (CIs) for average and cumulative REC and total duration REC exposure for subjects who ever worked underground jobs\*

exposure for subjects who ever worked underground job	s*						Replication	
Exposure metric	Case subject	<b>Control subject</b>	OR (95% Cl)	<b>P</b> trend	Case subject	Control subject	OR (95% Cl)	<b>P</b> trend
Average REC intensity, quartiles, unlagged, µg/m <sup>3</sup>								
0 to < 39	29	89	1.0 (referent)	.010	29	89	1.0 (referent)	
39 to < 71	29	57	1.91 (0.91 to 4.01)		29	57	1.905 (0.905 to 4.010)	
71 to < 147	29	66	2.38 (1.04 to 5.44)		29	66	2.383 (1.043 to 5.443)	
≥ 147	29	52	3.69 (1.40 to 9.70)		29	52	3.692 (1.405 to 9.703)	
Quartiles, lagged 15 years, µg/m <sup>3</sup>								
0 to < 8	29	81	1.0 (referent)	.001	29	81	1.0 (referent)	
8 to < 49	29	73	1.04 (0.45 to 2.43)		29	73	1.041 (0.446 to 2.430)	
49 to < 104	29	58	2.19 (0.87 to 5.53)		29	58	2.191 (0.868 to 5.529)	
≥ 104	29	52	5.43 (1.92 to 15.31)		29	52	5.427 (1.924 to 15.305)	
Cumulative REC, quartiles, unlagged, µg/m³-y								
0 to < 298	29	81	1.0 (referent)	.123	29	81	1.0 (referent)	
298 to < 675	29	63	1.45 (0.68 to 3.11)		29	63	1.452 (0.677 to 3.114)	
675 to < 1465	29	57	1.81 (0.84 to 3.89)		29	57	1.810 (0.842 to 3.892)	
≥ 1465	29	63	1.93 (0.90 to 4.15)		29	63	1.933 (0.901 to 4.147)	
Quartiles, lagged 15 years, µg/m³-y								
0 to < 81	29	92	1.0 (referent)	.004	29	92	1.0 (referent)	
81 to < 325	29	52	2.46 (1.01 to 6.01)		29	52	2.462 (1.008 to 6.014)	
325 to < 878	29	69	2.41 (1.00 to 5.82)		29	69	2.411 (1.000 to 5.816)	
≥ 878	29	51	5.10 (1.88 to 13.87)		29	51	5.100 (1.875 to 13.872)	
Duration of REC exposure, y								
< 5	37	92	1.0 (referent)	.062	37	92	1.0 (referent)	
5 to < 10	14	39	1.18 (0.52 to 2.68)		14	39	1.180 (0.519 to 2.680)	
10 to < 15	25	60	0.84 (0.39 to 1.82)		25	60	0.842 (0.389 to 1.824)	
≥15	40	73	2.08 (1.01 to 4.27)		40	73	2.079 (1.011 to 4.274)	

\* P values based on two-sided Wald test for linear trend. Adjusted for smoking status (never smoker, unknown/occasional smoker, former smoker/<1 pack per day, former smoker/1 to <2 pack s per day, former smoker/ ≥ 2 pack s per day, current smoker/<1 pack per day, current smoker/1 to <2 packs per day, current smoker/ ≥ 2 packs per day); history of respiratory disease 5 or more years before date of death/reference date; and history of a high-risk job for lung cancer for at least 10 years. REC = respirable elemental carbon.

<sup>+</sup> Eight case subjects and 148 control subjects were excluded because they no longer belonged to a complete matched set after analysis was restricted to underground workers.

Table 2.11. Odds ratios (ORs) and 95% confidence intervals (Cls) for average and cumulative REC and total duration REC
exposure for subjects who ever worked surface jobs*

exposure for subjects who ever worked surface jobs*					Replication				
Exposure metric	Case subject	Control subject	OR (95% Cl)	<b>P</b> trend	Case subject	Control subject	OR (95% Cl)	<b>P</b> trend	
Average REC intensity, quartiles, unlagged, µg/m <sup>3</sup>									
0 to < 0.86	13	24	1.0 (referent)	.983	13	24	1.0 (referent)		
0.86 to < 0.95	13	21	1.29 (0.18 to 9.33)		13	21	1.294 (0.179 to 9.333)		
0.95 to < 1.9	13	19	7.24 (0.23 to 228.53)		13	19	7.238 (0.229 to 228.518)		
≥ 1.9	14	36	3.28 (0.09 to 123.50)		14	36	3.282 (0.087 to 123.494)		
Quartiles, lagged 15 years, µg/m³									
0 to < 0.6	13	38	1.0 (referent)	.659	13	38	1.0 (referent)		
0.6 to < 0.9	13	17	4.38 (0.56 to 34.24)		13	17	4.377 (0.560 to 34.237)		
0.9 to < 1.4	13	12	5.67 (0.77 to 42.06)		13	12	5.672 (0.765 to 42.059)		
≥ 1.4	14	33	1.31 (0.14 to 12.01)		14	33	1.310 (0.143 to 12.004)		
Comulative REC, quartiles, unlagged, µg/m <sup>3</sup> -y									
0 to < 6.5	13	17	1.0 (referent)	.294	13	17	1.0 (referent)		
6.5 to < 12.5	13	27	0.78 (0.18 to 3.43)		13	27	0.779 (0.177 to 3.429)		
12.5 to < 22.5	13	23	0.60 (0.14 to 2.53)		13	23	0.596 (0.140 to 2.525)		
≥ 22.5	14	33	0.40 (0.07 to 2.40)		14	33	0.395 (0.065 to 2.402)		
Quartiles, lagged 15 years, µg/m³-y									
0 to < 0.7	13	29	1.0 (referent)	.117	13	29	1.0 (referent)		
0.7 to < 4.4	13	9	3.98 (0.69 to 23.02)		13	9	3.981 (0.689 to 23.016)		
4.4 to < 14.3	13	32	0.76 (0.12 to 4.98)		13	32	0.764 (0.117 to 4.981)		
≥ 14.3	14	30	0.42 (0.05 to 3.59)		14	30	0.424 (0.050 to 3.588)		
Duration of REC exposure, y									
Unexposed‡	34	61	1.0 (referent)		34	61	1.0 (referent)		
0 to < 5	10	17	1.44 (0.26 to 8.17)	.152	10	17	1.443 (0.255 to 8.166)		
5 to < 10	5	12	0.74 (0.10 to 5.21)		5	12	0.736 (0.104 to 5.212)		
10 to < 15	3	3	0.55 (0.05 to 6.17)		3	3	0.546 (0.048 to 6.169)		
≥ 15	1	7	0.22 (0.01 to 3.67)		1	7	0.216 (0.013 to 3.665)		

\* P values based on two-sided Wald test for linear trend. Adjusted for smoking status (never smoker, unknown/occasional smoker, former smoker/<1 pack

per day, former smoker/1 to <2 pack s per day, former smoker/  $\geq$  2 pack s per day, current smoker/<1 pack per day, current smoker/1 to <2 pack s per day, current smoker/  $\geq$  2 pack s per day); history of respiratory disease 5 or more years before date of death/reference date; and history of a high-risk job for lung cancer for at least 10 years. REC = respirable elemental carbon.

<sup>+</sup> Twenty-one case subjects and 154 control subjects were excluded because they no longer belonged to a complete matched set after analysis was restricted to surface workers.

‡ Unexposed includes subjects who worked surface jobs with either negligible or bystander exposure to REC.

			BBed 10 years crossed man						
smoking intensity*				Replication					
		Cumulative REC lagged 15 years	s	Cumulative REC lagged 15 years					
	OR (95% Cl)	), No. of case subjects/No. of co	ntrol subjects	OR (95% Cl), No. of case subjects/No. of control subjects					
Smoking intensity (packs per day)	Tertile 1 , 0 to < 8 μg/m³-γ	Tertile 2, 8 to < 304 μg/m³-y	Tertile 3 , ≥ 304 µg/m³-y	Tertile 1 , 0 to < 8 μg/m³-y	Tertile 2, 8 to < 304 μg/m³-y	Tertile 3 , ≥ 304 μg/m³-y			
Never smoker	1.0 (referent), 3/59	1.47 (0.29 to 7.50), 4/74	7.30 (1.46 to 36.57), 7/45	1.0 (referent), 3/59	1.465 (0.286 to 7.505), 4/74	7.305 (1.459 to 36.575), 7/45			
< 1	6.25 (1.42 to 27.60), 10/41	7.42 (1.62 to 34.00), 10/49	16.35 (3.45 to 77.63), 15/39	6.255 (1.417 to 27.605), 10/41	7.422 (1.620 to 34.005), 10/49	16.355 (3.445 to 77.641), 15/39			
1 to < 2	10.16 (2.55 to 40.53), 29/78	11.58 (2.87 to 46.71), 32/86	20.42 (4.52 to 92.36), 27/63	10.159 (2.546 to 40.535), 29/78	11.586 (2.873 to 46.720), 32/86	20.423 (4.515 to 92.375), 27/63			
≥ 2	26.79 (6.15 to 116.63), 19/22	22.17 (4.84 to 101.65), 15/22	17.38 (3.48 to 86.73), 10/28	26.792 (6.153 to 116.651), 19/22	22.175 (4.837 to 101.667), 15/22	17.384 (3.484 to 86.750), 10/28			
Unknown†	4.13 (0.74 to 23.22), 4/25	3.79 (0.64 to 22.41), 4/23	27.85 (5.03 to 154.31), 9/12	4.134 (0.736 to 23.226), 4/25	3.787 (0.640 to 22.418), 4/23	27.851 (5.026 to 154.339), 9/12			

Table 2.12. Odds ratios (ORs) and 95% confidence intervals (Cls) for Cumulative REC lagged 15 years crossed with

\* Adjusted for history of respiratory disease 5 or more years before date of death/reference date, history of a high-risk job for lung cancer for at least 10 years, and mine location (surface- only vs any underground work). P value for interaction between smoking intensity and cumulative REC lagged 15 years = .086. REC = respirable elemental carbon.

† Unknown includes subjects with unknown smoking status, and subjects considered occasional smokers, who smoked at least 100 cigarettes during their lifetimes, but never smoked regularly (  $\geq$  1 cigarette per day for at least 6 months).

Table 2.13. Odds ratios (ORs) and 95% confidence intervals (	Replication							
Exposure by mine type	Case subject	Control subject	OR (95% Cl)	<b>P</b> trend	Case subject	Control subject	OR (95% Cl)	<b>P</b> trend
Potash								
Average REC intensity, lagged 15 years, quartiles, $\mu g/m^3$								
0 to <1	25	95	1.0 (referent)	.058	25	95	1.0 (referent)	
1 to <6	20	51	1.16 (0.49 to 2.76)		20	51	1.163 (0.490 to 2.759)	
6 to <57	30	105	2.05 (0.70 to 6.01)		30	105	2.050 (0.700 to 6.010)	
≥57	27	85	3.01 (0.98-9.25)		27	85	3.014 <mark>(0.928</mark> to 9.250)	
Cumulative REC, lagged 15 years, quartiles, μg/m <sup>3</sup> -y								
0 to <3	19	60	1.0 (referent)	.006	19	60	1.0 (referent)	
3 to <72	30	103	1.64 (0.67 to 3.98)		30	103	1.635 (0.671 to 3.983)	
72 to <536	25	105	2.50 (0.86 to 7.24)		25	105	2.496 (0.860 to 7.243)	
≥536	28	68	5.53 (1.68 to 18.21)		28	68	5.528 (1.678 to 18.206)	
Trona								
Average REC intensity, lagged 15 years, quartiles, μg/m <sup>3</sup>								
0 to <1	17	70	1.0 (referent)	.105	17	70	1.0 (referent)	
1 to <6	18	64	2.32 (0.52 to 10.40)		18	64	2.317 (0.516 to 10.397)	
6 to <57	2	6	1.71 (0.12 to 23.66)		2	6	1.710 ( <mark>0.124</mark> to 23.656)	
≥57	14	34	5.95 (0.92 to 38.37)		14	34	5.953 (0.924 to 38.365)	
Cumulative REC, lagged 15 years, quartiles, μg/m <sup>3</sup> -y								
0 to <3	24	72	1.0 (referent)	.062	24	72	1.0 (referent)	
3 to <72	11	64	0.23 (0.06 to 0.91)		11	64	0.233 (0.059 to 0.913)	
72 to <536	7	17	0.95 (0.16 to 5.72)		7	17	0.954 (0.159 to 5.721)	
≥536	9	21	2.38 (0.44 to 13.00)		9	21	2.381 (0.436 to 12.997)	

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\* P values based on two-sided Wald test for linear trend. Adjusted for smoking status/mine location combination (surface work only/never smoker, surface work only/unknown/occasional smoker, surface work only/former smoker/<1 pack per day, surface work only/former smoker/1 to <2 pack s per day, surface work only/ former smoker/ ≥ 2 packs per day, surface work only/current smoker/<1 pack per day, surface work only/current smoker/1 to <2 pack s per day, surface work only/ current smoker/ ≥ 2 pack s per day, ever underground work/never smoker, ever underground work/unknown/occasional smoker, ever underground work/former smoker/<1 pack per day, ever underground work/former smoker/1 to <2 pack s per day, ever underground work/former smoker/ ≥ 2 pack s per day, ever underground work/current smoker/<1 pack per day, ever underground work/current smoker/1 to <2 pack s per day, ever underground work/current smoker/ ≥ 2 pack s per day); history of respiratory disease 5 or more years before date of death/reference date; and history of a high-risk job for lung cancer for at least 10 years. REC = respirable elemental carbon.