

Supplemental Materials

Supplemental Table 1

Supplemental Table 1. Underlying causes of death for non-malignant respiratory diseases and corresponding International Classification of Diseases (ICD) Ninth revision (ICD-9) and Tenth revision (ICD-10) codes, as defined in the Life Table Analysis System (LTAS) NIOSH-119 mortality rate file. Additionally included is the *a priori* defined "pulmonary fibrosis group" that is a subset of the "other respiratory diseases" group.

Underlying Cause of Death	ICD-9 Codes	ICD-10 Codes	No. Deaths Observed
Acute respiratory infections (excluding influenza and pneumonia)	460–466	J00–J01, J02.8–J02.9, J03.8–J03.9, J04–J06, J20–J22	< 10
Influenza	487	J09–J11	16
Pneumonia	480–486	A48.1, J12–J18	424
Chronic obstructive pulmonary disease	490–492, 496	J40–J44	583
Asthma	493	J45–J46	16
Asbestosis	501	J61	< 10
Silicosis	502	J62	0
Other pneumoconioses	500, 503, 505	J60, J63–J64	0
Other respiratory diseases	470–478, 494–495, 504, 506–519	J30–J33, J34.1–J34.8, J35–J39, J47, J66–J95, J98–J99, R09.1	537
Pulmonary fibrosis group	515, 516.3	J84.1	212

Supplemental Table 2

Supplemental Table 2. Race coding used in the Life Table Analysis System (LTAS) software (White or All Other Races) for sensitivity analyses (Groups 1–5) and main analyses.

ADA Race Information (submitted to NDI)	Number of Decedents	NDI Race Information							
		Does Not Match ADA Race		No Race Available		Not Provided by NDI*		Matches ADA Race	
		Race Coding in LTAS	Justification for Coding	Race Coding in LTAS	Justification for Coding	Race Coding in LTAS	Justification for Coding	Race Coding in LTAS	Justification for Coding
Group 1	38,719								
Asian or NHOPI [§]		all other races	NDI's race categories were more detailed than ADA's race categories so the decedents' race could be, or have been recorded by NDI as, another different, more detailed race category. Therefore, these decedents were coded for LTAS as "all other races."	all other races	Race information was not available from NDI so these decedents were coded for LTAS according to race information from ADA.	N/A	Decedents with unknown race information were coded for LTAS as White so as to not disproportionately skew "all other races" category results.	all other races	ADA race information matched NDI race information so were coded for LTAS accordingly.
White		all other races		White		N/A		White	
Black		all other races		all other races		N/A		all other races	
American Indian		all other races		N/A		N/A		all other races	
Unknown		N/A [†]		N/A		White		N/A	
Group 2	38,719								
Asian or NHOPI		all other races	Same as Group 1, except decedents with ADA race as "Black" and "American Indian" were coded for LTAS as White. [‡]	all other races	Same as Group 1	N/A	Same as Group 1	all other races	Same as Group 1
White		all other races		White		N/A		White	
Black		White		all other races		N/A		all other races	
American Indian		White		N/A		N/A		all other races	
Unknown		N/A		N/A		White		N/A	
Group 3	38,599								
Asian or NHOPI		all other races	Same as Groups 1 and 2, except decedents with ADA race as "Black" and "American Indian" were excluded because we do not know if coding them for LTAS as "all other races" (Group 1) or White (Group 2) is more appropriate.	all other races	Same as Group 1	N/A	Same as Group 1	all other races	Same as Group 1
White		all other races		White		N/A		White	
Black		excluded		all other races		N/A		all other races	
American Indian		excluded		N/A		N/A		all other races	
Unknown		N/A		N/A		White		N/A	

Group 4		38,123						
Asian or NHOPI	excluded	These decedents were excluded from this sensitivity analysis.	all other races	Same as Group 1	N/A	Same as Group 1	all other races	Same as Group 1
White	excluded		White		N/A		White	
Black	excluded		all other races		N/A		all other races	
American Indian	excluded		N/A		N/A		all other races	
Unknown	N/A		N/A		White		N/A	
Group 5		38,024						
Asian or NHOPI	excluded	These decedents were excluded from this sensitivity analysis.	excluded	These decedents were excluded from this sensitivity analysis.	N/A	Same as Group 1	all other races	Same as Group 1
White	excluded		excluded		N/A		White	
Black	excluded		excluded		N/A		all other races	
American Indian	excluded		N/A		N/A		all other races	
Unknown	N/A		N/A		White		N/A	
Main Analyses		21,928						
Asian or NHOPI	excluded	These decedents were excluded from main analyses.	excluded	These decedents were excluded from main analyses.	N/A	These decedents were excluded from main analyses.	all other races	Main analyses were limited to this group of decedents where ADA race information matched NDI race information and were coded for LTAS accordingly.
White	excluded		excluded		N/A		White	
Black	excluded		excluded		N/A		all other races	
American Indian	excluded		N/A		N/A		all other races	
Unknown	N/A		N/A		excluded		N/A	

*NDI provides an indicator describing how the user-supplied value matches (or not) the NDI death record. For all decedents with unknown race information from ADA, we did not provide NDI a value for race; hence, race information was not provided in return by NDI.

†N/A: no decedents in this category.

‡NDI has multiple Asian ancestry race categories so decedents in ADA race category "Asian or Native Hawaiian or Other Pacific Islander" might have matched to a different, more detailed Asian ancestry category; therefore, they were coded for LTAS as "all other races."

§NHOPI: Native Hawaiian or Other Pacific Islander

Supplemental Table 3

Supplemental Table 3. Characteristics of dentists who died during 1979–2018 for which cause(s) of death were obtained, by sensitivity analysis group.

	Group 1 (N=38,719)	Group 2 (N=38,719)	Group 3 (N=38,599)	Group 4 (N=38,123)	Group 5 (N=38,024)
Characteristic	n (%)	n (%)	n (%)	n (%)	n (%)
Sex					
Male	38,140 (98.5)	38,140 (98.5)	38,026 (98.5)	37,560 (98.5)	37,469 (98.5)
Female	579 (1.5)	579 (1.5)	573 (1.5)	563 (1.5)	555 (1.5)
Race (as coded for analyses)					
White	37,162 (96.0)	37,282 (96.3)	37,162 (96.3)	37,162 (97.5)	37,073 (97.5)
All Other Races	1,557 (4.0)	1,437 (3.7)	1,437 (3.7)	961 (2.5)	951 (2.5)
Age at death (years)					
Mean (range)	78.0 (26.1–108.8)	78.0 (26.1–108.8)	78.1 (26.1–108.8)	78.1 (26.1–108.8)	78.1 (26.1–108.8)
25–34	135 (0.3)	135 (0.3)	135 (0.3)	132 (0.3)	132 (0.3)
35–44	610 (1.6)	610 (1.6)	605 (1.6)	590 (1.5)	586 (1.5)
45–54	1,463 (3.8)	1,463 (3.8)	1,451 (3.8)	1,423 (3.7)	1,422 (3.7)
55–64	3,586 (9.3)	3,586 (9.3)	3,567 (9.2)	3,511 (9.2)	3,502 (9.2)
65–74	7,332 (18.9)	7,332 (18.9)	7,298 (18.9)	7,216 (18.9)	7,199 (18.9)
75–84	12,780 (33.0)	12,780 (33.0)	12,752 (33.0)	12,608 (33.1)	12,575 (33.1)
85–94	11,298 (29.2)	11,298 (29.2)	11,279 (29.2)	11,157 (29.3)	11,128 (29.3)
≥95	1,515 (3.9)	1,515 (3.9)	1,512 (3.9)	1,486 (3.9)	1,480 (3.9)
Time between dental school graduation and death (years)					
Mean (range)	51.0 (<1–83.8)	51.0 (<1–83.8)	51.0 (<1–83.8)	51.0 (<1–83.8)	51.0 (<1–83.8)
Less than 5	80 (0.2)	80 (0.2)	80 (0.2)	78 (0.2)	78 (0.2)
5–9	201 (0.5)	201 (0.5)	200 (0.5)	194 (0.5)	194 (0.5)
10–19	798 (2.1)	798 (2.1)	789 (2.0)	773 (2.0)	769 (2.0)
20–34	3,693 (9.5)	3,693 (9.5)	3,666 (9.5)	3,598 (9.4)	3,592 (9.4)
35–49	11,102 (28.7)	11,102 (28.7)	11,058 (28.6)	10,907 (28.6)	10,879 (28.6)
50–64	17,831 (46.1)	17,831 (46.1)	17,799 (46.1)	17,617 (46.2)	17,567 (46.2)
≥65	5,014 (12.9)	5,014 (12.9)	5,007 (13.0)	4,956 (13.0)	4,945 (13.0)
Practice Type					
Owner	26,373 (68.1)	26,373 (68.1)	26,289 (68.1)	25,896 (67.9)	25,819 (67.9)

Non-Owner	851 (2.2)	851 (2.2)	848 (2.2)	840 (2.2)	838 (2.2)
Associate	987 (2.5)	987 (2.5)	982 (2.5)	970 (2.5)	966 (2.5)
Independent Contractor	526 (1.4)	526 (1.4)	526 (1.4)	522 (1.4)	521 (1.4)
Unknown	9,982 (25.8)	9,982 (25.8)	9,954 (25.8)	9,895 (26.0)	9,880 (26.0)
NMRD* as underlying cause of death	2,969 (7.7)	2,969 (7.7)	2,964 (7.7)	2,925 (7.7)	2,917 (7.7)
Pulmonary fibrosis group as underlying cause of death†	326 (0.8)	326 (0.8)	324 (0.8)	319 (0.8)	319 (0.8)

*NMRD: non-malignant respiratory disease.

†Pulmonary fibrosis group was defined as International Classification of Diseases (ICD), Ninth Revision (ICD-9) and Tenth Revision (ICD-10) codes that most closely approximated idiopathic pulmonary fibrosis: ICD-9 515 (postinflammatory pulmonary fibrosis), ICD-9 516.3 (idiopathic interstitial pneumonia), or ICD-10 J84.1 (other interstitial pulmonary diseases with fibrosis).

Supplemental Sensitivity Analyses Results

In the broadest sensitivity analysis group (Group 1), which included all dentist decedents for whom we had an underlying cause of death (UCOD) for any proportionate mortality ratio (PMR) analysis (N=38,719), 2,969 (7.7%) decedents had a non-malignant respiratory disease (NMRD) as their UCOD, and 326 of these decedents (11.0% of decedents who died from NMRD; 0.8% overall) died from a pulmonary fibrosis group (PF group) UCOD; these percentages were the same among the five sensitivity analyses groups.

As with main analyses, proportionate mortality for dentist decedents in all five sensitivity analyses was significantly lower than the general U.S. population for NMRD overall, chronic obstructive pulmonary disease, pneumonia, and asbestosis; not significantly different from the general U.S. population for influenza and asthma; and significantly higher than the general U.S. population for the NMRD “other respiratory diseases” category and the PF group (Supplemental Table 4). Similarly, no decedents had an UCOD of silicosis or other pneumoconioses.

Consistent with main analyses, the most common UCODs for decedents in the NMRD “other respiratory diseases” category were PF group diseases, which accounted for 37.3–37.4% of this category, and pneumonitis due to food and vomit, which accounted for 37.1–37.4% of this category, among all sensitivity analysis groups (Supplemental Table 5). Also similar to main analyses, in the broadest sensitivity analysis group (Group 1), the contributions of PF group diseases and pneumonitis due to food and vomit to the “other respiratory diseases” category remained stable across each calendar period of the study since 1990–1994 (Supplemental Figure 1); Group 1 had fewer than ten deaths in the “other respiratory diseases” category prior to 1990.

Among decedents included in Group 1, the broadest sensitivity analysis, the earliest death from a PF group UCOD was during 1985–1989. The PMRs for PF group deaths were significantly elevated during 1990–2014; the PMRs for PF group deaths during 1985–1989 and 2015–2018 were greater than one but did not reach statistical significance (Supplemental Figure 2).

Supplemental Table 4

Supplemental Table 4. Proportionate mortality ratios for non-malignant respiratory disease and pulmonary fibrosis group causes of death among dentist decedents, by sensitivity analysis group.

Underlying Cause of Death	Group 1 (N=38,719)		Group 2 (N=38,719)		Group 3 (N=38,599)		Group 4 (N=38,123)		Group 5 (N=38,024)	
	Standardized PMR (95% CI)*	P value	Standardized PMR (95% CI)	P value	Standardized PMR (95% CI)	P value	Standardized PMR (95% CI)	P value	Standardized PMR (95% CI)	P value
Non-malignant respiratory disease	0.70 (0.67–0.72)	< .001	0.70 (0.67–0.72)	< .001	0.70 (0.67–0.72)	< .001	0.70 (0.67–0.72)	< .001	0.70 (0.67–0.72)	< .001
Chronic obstructive pulmonary disease	0.49 (0.46–0.52)	< .001	0.49 (0.46–0.52)	< .001	0.49 (0.46–0.52)	< .001	0.49 (0.46–0.52)	< .001	0.49 (0.46–0.52)	< .001
Pneumonia	0.82 (0.77–0.88)	< .001	0.82 (0.77–0.88)	< .001	0.82 (0.77–0.88)	< .001	0.82 (0.77–0.88)	< .001	0.82 (0.77–0.87)	< .001
Influenza	0.95 (0.59–1.45)	.911	0.95 (0.58–1.44)	.906	0.95 (0.59–1.45)	.917	0.96 (0.59–1.46)	.947	0.96 (0.59–1.47)	.960
Asthma	0.86 (0.58–1.24)	.491	0.87 (0.58–1.25)	.504	0.87 (0.58–1.25)	.517	0.89 (0.60–1.28)	.616	0.90 (0.60–1.29)	.626
Asbestosis	0.05 (0.00–0.30)	< .001	0.05 (0.00–0.30)	< .001	0.05 (0.00–0.30)	< .001	0.05 (0.00–0.30)	< .001	0.05 (0.00–0.30)	< .001
Acute respiratory infections (excluding influenza and pneumonia)	1.93 (1.00–3.37)	.051	1.93 (1.00–3.37)	.051	1.93 (1.00–3.38)	.050	1.95 (1.01–3.40)	.048	1.95 (1.01–3.41)	.047
Silicosis	0.00 (0.00–1.33)	.124	0.00 (0.00–1.33)	.125	0.00 (0.00–1.33)	.126	0.00 (0.00–1.35)	.131	0.00 (0.00–1.36)	.132
Other pneumoconioses	0.00 (0.00–0.21)	< .001	0.00 (0.00–0.21)	< .001	0.00 (0.00–0.21)	< .001	0.00 (0.00–0.21)	< .001	0.00 (0.00–0.21)	< .001
Other respiratory diseases	1.15 (1.08–1.23)	< .001	1.15 (1.08–1.23)	< .001	1.15 (1.08–1.23)	< .001	1.15 (1.07–1.23)	< .001	1.15 (1.07–1.23)	< .001
Pulmonary fibrosis group†	1.51 (1.35–1.68)	< .001	1.50 (1.35–1.68)	< .001	1.50 (1.34–1.67)	< .001	1.49 (1.33–1.66)	< .001	1.49 (1.33–1.66)	< .001

*PMRs were calculated using Life Table Analysis System software, indirectly standardized for age, sex, race, and 5-year calendar period, with 95% CIs and 2-sided *P* values based on the Poisson distribution.

†Pulmonary fibrosis group was defined as International Classification of Diseases (ICD), Ninth Revision (ICD-9) and Tenth Revision (ICD-10) codes that most closely approximated idiopathic pulmonary fibrosis: ICD-9 515 (postinflammatory pulmonary fibrosis), ICD-9 516.3 (idiopathic interstitial pneumonia), or ICD-10 J84.1 (other interstitial pulmonary diseases with fibrosis).

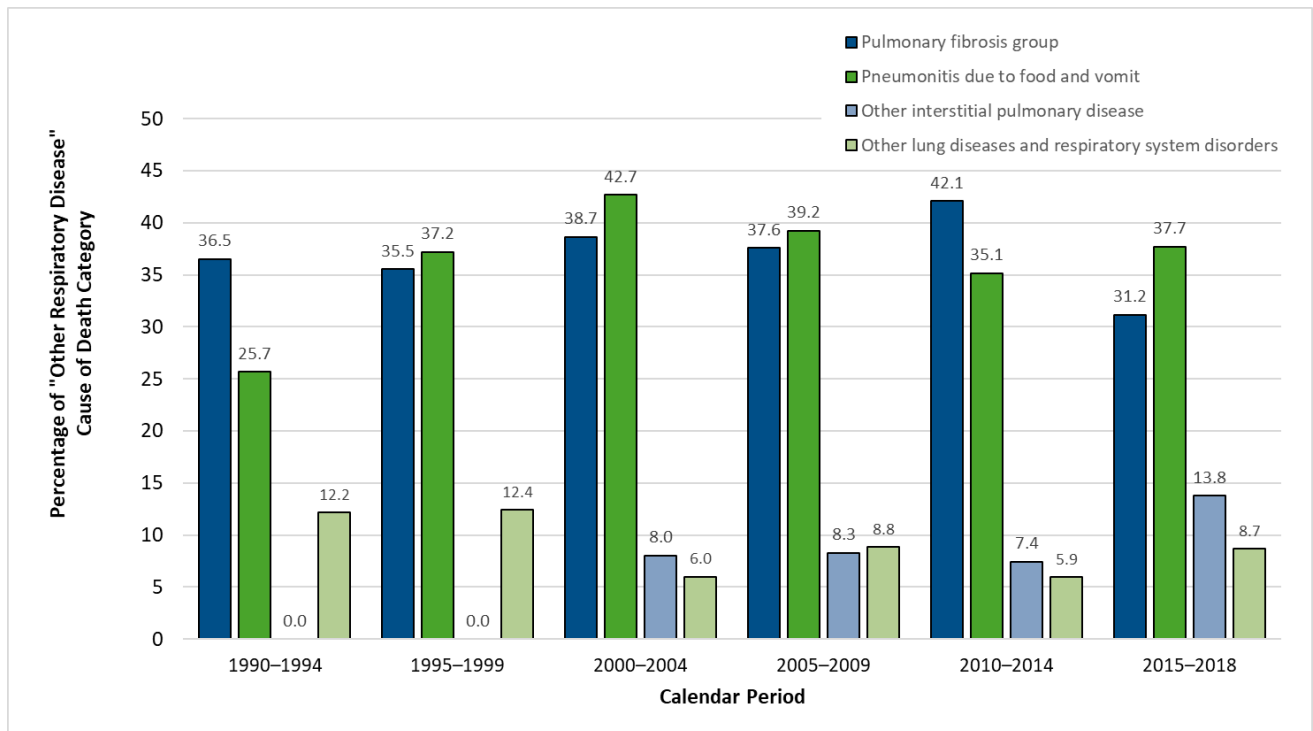
Supplemental Table 5

Supplemental Table 5. Underlying cause of death among dentist decedents in "other respiratory diseases" cause of death category and corresponding International Classification of Diseases (ICD) Ninth revision (ICD-9) and Tenth revision (ICD-10) codes, by sensitivity analysis group.

Underlying Cause of Death	ICD-9 Codes	ICD-10 Codes	Group 1 (n=871)	Group 2 (n=871)	Group 3 (n=871)	Group 4 (n=855)	Group 5 (n=853)
			n (%)	n (%)	n (%)	n (%)	n (%)
Pulmonary fibrosis group	515, 516.3	J84.1	326 (37.4)	326 (37.4)	324 (37.3)	319 (37.3)	319 (37.4)
Pneumonitis due to food and vomit	507.0	J69.0	323 (37.1)	323 (37.1)	322 (37.1)	319 (37.1)	319 (37.4)
Other interstitial pulmonary disease	N/A*	J84.8, J84.9	61 (7.0)	61 (7.0)	61 (7.0)	59 (6.9)	57 (6.7)
Other lung diseases and respiratory system disorders	518.8, 519.8	J80, J98.4, J98.8, J98.9	73 (8.4)	73 (8.4)	73 (8.4)	71 (8.3)	71 (8.3)

*N/A: No decedents in this category.

Supplemental Figure 1. Percentage of "other respiratory diseases" category deaths from a specified cause or group of causes for sensitivity analysis Group 1 (the broadest sensitivity analysis group), by calendar period.



Supplemental Figure 2. Proportionate mortality from pulmonary fibrosis group causes of death among dentist decedents in Group 1 (the broadest sensitivity analysis group), by calendar period, with 95% confidence intervals (CIs). Pulmonary fibrosis group was defined as International Classification of Diseases (ICD), Ninth Revision (ICD-9) and Tenth Revision (ICD-10) codes that most closely approximated idiopathic pulmonary fibrosis: ICD-9 515 (postinflammatory pulmonary fibrosis), ICD-9 516.3 (idiopathic interstitial pneumonia), or ICD-10 J84.1 (other interstitial pulmonary diseases with fibrosis). Proportionate mortality ratios (PMRs) were calculated using Life Table Analysis System software, indirectly standardized for age, sex, and race, with 95% CIs and 2-sided *P* values based on the Poisson distribution.

