to give up the habit should not be changed: stopping smoking benefits respiratory symptoms and cardiorespiratory disability, and it appears to reduce the risks of death from lung cancer and coronary heart disease."

Whether those who quit smoking in these somewhat inconclusive studies were "self-selected" or not, the decreased mortality rates among quitters lend further support for the idea that smoking cessation is beneficial to health. Since the authors of these reports clearly state the above observations, we are frankly surprised that Dr. Burch failed to mention them in his letter.

Chemical analysis of cigarette smoke reveals a multitude of known mutagens and carcinogens. These include both initiators, agents that irreversibly start the carcinogenic process, and tumor promoters, substances that accelerate malignant changes. It is not known which of the chemicals in cigarette smoke cause lung cancer. If a causative agent were an initiator, the cessation of smoking would not be expected to reduce the incidence of this disease. Thus, the fact that this decrease is observed has suggested that tumor promoters in cigarette smoke are major causal factors. If this decreased incidence in quitters were not observed it would not detract from the arguments for cigarette smoke as a cause of lung cancer. The fact that cessation of smoking results in a decreased incidence of lung cancer need not have been expected but should surely provide strong motivation to stop smoking.

Finally, our position paper was not produced in a vacuum. Arrayed against the opinions of Dr. Burch is an overwhelming body of evidence, much of which has been reported in Surgeon General reports since 1964. Cigarette smoke contains numerous carcinogens, tumor initiators, tumor promoters, cocarcinogens, and mutagens. Successive Surgeon General reports have identified the association between cigarette smoking and lung cancer among men (5) and women (6), cancers at other sites (7), heart disease (8), and chronic obstructive lung disease (9) and have reported growing evidence for the deleterious health effects of passive smoking (7). The scientific debate on smoking and health was over long ago, and the tobacco industry lost. Discussion should now turn to the best methods of reducing the preventable epidemic of smoking-related diseases.

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Reply 2

The evidence implicating cigarette smoking as the cause of 75 to 90% of lung cancer in the United States comes from a wide variety of sources, including numerous case-control and cohort studies that demonstrate a clear dose-response relationship (1). Internationally, populations with low smoking prevalence generally have low rates of lung cancer. Parallels between increases in smoking prevalence and subsequent increases in lung cancer rates have been seen throughout the world (2). That smoking cessation is effective is suggested by studies that have shown that people who quit smoking subsequently have lower risks of cancer and heart disease than people who continue to smoke, as well as by studies showing that marked reductions in cigarette smoking among British physicians and among young American men have been followed by marked declines in lung cancer rates (3, 4).

The vast majority of scientists and medical societies find that the reported associations between smoking and lung cancer enjoy a consistency with few, if any, parallels in the history of disease etiology. Variation in the strength of associations or any anomalies in the temporal relationship of smoking with lung cancer reported across studies predominantly reflect differing smoking patterns of the populations studied, providing further support for a causal interpretation. Although specificity of the association of smoking with lung cancer is a criterion difficult to satisfy, this is largely because of the myriad of diseases in which smoking is implicated.

The Advisory Committee to the Surgeon General in 1964 and the authors of subsequent reports on smoking and health from the Surgeon General have made it clear that their use of the term "causal" has not been intended to exclude other agents in the etiology of lung cancer. The scientific community has seriously considered and acknowledged the role of other environmental pollutants (notably occupational exposures), and careful multivariate analyses have been published on this subject. None has exonerated the key contribution of cigarette smoking to lung cancer. In fact, these investigations have served to underscore the role that smoking plays in compounding risks associated with other exposures. There is strong consensus that cigarette smoking is the overwhelming cause of lung cancer in the general population.

Burch's statements about "synchronous" changes in lung cancer mortality for men and women in Britain between 1901 and 1955 are untrue. The rates in British men increased faster and more dramatically than the rates in British women, who started smoking later (5). These dysynchronous changes are illustrated in Cairns' graph of sex-specific smoking prevalence and lung cancer mortality rates (6), which is reproduced in our paper. The statement that "Any increases that might reasonably be attributed to smoking would have been much too small to be detected against the overwhelming background of synchro-

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nous changes" is scientifically irresponsible.

Feinstein is quoted to the effect that the randomized trial is a "gold standard," and it is noted that we did not discuss the results of randomized trials in our review. The implication that randomized trials would be the best evidence is clever; since it would be ethically and logistically impossible to randomly assign people at an early age to smoke or not to smoke over their lifetimes, the strategy of calling for such evidence will continue to sustain those who claim that the truth is not yet known. But a catch-22 is introduced: "in common with all other epidemiological methods, [the randomized trial] falls short of the theoretical ideal." Addressing randomized trials of smoking cessation, Burch suggests that "it remains possible that the act of quitting is followed by other changes, of a psychological, dietary, or other nature, that are carcinogenic or anti-carcinogenic." We're damned if we don't conduct clinical trials and damned if we do.

The results of two randomized control studies (MRFIT and Whitehall) on the effects of smoking cessation are cited against causality of smoking in cancer. Both were studies of middle-aged men, presumably with long smoking histories. Neither study was designed to detect differences in lung cancer occurrence and both studies lack the power, in terms of numbers, to do so. From what is known about latency in lung cancer, the length of the follow-up period in the two studies (7 and 10 years, respectively) is probably too short to test for an effect of smoking cessation on lung cancer. Assuming a doubling time of 100 years, it would take a lung tumor over 8 years to grow to a clinically observable stage (7). Cancers detected within approximately 8 years of cessation may represent preexisting disease that could not be prevented through smoking cessation. Interestingly, Burch cites the results of the two studies only for "cancers other than lung cancer." The authors of the Whitehall study, observing a reduction in nasal obstruction, cough, phlegm, and dyspnea in their intervention group, stated, "in our view the present policy of encouraging smokers to give up the habit should not be changed" (8). The authors of the MRFIT study have reported that, within each of the two main study groups (special intervention and usual care), men who stopped cigarette smoking had lower total mortality than men who continued to smoke (9), a finding which is not appreciably altered when other potential confounding factors are taken into account (10).

However analyzed, the results of these two studies of smoking cessation should not be interpreted to mean that cigarette smoking does not *cause* cancer. What causes disease and what interrupts the disease process in later life should not be confused. Burch's suggestion that the results of the two studies be combined to enable "a more useful test of the causal/constitutional interpretations" is therefore not tenable, nor is there any guarantee that the results would satisfy him.

To question whether the relationship between smoking and lung cancer meets scientific criteria for causality is to continue to beat a dead horse. To suggest that the issue of lung cancer causality has been treated on an "all-or-none basis" is to mount a straw man on a dead horse. In the face of the evidence available in the mid-1980s, Burch's stance is more than academic folly. It is a disservice to the public health.

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