

Supplemental Table A:PMR/PCMR studies.

Citation	Study type	Country	Total deaths (n)	Industry	Stomach cancer deaths	PMR or PCMR	Limitations described by the authors of the primary studies	Confounding	Additional notes
Blair A. 1980. Mortality among workers in the metal polishing and plating industry, 1951--1969. J Occup Med 2, 158-62.	PMR	United States	1,292	Metal polishing and plating	14	0.84	Blair et al. indicated that: 1) risk estimates were obtained from PMR analyses only; 2) exposure information was not available (impossible to character each subject's work experience); 3) only the deaths reported to the union (consisting of actively working or retired union members participating in the insurance program) were included; 4) failure to obtain death certificates for 15% of decedents	Blair et al. indicated that polishing, electroplating, and coating involve exposures to nickel, copper, iron, lead, and zinc, corrosive acids, solvents such as trichloroethylene and tetrachloroethylene. Confounding information was not available (such as tobacco usage or alcohol consumption)	Deceased metal platers were identified from obituary listings. From these listings, name, date of death, union status, and addresses and numbers of the union local to which they had belonged to were abstracted for 1709 members who died between 1951 and 1969.
Garabrant DH, Wegman DH. 1984. Cancer mortality among shoe and leather workers in Massachusetts. Am J Ind Med 5, 303-14.	PMR	United States	2,798	Shoe manufacturing (Males)	16	1.69	Garabrant and Wegman indicated that the excess of stomach cancer risk may be due to the uses of the United States population rates for the calculation of expected deaths. The authors state that "factors other than work in the shoe and leather industry may be responsible for the excess risk of digest tract cancer seen in our study."	Garabrant and Wegman indicated that smoking habits of the study group may have been different from the general population and that it is possible the proportion of excess risk of bladder cancer was due to the differences in smoking habits.	Garabrant and Wegman observed excess risk of bladder cancer among female workers (but not male workers)
				Shoe manufacturing (Females)	2	2.8			
N Maizlish, J Beaumont, J Singleton. 1988. Mortality among California highway workers. Am J Ind Med 13, 363-79.	PMR/PCMR	United States	1570 (1,260 white males)	Highway maintenance	15	PMR=1.45; 95%CI: 0.81 to 2.39; PCMR= 1.23 (standardized PMR for CalTrans white males, 1970 to 1983)	Maizlish et al. noted limitations in the PMR methodology, unavoidable multiple comparisons, findings that may be due to chance, confounding biases, and misclassification errors.	Maizlish et al. indicated that adjustments using indirect standardization were made for age at death, sex, race, and year of birth. Other determinants of mortality including SES, state of residence, cigarette smoking, and alcohol consumption were not controlled.	Maizlish et al. states, "An important limitation of this study was the lack of exposure data, work histories, knowledge of previous or concomitant non-CALTRANS employment and recreational activities involving hazard substances, data on nonoccupational risk factors." Cr(VI) is not mentioned in this study.
Rosenman KD, Stanbury M. 1996. Risk of lung cancer among former chromium smelter workers. Am J Ind Med 29, 491-500.	PMR/PCMR	United States	1,858	Chromium smelter (white males) PMR	30	2.05 (CI: 1.38-2.92)	Rosenman and Stanbury indicated that given the limitations of a PMR analysis, a more valid estimate of risk is probably the PCMR. Limitations of the data were indicated as the lack of exposure data and lack of information on smoking habits.	Rosenman and Stanbury indicated that healthy worker effect will cause the PMR to be an overestimate of the true risk. Authors also noted that the sample size was small leading to insufficient statistical power for the subgroup analyses. The effects of smoking were not likely to be captured with the dataset.	Rosenman and Stanbury indicated that they could not distinguish between production workers and management.
				Chromium smelter (white males) PCMR		1.24 (CI: 0.84-1.77)			
				Chromium smelter (black males) PMR	4	0.68 (CI: 0.18-1.74)			
				Chromium smelter (black males) PCMR		0.44 (CI: 0.12-1.11)			
Salg J, Alterman T. 2005. A proportionate mortality study of bricklayers and allied craftworkers. Am J Ind Med 47, 10-9.	PMR	International	10,921	Bricklayers and allied craftworkers (white males)	94	131 (95%CI: 106-160)	Salg et al. indicated that "PMR analysis was chosen due to a limitation of available records, in that no records were available for those members who had left the union and were no longer paying dues."	Salg et al. indicated that "The contribution of non-occupational health risks to observed mortality patterns could not be quantified due to the lack of information on cigarette smoking, alcohol consumption, and other potential contributory factors."	Salg et al. noted exposures to asbestos, respirable dust, respirable quartz dust, silica, nickel, epoxy resins, cobalt, pitch, and lime in addition to Cr(VI).
				Bricklayers and allied craftworkers (non-white males)	8	117 (95%CI: 50-231)			

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Silverstein M, Mirer F, Kotelchuck D, Silverstein B, Bennett M. 1981. Mortality among workers in a die-casting and electroplating plant. Scand J Work Environ Health 7 Suppl 4, 156-65.	PMR	United States	238	Electroplating and die casting (White males)	4	2.54	Silverstein et al. indicated that the apparent chemical exposures of greatest extent in this plant was from die-casting operations, which may contain PAHs. Nickel exposure is also apparent.	Silverstein et al. indicated that smoking history and job classification as well as departmental assignment are needed.	Silverstein et al. noted that chemical constituents of the fumes need to be analyzed for B[a]P, PAHs as well as the chemical components of die lubricants and plating additives.
				Electroplating and die casting (White females)	0	0			
Stern F, Lehman E, Ruder A. 2001. Mortality among unionized construction plasterers and cement masons. Am J Ind Med 39, 373-88.	PMR/PCMR	United States	12,873	Construction plasterers, cement masons	161	PMR= 1.49; PCMR= 1.18 (both statistically significant)	Potential limitation in PMR methodology was discussed: "magnitude of the PMR for each cause of death is dependent on the magnitude of the PMR for other causes of death" Employment information was not available. Stern et al. indicate that with lack of death from 1981 to 1983, there may be a potential for biased results. They also discussed that no short-term workers were captured and inaccuracies in the cause of death on death certificates were possible.	Stern et al. discussed that smoking information was not available. Dietary factors, SES, asbestos exposure were also mentioned.	Stern et al. indicated that further research was needed. Cr(VI) is not mentioned in this study.
Walrath J, Decoufle P, Thomas TL. 1987. Mortality among workers in a shoe manufacturing company. Am J Ind Med 12, 615-623.	PMR	United States	4,734	Shoe manufacturing, leather (Males)	71	1.83 (statistically significant)	Walrath et al. discussed the limitation of PMR methodology. "PMR will overestimate risk when the study group's total mortality rate is lower than that of the general population and will underestimate risk when the study group's overall mortality rate is higher than that of the general population." It was also indicated that length of employment and type of job health in the leather industry could not be evaluated.	Confounding factors were not discussed.	Walrath et al. added that they were not able to evaluate whether the exposures of these shoe workers differed from those included in other epidemiologic investigations. Cr(VI) is not mentioned in this study.
				Shoe manufacturing, leather (Females)	14	1.28			