Exhibit 228

Extended Mortality Follow-up of a Cohort of Dry Cleaners

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Background: Dry cleaning workers are commonly exposed to tetrachloroethylene, a suspected bladder carcinogen, and other organic solvents. The health risks associated with solvent exposures in this industry are unclear.

Methods: We extended mortality follow-up of 5,369 dry cleaning union members in St. Louis to further investigate solvent-related risks. We added 22 years of follow-up, from 1993 through 2014, via linkage to the National Death Index. Using Cox proportional hazards modeling, we computed hazard ratios (HRs) and 95% confidence intervals (CIs) relating cause-specific mortality with levels of a solvent exposure index previously developed by an industrial hygienist based on workers' job titles from union records. The models were fit adjusting for age, sex, and decade of union enrollment, and assuming different exposure lags.

Results: In internal analyses of estimated solvent exposure with a 20-year lag, we observed exposure–response relationships for bladder cancer (HR medium exposure = 4.2; 95% CI = 0.7, 24.5 and HR high exposure = 9.2; 95% CI = 1.1, 76.7 vs. no exposure; P_{trend} = 0.08) and kidney cancer (HR = 4.1; 95% CI = 0.7, 22.5 and 24.4; 2.9, 201.6; P_{trend} = 0.004). High exposure was also associated with heart disease (HR = 1.6; 95% CI = 1.1, 2.2) and lymphatic/hematopoietic malignancies (HR = 4.3; 95% CI = 1.4, 13.6).

Conclusions: These findings are, to the best of our knowledge, the first cohort evidence relating solvent exposure levels among dry cleaners to elevated risks of selected cancers and heart disease. Additional studies employing solvent-specific exposure assessment are needed to clarify cancer risks associated with tetrachloroethylene.

Keywords: Bladder cancer; Cohort study; Dry cleaning; Kidney cancer; Mortality; Tetrachloroethylene

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The International Agency for Research on Cancer (IARC) has classified exposures related to employment in the dry cleaning industry as possibly carcinogenic to humans (Group 2B).[1] The exposures of concern involve organic solvents used in the dry cleaning process. Over the years, the dry cleaning industry has used several different solvents.[2,3] Stoddard solvent, a petroleum-derived organic solvent, dominated the industry until the 1930s, when chlorinated solvents such as carbon tetrachloride and trichloroethylene became popular. Both Stoddard solvent and carbon tetrachloride were largely replaced in the 1960s by tetrachloroethylene (also commonly referred to as perchloroethylene), which has become the predominant solvent used by retail dry cleaners in the United States. Tetrachloroethylene is a widespread environmental pollutant owing to industrial releases,[4] with particularly high concentrations in ambient indoor air of buildings containing dry cleaning facilities.[5,6]

There is concern over the health effects of tetrachloroethylene, classified by IARC as a probable human carcinogen.[7] Experimental studies have demonstrated excesses of liver tumors in mice, mononuclear cell leukemia in one strain of rats, and renal cell adenomas and adenocarcinomas in male rats.[7] The epidemiologic evidence, however, is limited. Some epidemiologic studies among dry cleaners, but not others, have reported excesses for bladder cancer and, less frequently, cancers of the esophagus, cervix, and kidney[7] and non-Hodgkin lymphoma (NHL), although most lacked assessments of workers' solvent exposure levels.

To further investigate cancer associations with solvent exposure in the dry cleaning industry, we extended mortality follow-up within a cohort of 5,369 dry cleaning union members. In particular, we utilized solvent exposure assessment metrics previously developed within this cohort to conduct internal comparisons of relative exposure level among workers.

METHODS

Details of the study have been described.[8,9] The cohort was assembled from historical dues records maintained by Local No. 161 (St Louis) of the Laundry, Dry Cleaning, and Dye House Workers' International Union. Members of Local 161 worked exclusively in dry cleaning establishments. Only union members admitted before 1978 were included in the cohort. Investigators abstracted the following information from dues records for union members admitted: name, Social Security number, date of birth, year and age of entry into the union, number of dues-paying months by calendar year, race, sex, job titles (usually from around the time of union entry), and most recent firm where employed. When not available from dues records, race, sex, and date of birth were sought from other sources including

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driver's license records, social security files, health care finance administration records, and credit bureaus. This study was determined to be exempt from institutional review board review by the NIH Office of Human Subjects Research Protections.

In the initial follow-up of the cohort through 1978, vital status was determined using information from union records, the Social Security Administration, motor vehicle departments, credit bureaus, state bureaus of social services, and telephone and street directories.[8] Death certificates were coded by an experienced nosologist. In a subsequent follow-up through 1992, vital status and cause of death were ascertained through linkage to the National Death Index (NDI).[9] For this update, we extended follow-up until December 31, 2014 through linkage to the NDI and Social Security Administration Death Master File. Underlying and contributing causes of death, coded according to the International Classification of Diseases, Ninth Revision (ICD-9) system, were translated to the Eighth Revision (Adapted) Classification (ICDA-8) coding system to harmonize with previously collected mortality data from earlier cohort follow-up.

A solvent exposure score was developed by the study industrial hygienist (P.A.S.) based on published monitoring studies of the dry cleaning industry[10–14] and applied to job titles abstracted from union records. Mean tetrachloroethylene exposure levels reported in the published monitoring studies ranged from 25 to 280 ppm. For context, the current Occupational Safety and Health Administration's personal exposure limit for tetrachloroethylene is an 8-hour time-weighted average of 100 ppm.[15] Monitoring data indicated that levels were highest for jobs performed at the washers and progressively decreased with distance from the washing machines. In our study, cleaners were assigned a score of 40 (high exposure) for an 8-hour time-weighted average, while persons working as pressers or sewers or at the counter were given a score of 7 (medium exposure). Cohort members employed at pick-up stations where no dry cleaning occurred had little or no exposure and were assigned a score of zero (although they would have had a higher exposure than the general population due to off-gassing from the cleaned garments). For most subjects, only one job title was recorded. Of the 978 subjects with a second job title, the exposure assessment category was identical for 956 of them. In addition to the workers' assessed solvent exposure level, other analyzed exposure metrics included duration of union membership through 1978 (as a surrogate for exposure duration) and cumulative exposure (the product of exposure score and duration of union membership through 1978), categorized using tertiles.

Person–year accumulation began on date of entry into the union, or January 1, 1948, whichever came later, and ended at date of death, 90 years, or end of follow-up, whichever came first. For external comparisons, we calculated standardized mortality ratios (SMRs) and 95% confidence intervals (CI), with US general population mortality rates by age, sex, race, and calendar period as a reference, both overall and stratified by sex, race, and year of enrollment in the union (<1960, ≥1960). For internal comparisons, we computed hazard ratios (HRs) and 95% CIs relating different levels of the exposure metrics to mortality by fitting Cox proportional hazards models using attained age as the time scale, adjusting for sex and decade of union enrollment, and applying exposure lags of 0, 10, and 20 years. We evaluated the proportional hazards assumption through inspection of Kaplan–Meier curves and testing the significance of interaction terms relating exposure and attained age. Tests of trend were computed by modeling the solvent exposure level scores (0, 7, and 40), intra-category medians of union membership duration, or cumulative exposure as continuous variables. As a sensitivity analysis, we also performed trend tests using alternative integer values (1, 2, and 3) for the exposure levels. Internal analyses were also restricted to subjects entering the cohort during or after 1960.

RESULTS

Selected characteristics of the study cohort are summarized in Table 1. Workers joined the union in the mid-1950s on average with a mean age at entry of 36.7 years and remained as members through 1978, an average of 6.6 years. Three-quarters of workers were female and 55% were white. With this latest follow-up period, the total person–years of follow-up increased to 178,459 (no/low exposure: 84,428; medium exposure: 69,891; high exposure: 8,641; and unknown exposure: 15,498), and the number of deaths increased from 2,278 to 3,543. A plot of the cumulative distribution of accumulated person–time across calendar years of follow-up is provided in eFigure 1; http://links.lww.com/EDE/B438.

SMR results for selected causes of death are presented in Table 2 (complete results in eTable 1; http://links.lww.com/EDE/B438). Mortality excesses among workers were

TABLE 1. Characteristics of Dry Cleaners in Cohort (n = 5,369)

Characteristics	Mean (SD)
Year of birth	1918 (15.4)
Age at entry	36.7 (12.1)
Year at entry	1956 (8.5)
Years of union membership	6.6 (6.0)
Sex	n (%)
Male	1,320 (25)
Female	4,049 (75)
Race	
White	2,973 (55)
Black/other	2,396 (45)
Estimated solvent exposure	
No/low	2,526 (47)
Medium	2,079 (39)
High	278 (5)
Unknown	486 (9)

SD, standard deviation.

TABLE 2. Mortality Among Dry Cleaners for Selected Causes of Death Compared with the US Population

	Entire Cohort				Year Joined the Union: <1960				Year Joined the Union: >1960			
Cause of Death	**O**	**E**	**SMR**	**(95% CI)**	**O**	**E**	**SMR**	**(95% CI)**	**O**	**E**	**SMR**	**(95% CI)**
All causes	3,543	3,403	1.0	(1.0, 1.1)	2,674	2,632	1.0	(1.0, 1.1)	869	770	1.1	(1.1, 1.2)
All cancers	879	741	1.2	(1.1, 1.3)	636	549	1.2	(1.1, 1.3)	243	192	1.3	(1.1, 1.4)
Buccal cavity and pharynx	13	12	1.1	(0.6, 1.8)	10	9	1.1	(0.5, 2.0)	3	3	1.1	(0.2, 3.1)
Esophageal	32	16	2.0	(1.4, 2.9)	26	12	2.1	(1.4, 3.1)	6	4	1.7	(0.6, 3.7)
Stomach	23	30	0.8	(0.5, 1.2)	17	24	0.7	(0.4, 1.1)	6	5	1.1	(0.4, 2.4)
Colon	88	76	1.2	(0.9, 1.4)	65	58	1.1	(0.9, 1.4)	23	18	1.3	(0.8, 1.9)
Rectum	20	15	1.3	(0.8, 2.1)	17	12	1.4	(0.8, 2.3)	3	3	1.0	(0.2, 2.9)
Liver	16	20	0.8	(0.5, 1.3)	13	15	0.9	(0.5, 1.5)	3	5	0.6	(0.1, 1.8)
Pancreas	49	42	1.2	(0.9, 1.5)	31	31	1.0	(0.7, 1.4)	18	11	1.6	(1.0, 2.6)
Larynx	10	5	2.0	(1.0, 3.8)	7	4	1.9	(0.7, 3.8)	3	1	2.7	(0.6, 8.0)
Lung	232	153	1.5	(1.3, 1.7)	155	109	1.4	(1.2, 1.7)	77	45	1.7	(1.4, 2.1)
Skin	5	7	0.7	(0.2, 1.6)	5	5	1.0	(0.3, 2.2)	0	2	0.0	(0.0, 1.8)
Breast	88	90	1.0	(0.8, 1.2)	60	62	1.0	(0.7, 1.2)	28	28	1.0	(0.7, 1.5)
Cervix uteri	30	19	1.6	(1.0, 2.2)	24	15	1.6	(1.0, 2.4)	6	4	1.4	(0.5, 3.1)
Corpus uteri	22	19	1.1	(0.7, 1.7)	17	14	1.2	(0.7, 1.9)	5	5	1.0	(0.3, 2.4)
Prostate	28	30	1.0	(0.6, 1.4)	23	26	0.9	(0.6, 1.4)	5	4	1.2	(0.4, 2.9)
Bladder	15	14	1.1	(0.6, 1.8)	11	11	1.0	(0.5, 1.8)	4	3	1.5	(0.4, 3.7)
Kidney	14	13	1.1	(0.6, 1.9)	8	9	0.9	(0.4, 1.7)	6	3	1.8	(0.7, 3.9)
Brain	7	12	0.6	(0.2, 1.2)	5	8	0.6	(0.2, 1.4)	2	3	0.6	(0.1, 2.1)
Lymphatic and hematopoietic	64	64	1.0	(0.8, 1.3)	55	47	1.2	(0.9, 1.5)	9	17	0.5	(0.2, 1.0)
Non-Hodgkin's lymphoma	21	21	1.0	(0.6, 1.5)	18	15	1.2	(0.7, 1.9)	3	6	0.5	(0.1, 1.5)
Hodgkin's disease	5	3	1.8	(0.6, 4.1)	4	2	1.8	(0.5, 4.5)	1	1	1.7	(0.0, 9.6)
Multiple myeloma	14	15	0.9	(0.5, 1.5)	13	11	1.2	(0.6, 2.0)	1	4	0.3	(0.0, 1.4)
Leukemia	20	23	0.9	(0.5, 1.3)	16	17	0.9	(0.5, 1.5)	4	6	0.7	(0.2, 1.7)
Heart disease	904	859	1.1	(1.0, 1.1)	694	694	1.0	(0.9, 1.1)	210	165	1.3	(1.1, 1.5)
Emphysema	33	18	1.8	(1.2, 2.5)	24	14	1.7	(1.1, 2.5)	9	4	2.1	(0.9, 3.9)

E, expected numbers of deaths; O, observed number of deaths; SMR, standardized mortality ratio.

observed for cancer overall (SMR = 1.2; 95% CI = 1.1, 1.3); cancers of the esophagus (SMR = 2.0; 95% CI = 1.4, 2.9), larynx (SMR = 2.0; 95% CI = 1.0, 3.8), lung (SMR = 1.5; 95% CI = 1.3, 1.7), and cervix (SMR = 1.6; 95% CI = 1.0, 2.2); heart disease (SMR = 1.1; 95% CI = 1.0, 1.1); and emphysema (SMR = 1.8; 95% CI = 1.2, 2.5). The SMR results for bladder and kidney cancers were null overall (SMR = 1.1 for both), although imprecise excesses were observed among workers who joined the union in 1960 or later (SMR = 1.5; 95% CI = 0.4, 3.7 for bladder cancer and 1.8; 0.7, 3.9 for kidney cancer). The SMR findings did not notably differ by sex or race (results not shown).

The results for selected causes of death from internal comparisons of the solvent exposure score are shown in Table 3 (complete results in eTable 2; http://links.lww.com/EDE/B438). In 20-year lagged analyses, exposure–response relationships were observed for bladder cancer (medium: HR = 4.2; 95% CI = 0.7, 24.5; high: HR = 9.2; 95% CI = 1.1, 76.7; P_{trend} = 0.08) and kidney cancer (medium: HR = 4.1; 95% CI = 0.7, 22.5; high: HR = 24.4; 95% CI = 2.9, 201.6; P_{trend} = 0.004). High exposure was also associated with elevated mortality from heart disease (HR = 1.6; 95% CI = 1.1, 2.2; P_{trend} = 0.01) and lymphatic/hematopoietic malignancies (4.3; 1.4, 13.6; P_{trend} = 0.01). The alternative trend tests were statistically significant for cancers of the bladder and kidney (P_{trend} = 0.04 and 0.006, respectively, assuming a 20-year lag) but not for heart disease or the blood malignancies (0.10 and 0.18, respectively). Of the other endpoints elevated in SMR analyses, most were null in the internal comparisons, except a weak association for lung cancer (HR = 1.4; 95% CI = 0.8, 2.6; P_{trend} = 0.28) and an imprecise inverse association for esophageal cancer (HR = 0.2; 95% CI = 0.0, 1.8; P_{trend} = 0.15). When 20-year lagged analyses were restricted to subjects entering the cohort during or after 1960, the association with high exposure and heart disease persisted, but was imprecise (HR = 1.4; 95% CI = 0.7, 2.8; P_{trend} = 0.30), and there were too few kidney or bladder cancer deaths to generate stable HR estimates (results not shown).

TABLE 3. Risk of Death from Selected Causes by Estimated Solvent Exposure, Missouri Dry Cleaners Cohort

Cause of Death	Solvent Exposure	No Lag		10-year Lag		20-year Lag	
		N Events	HR[a] (95% CI)	N Events	HR[a] (95% CI)	N Events	HR[a] (95% CI)
Any[b]	No/low	1,525	1.0	1,433	1.0	1,200	1.0
	Medium	1,508	1.1 (1.0, 1.2)	1,408	1.1 (1.0, 1.2)	1,196	1.1 (1.0, 1.2)
	High	217	1.2 (1.0, 1.4)	194	1.1 (1.0, 1.3)	147	1.1 (0.9, 1.3)
	P_{trend}		0.05		0.09		0.83
All cancers	No/low	351	1.0	321	1.0	264	1.0
	Medium	384	1.2 (1.0, 1.4)	360	1.2 (1.0, 1.4)	307	1.1 (1.0, 1.4)
	High	54	1.1 (0.8, 1.6)	52	1.1 (0.8, 1.6)	47	1.2 (0.9, 1.8)
	P_{trend}		0.43		0.38		0.23
Esophageal cancer	No/low	9	1.0	9	1.0	9	1.0
	Medium	17	0.8 (0.3, 2.0)	16	0.7 (0.3, 1.7)	14	0.7 (0.3, 1.7)
	High	2	0.4 (0.1, 2.0)	2	0.4 (0.1, 2.0)	1	0.2 (0.0, 1.8)
	P_{trend}		0.26		0.30		0.15
Lung cancer	No/low	82	1.0	81	1.0	72	1.0
	Medium	110	1.4 (1.0, 2.0)	106	1.4 (1.0, 1.9)	95	1.4 (1.0, 2.0)
	High	15	1.1 (0.6, 2.0)	15	1.1 (0.6, 2.1)	15	1.4 (0.8, 2.6)
	P_{trend}		0.14		0.64		0.28
Bladder cancer	No/low	6	1.0	5	1.0	2	1.0
	Medium	6	1.7 (0.5, 5.8)	6	2.3 (0.6, 8.3)	5	4.2 (0.7, 24.5)
	High	3	3.2 (0.6, 17.1)	3	5.2 (0.9, 30.4)	3	9.2 (1.1, 76.7)
	P_{trend}		0.19		0.09		0.08
Kidney cancer	No/low	3	1.0	2	1.0	2	1.0
	Medium	6	2.4 (0.5, 10.6)	6	3.4 (0.6, 18.6)	6	4.1 (0.7, 22.5)
	High	3	13.2 (1.9, 90.8)	3	17.8 (2.2, 143.7)	3	24.4 (2.9, 201.6)
	P_{trend}		0.004		0.004		0.004
Lymphatic/ hematopoietic malignancies	No/low	30	1.0	27	1.0	21	1.0
	Medium	21	0.8 (0.4, 1.5)	17	0.7 (0.4, 1.4)	17	0.9 (0.5, 1.8)
	High	7	2.8 (1.0, 7.5)	7	3.2 (1.1, 9.1)	6	4.3 (1.4, 13.6)
	P_{trend}		0.02		0.02		0.01
Non-Hodgkin lymphoma	No/low	9	1.0	7	1.0	5	1.0
	Medium	11	1.7 (0.6, 4.4)	8	1.5 (0.5, 4.6)	8	1.9 (0.6, 6.6)
	High	1	1.7 (0.2, 16.6)	1	1.6 (0.2, 16.4)	1	2.1 (0.2, 23.6)
	P_{trend}		0.57		0.17		0.55
Cervical cancer	No/low	13	1.0	9	1.0	5	1.0
	Medium	13	1.2 (0.5, 2.7)	8	1.0 (0.4, 2.8)	5	1.2 (0.3, 4.5)
	High	0		0		0	
	P_{trend}		0.91		0.78		0.99
Heart disease	No/low	412	1.0	393	1.0	329	1.0
	Medium	357	1.0 (0.9, 1.2)	340	1.0 (0.9, 1.2)	289	1.0 (0.9, 1.2)
	High	66	1.5 (1.2, 2.1)	61	1.6 (1.2, 2.1)	46	1.6 (1.1, 2.2)
	P_{trend}		0.005		0.006		0.01
Emphysema	No/low	17	1.0	16	1.0	12	1.0
	Medium	11	0.7 (0.3, 1.6)	11	0.7 (0.3, 1.6)	10	0.9 (0.3, 2.3)
	High	2	0.4 (0.1, 2.0)	2	0.4 (0.1, 2.0)	2	0.6 (0.1, 3.2)
	P_{trend}		0.28		0.30		0.59

CI indicates confidence interval; HR, hazard ratio.
[a]HRs calculated from Cox proportional hazards models using age as the underlying timescale adjusted for race, sex, and decade of enrollment.
[b]Interaction terms with exposure and time tested the proportional hazards assumption. This assumption was violated only for the analysis of overall mortality ($p = 0.004$); however, results adjusted for the interaction between exposure and time were similar to the results presented.

Analyses of cumulative solvent exposure found associations with cancers of the bladder and kidney similar to the associations by exposure level (eTable 3; http://links.lww.com/EDE/B438) but no associations with heart disease or lymphatic/hematopoietic malignancies. Analyses of union membership duration were null (results not shown).

DISCUSSION

A strength of this study that is unique among cohort studies of dry cleaners is the availability of specific job titles from union records, which enabled the development of semi-quantitative estimates of workers' solvent exposure levels. In earlier analyses of this cohort, there was an insufficient number of deaths to support formal comparisons of mortality rates across workers' relative solvent exposure levels. With this 22-year update, we accrued enough deaths to conduct such internal analyses. From these analyses, we observed that solvent exposure levels were associated with increases in mortality owing to heart disease and cancers of the bladder, kidney, and lymphatic/hematopoietic system. These findings are, to the best of our knowledge, the first cohort evidence directly relating solvent exposure levels among dry cleaners to excess mortality for these endpoints. As such, they offer new evidence supporting workplace solvent exposures as a possible explanation for reported excesses of these cancers among dry cleaners.[7,16] Dry cleaning employment was associated with elevated bladder cancer mortality in a meta-analysis of seven cohort studies,[16] while findings for cancers of the kidney and lymphatic system have been inconsistent. The only other dry cleaning cohort to have investigated noncancer mortality also observed an elevated SMR (1.2; 95% CI = 1.0, 1.5) for ischemic heart disease among workers exposed exclusively to tetrachloroethylene.[17]

The lack of information on subjects' smoking habits is a limitation of our study. Given that data from other sources suggest that dry cleaners smoked more than workers in other occupations,[18,19] it is plausible that the elevated SMRs for emphysema and cancers of the esophagus, larynx, lung, and cervix, all tobacco-related endpoints, may at least partly reflect different smoking habits within the cohort compared with the general population. We note, however, that these smoking-related endpoints were not associated with solvent exposures in our internal-comparison analyses, thus arguing against confounding from smoking as an explanation for the observed exposure–response patterns for cancers of the bladder, kidney, and lymphatic and hematopoietic systems. Additionally, suggestive associations with dry cleaning for kidney and bladder cancer have been reported in case–control studies that did adjust for smoking.[16,20]

Other limitations in the information available from union records affected our exposure assessment. We did not have information on workers' potential dry cleaning industry employment before their membership in the union. Further, as we only had union records available through 1978, subjects who worked in dry cleaning establishments beyond this year would have truncated estimates of exposure duration and cumulative exposure, which may have introduced bias into results for these metrics. The absence of direct exposure monitoring in subjects' workplaces and the lack of a specific exposure scale for tetrachloroethylene, or other individual dry cleaning solvents, are additional limitations of our study. We note that the SMRs for bladder cancer, kidney cancer, and heart disease, but not lymphatic/hematopoietic malignancies, were elevated among workers joining the union during or after 1960, when tetrachloroethylene became the overwhelming solvent of choice in the industry,[2,3] and null among those joining before 1960. These results are compatible with a tetrachloroethylene-specific effect for these outcomes. However, we were unable to directly assess when members of this cohort were first exposed to tetrachloroethylene. Two case–control studies employing detailed exposure assessment methods to investigate occupational tetrachloroethylene exposure have also reported associations with high exposure for cancers of the bladder and kidney.[21,22]

Our study was also limited by the relatively small sample size. The number of kidney and bladder cancer deaths was too small to assess solvent exposure in internal analyses restricted to subjects who entered the cohort after 1960. We also observed lower rates of several causes of death (e.g., esophageal cancer) among the high versus the low exposure group that were based on very few of deaths overall and particularly among highly exposed subjects ($n < 3$). As these inverse associations have wide confidence limits, they may have arisen due to chance.

In conclusion, our findings from this updated analysis of a cohort of dry cleaning workers suggest that workplace exposure to tetrachloroethylene in the dry cleaning industry is associated with an increased risk of bladder cancer, kidney cancer, lymphatic/hematopoietic malignancies, and heart disease. Further research is needed to clarify the cancer and noncancer risks associated with occupational exposure to tetrachloroethylene, as well as the possible health risks associated with residential proximity to dry cleaning facilities[5,6] and the presence of dry-cleaned clothing in the home.[23,24]

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Supplemental Table 1. Mortality among dry cleaners for selected causes of death by follow-up period compared to the US population

	Follow-up through 12/31/1992				Follow-up from 1/1/1993 to 12/31/2014				Follow-up over entire period			
Cause of death	O	E	SMR	95%CI	O	E	SMR	95%CI	O	E	SMR	95%CI
All causes	2278	2212	1.0	(1.0, 1.1)	1265	1190	1.1	(1.0, 1.1)	3543	3403	1.0	(1.0, 1.1)
Infective and parasitic diseases	33	40	0.8	(0.6, 1.2)	24	28	0.9	(0.6, 1.3)	57	68	0.8	(0.6, 1.1)
Tuberculosis	8	16	0.5	(0.2, 1.0)	0	1	0.0	(0.0, 4.9)	8	16	0.5	(0.2, 1.0)
All malignant neoplasms	586	490	1.2	(1.1, 1.3)	293	252	1.2	(1.0, 1.3)	879	741	1.2	(1.1, 1.3)
Buccal cavity and pharynx	10	9	1.1	(0.5, 2.0)	3	3	1.0	(0.2, 3.0)	13	12	1.1	(0.6, 1.8)
Esophagus	26	12	2.3	(1.5, 3.3)	6	4	1.4	(0.5, 3.0)	32	16	2.0	(1.4, 2.9)
Stomach	20	22	0.9	(0.6, 1.4)	3	8	0.4	(0.1, 1.2)	23	30	0.8	(0.5, 1.2)
Colon	60	51	1.2	(0.9, 1.5)	28	25	1.1	(0.7, 1.6)	88	76	1.2	(0.9, 1.4)
Rectum	15	11	1.3	(0.7, 2.2)	5	4	1.3	(0.4, 3.1)	20	15	1.3	(0.8, 2.1)
Liver	10	12	0.9	(0.4, 1.6)	6	8	0.8	(0.3, 1.7)	16	20	0.8	(0.5, 1.3)
Pancreas	28	26	1.1	(0.7, 1.6)	21	16	1.3	(0.8, 2.0)	49	42	1.2	(0.9, 1.5)
Larynx	6	4	1.7	(0.6, 3.7)	4	1	2.9	(0.8, 7.4)	10	5	2.0	(1.0, 3.8)
Lung	125	91	1.4	(1.2, 1.6)	107	63	1.7	(1.4, 2.1)	232	153	1.5	(1.3, 1.7)
Skin	4	5	0.8	(0.2, 2.1)	1	2	0.4	(0.0, 2.2)	5	7	0.7	(0.2, 1.6)
Breast	68	65	1.1	(0.8, 1.3)	20	25	0.8	(0.5, 1.2)	88	90	1.0	(0.8, 1.2)
Cervix uteri	27	17	1.6	(1.0, 2.3)	3	2	1.3	(0.3, 3.7)	30	19	1.6	(1.0, 2.2)
Corpus uteri	15	14	1.1	(0.6, 1.8)	7	6	1.2	(0.5, 2.6)	22	19	1.1	(0.7, 1.7)
Prostate	16	17	1.0	(0.6, 1.6)	12	13	0.9	(0.5, 1.6)	28	30	1.0	(0.6, 1.4)

Supplemental Table 1. Mortality among dry cleaners for selected causes of death by follow-up period compared to the US population

	Follow-up through 12/31/1992				Follow-up from 1/1/1993 to 12/31/2014				Follow-up over entire period			
Cause of death	O	E	SMR	95%CI	O	E	SMR	95%CI	O	E	SMR	95%CI
Bladder	12	9	1.4	(0.7, 2.4)	3	5	0.6	(0.1, 1.8)	15	14	1.1	(0.6, 1.8)
Kidney	8	8	1.0	(0.4, 2.0)	6	5	1.3	(0.5, 2.8)	14	13	1.1	(0.6, 1.9)
Brain	5	8	0.6	(0.2, 1.4)	2	3	0.6	(0.1, 2.1)	7	12	0.6	(0.2, 1.2)
Lymphatic and hematopoietic	39	40	1.0	(0.7, 1.3)	25	24	1.0	(0.7, 1.5)	64	64	1.0	(0.8, 1.3)
Non-Hodgkin's lymphoma	12	13	0.9	(0.5, 1.6)	9	8	1.1	(0.5, 2.0)	21	21	1.0	(0.6, 1.5)
Hodgkin's disease	5	3	2.0	(0.6, 4.6)	0	0	0.0	(0.0, 11.1)	5	3	1.8	(0.6, 4.1)
Multiple myeloma	7	9	0.8	(0.3, 1.6)	7	6	1.1	(0.4, 2.3)	14	15	0.9	(0.5, 1.5)
Leukemia	12	15	0.8	(0.4, 1.4)	8	8	1.0	(0.4, 1.9)	20	23	0.9	(0.5, 1.3)
Diabetes mellitus	62	59	1.1	(0.8, 1.4)	47	44	1.1	(0.8, 1.4)	109	102	1.1	(0.9, 1.3)
Arteriosclerotic heart disease	613	600	1.0	(0.9, 1.1)	291	260	1.1	(1.0, 1.3)	904	859	1.1	(1.0, 1.1)
Emphysema	20	12	1.6	(1.0, 2.5)	13	6	2.2	(1.2, 3.7)	33	18	1.8	(1.2, 2.5)
Cirrhosis of liver	38	36	1.1	(0.8, 1.5)	7	6	1.1	(0.4, 2.2)	45	42	1.1	(0.8, 1.4)
Chronic nephritis	12	12	1.0	(0.5, 1.7)	0	1	0.0	(0.0, 4.1)	12	13	0.9	(0.5, 1.6)
Motor vehicle accidents	25	30	0.8	(0.6, 1.3)	4	3	1.2	(0.3, 3.1)	29	33	0.9	(0.6, 1.3)
Suicide	12	14	0.9	(0.5, 1.5)	5	2	2.3	(0.7, 5.3)	17	16	1.1	(0.6, 1.7)

Abbreviations: O, observed number of deaths; E, expected numbers of deaths; SMR, standardized mortality ratio; CI, confidence interval.

Supplemental Table 2. Risk of death from selected causes by estimated solvent exposure, Missouri Dry Cleaners cohort

Cause of death	Solvent exposure	No Lag			10-year lag			20-year lag		
		N events	HR[a]	(95%CI)	N events	HR[a]	(95%CI)	N events	HR[a]	(95%CI)
Any	No/low	1525	1.0		1433	1.0		1200	1.0	
	Medium	1508	1.1	(1.0, 1.2)	1408	1.1	(1.0, 1.2)	1196	1.1	(1.0, 1.2)
	High	217	1.2	(1.0, 1.4)	194	1.1	(1.0, 1.3)	147	1.1	(0.9, 1.3)
	Ptrend		0.05			0.09			0.17	
Infectious	No/low	27	1.0		27	1.0		27	1.0	
	Medium	23	0.8	(0.5, 1.6)	21	0.8	(0.4, 1.5)	18	0.7	(0.4, 1.4)
	High	4	1.0	(0.3, 3.1)	4	1.0	(0.3, 3.4)	1	0.3	(0.0, 2.1)
	Ptrend		0.83			0.94			0.13	
Tuberculosis	No/low	1	1.0		1	1.0		1	1.0	
	Medium	6	3.6	(0.4, 34.5)	5	3.5	(0.4, 35.4)	3	2.8	(0.2, 35.1)
	High	1	3.0	(0.2, 59.6)	1	3.8	(0.2, 79.4)	0		
	Ptrend		0.73			0.58			0.65	
All cancer	No/low	351	1.0		321	1.0		264	1.0	
	Medium	384	1.2	(1.0, 1.4)	360	1.2	(1.0, 1.4)	307	1.1	(1.0, 1.4)
	High	54	1.1	(0.8, 1.6)	52	1.1	(0.8, 1.6)	47	1.2	(0.9, 1.8)
	Ptrend		0.43			0.38			0.23	
Buccal cavity	No/low	6	1.0		5	1.0		4	1.0	
	Medium	6	1.0	(0.3, 3.5)	6	1.2	(0.3, 4.5)	6	1.5	(0.4, 6.3)
	High	0			0			0		
	Ptrend		0.24			0.31			0.33	
Esophagus	No/low	9	1.0		9	1.0		9	1.0	
	Medium	17	0.8	(0.3, 2.0)	16	0.7	(0.3, 1.7)	14	0.7	(0.3, 1.7)
	High	2	0.4	(0.1, 2.0)	2	0.4	(0.1, 2.0)	1	0.2	(0.0, 1.8)
	Ptrend		0.26			0.30			0.15	
Stomach	No/low	10	1.0		9	1.0		5	1.0	
	Medium	11	0.6	(0.2, 1.6)	11	0.7	(0.3, 1.8)	7	0.7	(0.2, 2.4)
	High	1	0.3	(0.0, 2.4)	0			0		
	Ptrend		0.23			0.10			0.20	
Colon	No/low	39	1.0		37	1.0		30	1.0	
	Medium	34	0.9	(0.6, 1.5)	33	0.9	(0.4, 1.5)	29	0.9	(0.5, 1.6)
	High	7	1.5	(0.6, 3.8)	7	1.5	(0.6, 3.8)	6	1.5	(0.6, 4.1)
	Ptrend		0.37			0.35			0.38	
Rectal	No/low	9	1.0		7	1.0		6	1.0	
	Medium	8	1.0	(0.3, 2.8)	8	1.2	(0.4, 3.7)	6	0.8	(0.2, 2.9)
	High	0			0			0		
	Ptrend		0.36			0.46			0.34	
Liver	No/low	4	1.0		3	1.0		3	1.0	
	Medium	11	1.9	(0.5, 6.6)	11	2.3	(0.6, 9.2)	9	1.9	(0.5, 8.0)
	High	0			0			0		
	Ptrend		0.30			0.33			0.41	
Pancreas	No/low	28	1.0		27	1.0		24	1.0	
	Medium	13	0.5	(0.2, 1.0)	13	0.5	(0.2, 1.0)	10	0.4	(0.2, 0.9)
	High	1	0.2	(0.0, 1.8)	1	0.2	(0.0, 1.9)	1	0.2	(0.0, 1.8)
	Ptrend		0.15			0.16			0.17	
Larynx	No/low	2	1.0		2	1.0		2	1.0	
	Medium	6	1.8	(0.3, 10.5)	6	1.9	(0.3, 10.5)	5	1.4	(0.2, 8.6)
	High	0			0			0		
	Ptrend		0.37			0.37			0.33	
Lung	No/low	82	1.0		81	1.0		72	1.0	
	Medium	110	1.4	(1.0, 2.0)	106	1.4	(1.0, 1.9)	95	1.4	(1.0, 2.0)
	High	15	1.1	(0.6, 2.0)	15	1.1	(0.6, 2.1)	15	1.4	(0.8, 2.6)
	Ptrend		0.14			0.64			0.28	
Skin	No/low	3	1.0		3	1.0		3	1.0	
	Medium	2	0.4	(0.1, 2.7)	2	0.4	(0.1, 2.7)	1	0.2	(0.0, 2.8)
	High	0			0			0		
	Ptrend		0.29			0.29			0.25	

Supplemental Table 2. Risk of death from selected causes by estimated solvent exposure, Missouri Dry Cleaners cohort

Cause of death	Solvent exposure	No Lag			10-year lag			20-year lag		
		N events	HR[a]	(95%CI)	N events	HR[a]	(95%CI)	N events	HR[a]	(95%CI)
Bladder	No/low	6	1.0		5	1.0		2	1.0	
	Medium	6	1.7	(0.5, 5.8)	6	2.3	(0.6, 8.3)	5	4.2	(0.7, 24.5)
	High	3	3.2	(0.6, 17.1)	3	5.2	(0.9, 30.4)	3	9.2	(1.1, 76.7)
	Ptrend		0.19			0.09			0.08	
Kidney	No/low	3	1.0		2	1.0		2	1.0	
	Medium	6	2.4	(0.5, 10.6)	6	3.4	(0.6, 18.6)	6	4.1	(0.7, 22.5)
	High	3	13.2	(1.9, 90.8)	3	17.8	(2.2, 143.7)	3	24.4	(2.9, 201.6)
	Ptrend		0.004			0.004			0.004	
Brain	No/low	2	1.0		2	1.0		1	1.0	
	Medium	5	2.3	(0.4, 14.0)	5	2.3	(0.4, 14.1)	5	3.7	(0.4, 37.0)
	High	0			0			0		
	Ptrend		0.75			0.75			0.85	
Lymphatic/ hematopoietic	No/low	30	1.0		27	1.0		21	1.0	
	Medium	21	0.8	(0.4, 1.5)	17	0.7	(0.4, 1.4)	17	0.9	(0.5, 1.8)
	High	7	2.8	(1.0, 7.5)	7	3.2	(1.1, 9.1)	6	4.3	(1.4, 13.6)
	Ptrend		0.02			0.02			0.01	
Non-Hodgkin lymphoma	No/low	9	1.0		7	1.0		5	1.0	
	Medium	11	1.7	(0.6, 4.4)	8	1.5	(0.5, 4.6)	8	1.9	(0.6, 6.6)
	High	1	1.7	(0.2, 16.6)	1	1.6	(0.2, 16.4)	1	2.1	(0.2, 23.6)
	Ptrend		0.57			0.17			0.55	
Hodgkin's disease	No/low	3	1.0		2	1.0		0		
	Medium	1	0.7	(0.1, 7.5)	1	1.0		1		
	High	1	8.8	(0.4, 219)	1	11.9	(0.4, 383.4)	1		
	Ptrend		0.19			0.15			0.07	
Multiple myeloma	No/low	6	1.0		6	1.0		5	1.0	
	Medium	4	0.5	(0.1, 1.9)	3	0.4	(0.1, 2.0)	3	0.5	(0.1, 2.1)
	High	2	2.2	(0.3, 15.1)	2	4.3	(0.5, 36.7)	1	2.4	(0.2, 33.3)
	Ptrend		0.15			0.06			0.32	
Leukemia	No/low	10	1.0		10	1.0		9	1.0	
	Medium	5	0.5	(0.2, 1.7)	5	0.5	(0.1, 1.7)	5	0.7	(0.2, 2.2)
	High	1	1.2	(0.1, 11.4)	1	1.2	(0.1, 11.5)	1	2.7	(0.2, 30.2)
	Ptrend		0.97			0.97			0.69	
Breast	No/low	41	1.0		35	1.0		27	1.0	
	Medium	37	1.4	(0.8, 2.2)	34	1.4	(0.8, 2.3)	29	1.5	(0.8, 2.6)
	High	0			0			0		
	Ptrend		0.84			0.79			0.61	
Cervical	No/low	13	1.0		9	1.0		5	1.0	
	Medium	13	1.2	(0.5, 2.7)	8	1.0	(0.4, 2.8)	5	1.2	(0.3, 4.5)
	High	0			0			0		
	Ptrend		0.91			0.78			0.99	
Uterine	No/low	9	1.0		9	1.0		9	1.0	
	Medium	10	1.4	(0.5, 3.6)	8	1.0	(0.4, 2.8)	7	0.8	(0.3, 2.3)
	High	0			0			0		
	Ptrend		0.78			0.83			0.65	
Prostate	No/low	6	1.0		6	1.0		6	1.0	
	Medium	14	0.8	(0.3, 2.2)	14	0.8	(0.3, 2.2)	14	0.7	(0.3, 2.0)
	High	6	1.0	(0.3, 3.2)	6	1.0	(0.3, 3.2)	6	1.0	(0.3, 3.1)
	Ptrend		0.74			0.74			0.77	
Diabetes	No/low	57	1.0		53	1.0		41	1.0	
	Medium	39	0.8	(0.5, 1.2)	38	0.8	(0.5, 1.2)	35	0.9	(0.5, 1.4)
	High	5	1.0	(0.4, 2.8)	4	0.9	(0.3, 2.7)	3	0.8	(0.2, 3.0)
	Ptrend		0.80			0.61			0.64	
Heart disease	No/low	412	1.0		393	1.0		329	1.0	
	Medium	357	1.0	(0.9, 1.2)	340	1.0	(0.9, 1.2)	289	1.0	(0.9, 1.2)
	High	66	1.5	(1.2, 2.1)	61	1.6	(1.2, 2.1)	46	1.6	(1.1, 2.2)
	Ptrend		0.005			0.006			0.01	

Supplemental Table 2. Risk of death from selected causes by estimated solvent exposure, Missouri Dry Cleaners cohort

Cause of death	Solvent exposure	No Lag			10-year lag			20-year lag		
		N events	HR[a]	(95%CI)	N events	HR[a]	(95%CI)	N events	HR[a]	(95%CI)
Emphysema	No/low	17	1.0		16	1.0		12	1.0	
	Medium	11	0.7	(0.3, 1.6)	11	0.7	(0.3, 1.6)	10	0.9	(0.3, 2.3)
	High	2	0.4	(0.1, 2.0)	2	0.4	(0.1, 2.0)	2	0.6	(0.1, 3.2)
	Ptrend		0.28			0.30			0.59	
Cirrhosis of the liver	No/low	12	1.0		10	1.0		9	1.0	
	Medium	26	1.8	(0.9, 3.9)	24	2.1	(0.9, 4.8)	17	1.8	(0.7, 4.4)
	High	2	0.6	(0.1, 3.0)	2	0.8	(0.2, 4.1)	1	0.5	(0.1, 4.3)
	Ptrend		0.10			0.06			0.16	
Chronic nephritis	No/low	1	1.0		1	1.0		1	1.0	
	Medium	10	4.0	(0.5, 33.3)	8	3.3	(0.4, 29.4)	7	2.5	(0.3, 22.7)
	High	0			0			0		
	Ptrend		0.44			0.44			0.42	
Motor vehicle accidents	No/low	15	1.0		11	1.0		6	1.0	
	Medium	11	0.8	(0.3, 2.0)	8	0.7	(0.3, 2.1)	5	0.9	(0.2, 3.3)
	High	2	0.7	(0.1, 3.4)	1	0.5	(0.1, 4.3)	1	1.1	(0.1, 12.3)
	Ptrend		0.72			0.58			0.86	
Suicide	No/low	6	1.0		5	1.0		5	1.0	
	Medium	5	0.9	(0.3, 3.5)	4	0.8	(0.2, 3.4)	3	0.6	(0.1, 3.0)
	High	2	0.8	(0.1, 4.1)	2	0.9	(0.2, 5.4)	1	0.5	(0.1, 4.9)
	Ptrend		0.70			0.96			0.57	

Abbreviations: HR, hazard ratio; CI, confidence interval. [a]HRs calculated from Cox proportional hazards models using age as the underlying time-scale adjusted for race, sex, and decade of enrollment.

Supplemental Table 3. Risk of death from selected causes by cumulative estimated solvents exposure, Missouri Dry Cleaners cohort

Cause of death	Tertile solvent exposure	No Lag			10-year lag			20-year lag		
		N events	HR[a]	(95%CI)	N events	HR[a]	(95%CI)	N events	HR[a]	(95%CI)
Any	T1	920	1.0		845	1.0		710	1.0	
	T2	1119	0.9	(0.9, 1.0)	1034	0.9	(0.9, 1.0)	858	0.9	(0.8, 1.0)
	T3	1211	1.0	(0.8, 1.1)	1156	1.0	(0.9, 1.1)	975	1.0	(0.9, 1.1)
	Ptrend		0.99			0.30			0.22	
Infectious	T1	15	1.0		15	1.0		15	1.0	
	T2	19	0.9	(0.5, 1.9)	17	0.9	(0.4, 1.8)	17	0.9	(0.4, 1.8)
	T3	20	0.9	(0.4, 1.9)	20	0.9	(0.4, 2.0)	14	0.7	(0.3, 1.5)
	Ptrend		0.74			0.96			0.31	
Tuberculosis	T1	1	1.0		1	1.0		1	1.0	
	T2	3	1.5	(0.1, 15.9)	2	1.1	(0.1, 13.6)	2	1.3	(0.1, 16.1)
	T3	4	1.2	(0.1, 13.1)	4	15	(0.1, 16.2)	1	0.5	(0.0, 9.3)
	Ptrend		0.92			0.70			0.44	
All cancer	T1	220	1.0		195	1.0		165	1.0	
	T2	259	0.9	(0.8, 1.1)	240	0.9	(0.8, 1.2)	192	0.8	(0.7, 1.1)
	T3	310	1.0	(0.8, 1.2)	298	1.1	(0.9, 1.3)	261	1.0	(0.8, 1.3)
	Ptrend		0.48			0.26			0.19	
Buccal cavity	T1	3	1.0		2	1.0		2	1.0	
	T2	7	1.9	(0.5, 7.7)	7	2.9	(0.6, 14.5)	6	2.5	(0.5, 12.8)
	T3	2	0.4	(0.1, 2.8)	2	0.6	(0.1, 5.1)	2	0.6	(0.1, 5.0)
	Ptrend		0.10			0.15			0.18	
Esophagus	T1	4	1.0		4	1.0		4	1.0	
	T2	10	1.2	(0.4, 4.0)	9	1.0	(0.3, 3.5)	9	1.1	(0.3, 3.6)
	T3	14	1.0	(0.3, 3.2)	14	0.9	(0.3, 3.1)	11	0.8	(0.2, 2.7)
	Ptrend		0.75			0.85			0.51	
Stomach	T1	4	1.0		3	1.0		2	1.0	
	T2	9	1.4	(0.4, 4.6)	9	1.8	(0.5, 7.1)	6	1.5	(0.3, 7.8)
	T3	9	0.9	(0.2, 3.2)	8	1.0	(0.3, 4.4)	4	0.6	(0.1, 3.6)
	Ptrend		0.46			0.42			0.18	
Colon	T1	19	1.0		17	1.0		14	1.0	
	T2	27	1.1	(0.6, 2.0)	27	1.2	(0.7, 2.3)	21	1.1	(0.5, 2.2)
	T3	34	1.4	(0.7, 2.5)	33	1.4	(0.7, 2.7)	30	1.4	(0.7, 2.8)
	Ptrend		0.25			0.28			0.22	
Rectal	T1	4	1.0		3	1.0		2	1.0	
	T2	6	1.2	(0.3, 4.3)	5	1.3	(0.3, 5.5)	3	1.1	(0.2, 6.7)
	T3	7	1.4	(0.4, 5.1)	7	1.7	(0.4, 7.4)	7	2.2	(0.4, 12.0)
	Ptrend		0.62			0.41			0.21	
Liver	T1	3	1.0		2	1.0		2	1.0	
	T2	6	1.2	(0.3, 4.9)	6	1.7	(0.3, 8.8)	5	1.4	(0.3, 7.6)
	T3	6	0.8	(0.2, 3.7)	6	1.2	(0.2, 6.3)	5	1.0	(0.2, 5.7)
	Ptrend		0.59			0.68			0.68	
Pancreas	T1	17	1.0		17	1.0		14	1.0	
	T2	16	0.8	(0.4, 1.6)	15	0.7	(0.3, 1.4)	13	0.7	(0.3, 1.5)
	T3	9	0.4	(0.2, 1.0)	9	0.4	(0.2, 0.9)	8	0.4	(0.2, 1.0)
	Ptrend		0.07			0.07			0.10	
Larynx	T1	2	1.0		2	1.0		2	1.0	
	T2	3	0.9	(0.1, 5.7)	3	0.9	(0.1, 5.7)	2	0.6	(0.1, 4.5)
	T3	3	0.6	(0.1, 3.8)	3	0.6	(0.1, 3.8)	3	0.5	(0.1, 3.7)
	Ptrend		0.52			0.52			0.67	
Lung	T1	52	1.0		51	1.0		47	1.0	
	T2	72	1.1	(0.8, 1.6)	69	1.1	(0.7, 1.6)	61	1.0	(0.7, 1.5)
	T3	83	1.1	(0.8, 1.7)	82	1.1	(0.8, 1.7)	74	1.1	(0.8, 1.7)
	Ptrend		0.55			0.50			0.530	
Skin	T1	2	1.0		2	1.0		2	1.0	
	T2	1	0.3	(0.0, 3.2)	1	0.3	(0.0, 3.2)	1	0.3	(0.0, 3.8)
	T3	2	0.3	(0.0, 3.1)	2	0.3	(0.0, 3.1)	1	0.2	(0.0, 3.2)
	Ptrend		0.64			0.65			0.43	

Supplemental Table 3. Risk of death from selected causes by cumulative estimated solvents exposure, Missouri Dry Cleaners cohort

Cause of death	Tertile solvent exposure	No Lag			10-year lag			20-year lag		
		N events	HR[a]	(95%CI)	N events	HR[a]	(95%CI)	N events	HR[a]	(95%CI)
Bladder	T1	5	1.0		4	1.0		2	1.0	
	T2	3	0.5	(0.1, 2.3)	3	0.7	(0.2, 3.2)	1	0.4	(0.0, 5.0)
	T3	7	1.3	(0.4, 4.9)	7	1.9	(0.5, 7.6)	7	3.2	(0.6, 18.4)
	Ptrend		0.35			0.17			0.05	
Kidney	T1	1	1.0		1	1.0		1	1.0	
	T2	3	2.8	(0.3, 28.3)	2	1.8	(0.2, 20.8)	2	2.0	(0.2, 22.9)
	T3	8	7.4	(0.8, 65.8)	8	6.6	(0.7, 59.3)	8	8.3	(0.9, 75.8)
	Ptrend		0.04			0.03			0.03	
Brain	T1	2	1.0		2	1.0		1	1.0	
	T2	2	0.7	(0.1, 5.0)	2	0.7	(0.1, 5.0)	2	1.1	(0.1, 13.2)
	T3	3	0.8	(0.1, 5.6)	3	0.8	(0.1, 5.6)	3	1.2	(0.1, 13.5)
	Ptrend		0.95			0.95			0.91	
Lymphatic/ hematopoietic	T1	23	1.0		20	1.0		16	1.0	
	T2	14	0.5	(0.2, 0.9)	12	0.4	(0.2, 0.9)	10	0.4	(0.2, 1.0)
	T3	21	0.7	(0.3, 1.3)	19	0.7	(0.3, 1.4)	18	0.8	(0.4, 1.6)
	Ptrend		0.97			0.96			0.72	
Non-Hodgkin lymphoma	T1	7	1.0		5	1.0		4	1.0	
	T2	7	0.8	(0.3, 2.4)	5	0.8	(0.2, 2.8)	4	0.7	(0.2, 2.9)
	T3	7	0.9	(0.3, 2.7)	6	1.0	(0.3, 3.7)	6	1.0	(0.3, 4.3)
	Ptrend		0.90			0.88			0.70	
Hodgkin's disease	T1	3	1.0		2	1.0		0		
	T2	1	0.4	(0.0, 3.6)	1	0.5	(0.0, 5.4)	1		
	T3	1	0.4	(0.0, 5.5)	1	0.5	(0.0, 7.6)	1		
	Ptrend		0.66			0.76			0.83	
Multiple myeloma	T1	4	1.0		4	1.0		4	1.0	
	T2	2	0.3	(0.1, 1.7)	2	0.3	(0.1, 1.9)	1	0.1	(0.0, 1.4)
	T3	6	0.8	(0.2, 3.1)	5	0.8	(0.2, 3.3)	4	0.5	(0.1, 2.4)
	Ptrend		0.49			0.66			0.88	
Leukemia	T1	8	1.0		8	1.0		7	1.0	
	T2	3	0.3	(0.1, 1.1)	3	0.3	(0.1, 1.1)	3	0.3	(0.1, 1.3)
	T3	5	0.4	(0.1, 1.5)	5	0.4	(0.1, 1.5)	5	0.6	(0.2, 2.0)
	Ptrend		0.55			0.56			0.77	
Breast	T1	28	1.0		22	1.0		18	1.0	
	T2	23	0.8	(0.5, 1.4)	21	0.9	(0.5, 1.6)	15	0.8	(0.4, 1.5)
	T3	27	1.2	(0.7, 2.1)	26	1.3	(0.7, 2.4)	23	1.4	(0.7, 2.7)
	Ptrend		0.44			0.27			0.14	
Cervical	T1	5	1.0		2	1.0		1	1.0	
	T2	12	2.1	(0.7, 6.0)	9	3.8	(0.8, 17.8)	6	5.2	(0.6, 43.7)
	T3	9	1.7	(0.5, 5.3)	6	2.6	(0.5, 14.0)	3	2.7	(0.3, 28.3)
	Ptrend		0.95			0.90			0.93	
Uterine	T1	8	1.0		8	1.0		8	1.0	
	T2	3	0.3	(0.1, 1.2)	3	0.3	(0.1, 1.1)	3	0.3	(0.1, 1.1)
	T3	8	0.9	(0.3, 2.5)	6	0.6	(0.2, 1.8)	5	0.4	(0.1, 1.4)
	Ptrend		0.53			0.88			0.59	
Prostate	T1	5	1.0		5	1.0		5	1.0	
	T2	6	0.5	(0.1, 1.6)	6	0.5	(0.1, 1.6)	6	0.4	(0.1, 1.5)
	T3	15	0.6	(0.2, 1.8)	15	0.6	(0.2, 1.8)	15	0.6	(0.2, 1.7)
	Ptrend		0.88			0.99			0.87	
Diabetes	T1	32	1.0		28	1.0		22	1.0	
	T2	39	1.0	(0.6, 1.6)	39	1.1	(0.7, 1.8)	32	1.1	(0.6, 1.9)
	T3	30	0.8	(0.5, 1.4)	28	0.8	(0.5, 1.4)	25	0.8	(0.4, 1.6)
	Ptrend		0.29			0.24			0.34	
Heart disease	T1	237	1.0		222	1.0		188	1.0	
	T2	284	0.9	(0.8, 1.1)	268	0.9	(0.8, 1.1)	223	0.9	(0.7, 1.1)
	T3	314	1.0	(0.9, 1.2)	304	1.1	(.9, 1.3)	253	1.0	(0.8, 1.3)
	Ptrend		0.33			0.18			0.29	

Supplemental Table 3. Risk of death from selected causes by cumulative estimated solvents exposure, Missouri Dry Cleaners cohort

Cause of death	Tertile solvent exposure	No Lag			10-year lag			20-year lag		
		N events	HR[a]	(95%CI)	N events	HR[a]	(95%CI)	N events	HR[a]	(95%CI)
Emphysema	T1	12	1.0		11	1.0		9	1.0	
	T2	8	0.5	(0.2, 1.3)	8	0.6	(0.2, 1.4)	6	0.5	(0.2, 1.5)
	T3	10	0.5	(0.2, 1.4)	10	0.6	(0.2, 1.5)	9	0.6	(0.2, 1.8)
	Ptrend		0.47			0.52			0.79	
Cirrhosis of the liver	T1	6	1.0		4	1.0		3	1.0	
	T2	17	2.1	(0.8, 5.3)	15	2.7	(0.9, 8.4)	13	3.3	(0.9, 11.9)
	T3	17	1.6	(0.6, 4.3)	17	2.5	(0.8, 7.8)	11	2.3	(0.6, 9.0)
	Ptrend		0.94			0.48			0.83	
Chronic nephritis	T1	0			0			0		
	T2	3			3			2		
	T3	8			6			6		
	Ptrend		0.22			0.41			0.26	
Motor vehicle accidents	T1	14	1.0		11	1.0		6	1.0	
	T2	7	0.4	(0.2, 1.1)	4	0.3	(0.1, 0.9)	2	0.2	(0.0, 1.2)
	T3	7	0.3	(0.1, 1.0)	5	0.3	(0.1, 0.9)	4	0.4	(0.1, 1.6)
	Ptrend		0.14			0.14			0.55	
Suicide	T1	6	1.0		5	1.0		5	1.0	
	T2	3	0.5	(0.1, 2.0)	2	0.4	(0.1, 1.9)	2	0.3	(0.1, 1.8)
	T3	4	0.4	(0.1, 1.7)	4	0.5	(0.1, 2.0)	2	0.2	(0.0, 1.3)
	Ptrend		0.30			0.49			0.18	

Abbreviations: HR, hazard ratio; CI, confidence interval; T, tertile. Tertiles of solvent exposure were as follows: T1, 1-5.5; T2, 5.6-28; T3 >28. [a]HRs calculated from Cox proportional hazards models using age as the underlying time-scale adjusted for race, sex, and decade of enrollment.

Supplemental Figure 1. Cumulative distribution of person-years, Missouri Dry Cleaners cohort