control study, but make no such statement for the SMR study. A second limitation is that the work history documentation was primarily limited to review of work records. As the authors point out, this is a highly skilled trade, and one which typically retains tradesmen from high school graduation to retirement. Also, the majority of individuals in this trade precede journeyman status by an apprenticeship of 4 year duration on the average. The authors identify a "mean duration of employment" as 15 years, and a mean age at first employment of 34 years. This captures only a portion, perhaps approximately half of the total exposure and work experience accumulated by men in this trade. Although the authors attempt to complement this work history by work experience, the data available to them to incorporate past work experience were suboptimal.

Perhaps the major shortcoming is choice of target exposure for study. For colon cancer, the authors have followed the direction of most previous authors on this topic in choosing wood dust as the potential carcinogen. The rationale for this is knowledge that wood dust has been highly associated with nasal cancer in previous studies.[2] In fact, this is a highly skilled occupational group that is exposed to many substances, some of which are potential carcinogens. The assumption that wood dust is possibly associated with excess colon cancer must be approached with caution. Our work with independent job shop pattern and model makers in the Detroit area has incorporated repeated analyses to review possible associations of numerous exposures with colon neoplasia. Exposure to epoxies approaches statistical significance on many of these analyses, and wood dust does not.

In conclusion, we agree that this topic needs continued attention. Furthermore, we believe that the appropriate study populations are those most intensely involved in this trade, ie, lifetime tradesmen with apprenticeship training, and have minimal involvement with other trades, or other hazardous exposures that may confound results.

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References

1. Roscoe RJ, Steenland K, McCammon CS Jr, et al. Colon and stomach cancer mortality among automotive wood model makers. *J Occup Med.* 1992;34: 759–768.
2. Acheson ED, Cowdell RH, Hadfield EH, MacBeth RG. Nasal cancer in woodworkers in the furniture industry. *Br Med J.* 1968:587–596.

The Author Replies: Dr Demers raised several interesting points in his letter commenting on our study of mortality among automotive wood model makers.[1] We wanted to clarify some of our design elements and provide additional information where it might be helpful.

Dr Demers pointed out that the cohort inclusion criterion of at least 1 month of model making, "allows for the inclusion of many individuals who may not have achieved the required duration of exposure to develop a malignancy." Although the "required duration of exposure to develop a malignancy" is unknown, 79% of our cohort had at least 5 years of employment in a study plant. Only 3% of the cohort had less than 1 year of employment in a study plant and only 5% had less than 2 years. In our case-control studies, 89% of cases and 93% of controls had at least 5 years of wood-working employment in a study plant.

Dr Demers pointed out that our assumption that wood dust and other exposures remained relatively constant over time may be erroneous. This assumption was made out of necessity in order to quantify cumulative wood dust exposure over the careers of the cases and controls. In our case-control studies, we addressed the possibility of changing exposures by including separate tests for associations between mortality from colon and stomach cancer and wood-model making exposures after 1955. We found no association. In our cohort study, we indirectly addressed the changes in wood model making over time by providing SMRs by decade. We found the SMRs to be flat over the study period 1940 to 1984 for colon cancer and increasing for stomach cancer.

Dr Demers pointed out that our comparative analyses using the mortality rates for Wayne county might have been inappropriate, because the majority of pattern and model makers probably resided in Monroe and Macomb counties. Although he raises a important question, our SMRs for colon and stomach

cancer would not have been substantially different had we chosen the other Detroit-area counties. In our paper, we used mortality rates from Wayne county over the period 1960 to 1984 for comparison. We found SMRs of 0.94 (95% CI, 0.53–1.57) for colon cancer and 1.63 (95% CI, 0.92–2.70) for stomach cancer for our cohort of wood model makers. In calculations performed for this letter using the combined mortality rates for Wayne, Macomb, and Monroe counties, we found SMRs of 0.95 (95% CI, 0.53–1.57) for colon cancer and 1.68 (95% CI, 0.94–2.77) for stomach cancer. Separate SMR calculations using mortality rates from Macomb and Monroe counties also revealed virtually identical SMRs. The death certificates for the 37 model makers who died from either colon or stomach cancer in our cohort revealed that 51% died in Wayne county, 14% died in Macomb county, 0% died in Monroe county, 16% died in Oakland county, and 19% died outside the Detroit area.

Dr Demers stated that, "... the authors may not have adequately identified the primary cause of death as cancer in the SMR portion of their study. They do state that contributing causes were listed in the case-control study, but make no such statement for the SMR study." In both our cohort and case-control studies, deaths were defined identically by the underlying cause of death from the death certificate. Our case-control study for stomach cancer analyzed the same 17 deaths found in our cohort study; our case-control study for colon cancer analyzed 20 out of the 21 deaths found in our cohort study (one death in the cohort study was due to cancer of the small intestine). In our paper, we noted the number of cases which would have been added had we included contributory causes of death. The total was one additional mention of colon cancer and no additional mentions of stomach cancer. We did not include the one additional mention in either our cohort or case-control studies because it would not have changed our results. Dr Demers' points about identification of cancer as the primary cause of death and the weaknesses of mortality studies are well taken. Included in our recommendations for future studies is the use of disease incidence as the outcome measure.

Dr Demers stated that our major shortcoming might have been the choice of wood dust as the potential carcinogen. Besides wood dust, however, we also analyzed the duration of time employed in wood model making because other potential carcinogens in addition to wood dust might have been present. Specifically, we noted that about 90% of the jobs with wood dust as their predominant exposure also exposed workers to plastics and solvents. In our case-control studies, in addition to our tests for associations between mortality and wood dust exposure, we also tested for associations between mortality and the duration employed in wood model making. We tested the cumulative duration employed in model making over the entire career at the study plants, the cumulative duration lagged by 10 years to help account for latency, and the cumulative duration only after 1955 when wood products impregnated with epoxy resins were introduced. All the odds ratios we calculated either for wood

dust or for the cumulative duration employed in wood model making were less than 1.0 and nonsignificant.

We thank Dr Demers for his comments and hope that this additional information will be helpful.

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1. Roscoe RJ, Steenland K, McCammon, CS Jr, et al. Colon and stomach cancer mortality among automotive wood model makers. *J Occup Med.* 1992;34: 759–768.

Board-Certified Occupational Physicians

To the Editor: The current shortage of board-certified or board-eligible occupational physicians in the United States has been convincingly documented by the Institute of Medicine of the National Academy of Sciences. Fewer than 1200 physicians have ever been board-certified in occupational medicine, with an unknown fraction of these retired or inactive. Estimates of the shortage of occupational and environmental physicians range from 3280[1] to 3100 to 5500.[2] Yet current traditional, full-time residency programs in the United States have graduated on average only 70 physicians per year. At the same time, opportunities for practice in the field are growing very rapidly, particularly in hospital-based or group practice-based consultative services. These opportunities create an ever increasing demand for well-trained occupational physicians, far outstripping the available supply. This imbalance results in the majority of such positions being filled by physicians either unboarded or with boards in other specialities. Many of these physicians have a desire to pursue additional training and become board-eligible in occupational medicine. However, few of these physicians are willing to undergo the substantial disruption of their careers represented by enrollment in a full-time, on-site residency. Moreover, existent residency programs do not have the financial resources to support stipends and tuition for even a modest influx of such physicians.

The University of Michigan On Job/On Campus Residency

The above considerations suggest that the offering of a well-designed part-time residency in occupational medicine could meet the demand for more training for currently practicing physicians and substantially contribute to the level of competence of occupational medicine as it is actually being practiced. The University of Michigan Residency in Occupational and Environmental Medicine has strived to meet this need for additional training in a unique, nonresidential training program known as the On Job/On Campus (OJ/OC) Residency Program in Occupational and Environmental Medicine.

Academic Component

The OJ/OC training program includes distinct academic and practicum components. The academic component leads to a Masters of Public Health in Occupational Health over a 24-month period. Residents attend 24 monthly 4-day sessions (Thursday through Sunday) at the Ann Arbor campus. During the program, they complete the same coursework with the same faculty instructors as they would if enrolled as a full-time student for 1 academic year. A list of courses is shown in Table 1. The academic component was established in 1981 with a new cohort beginning every 2 years. To date, 63 physicians have completed the degree in one of the five previous cohorts, with another 15 enrolled in the current cohort. The seventh cohort will begin September 1993. In the early cohorts, plant-based corporate physicians predominated. In recent cohorts, most physicians have come from hospitals or group-based consulting practices. Physicians from national, state, and local governmental agencies in both the United States and Canada have also been represented. While roughly two thirds of residents have come from the states of Michigan, Ohio, and Indiana, residents have hailed from as far away as California and New Mexico.

The academic component of the OJ/OC program is virtually identical in its essentials to the same component of our