

Nonsmokers and Cigarette Smoke:

A Modified Perception of Risk

The article by Repace and Lowrey (1) is an interesting and useful aid for evaluating the exposure levels of nonsmokers to cigarette smoke. The article, however, is flawed because it compares the levels to those of smokers of cigarettes delivering the lowest amount of tar of any brand on the market. This cigarette delivered 0.55 mg of tar in 1978 and accounted for less than 2 percent of the cigarettes consumed that year and for less than 3 percent of the cigarettes sold in 1979 (2). The exposure of various nonsmokers was found to be the equivalent of smoking 2 to 27 such cigarettes per day. Twenty years ago, smoking as few as ten cigarettes daily was hazardous (3). Hence, the article implies that the health of exposed nonsmokers is seriously jeopardized.

The consequences of smoking on health have not been measured for consumers of the brand yielding the lowest tar, but rather for all smokers. In 1977 the average tar yield of American cigarettes, based on sales, was about 16 mg (4). Thus, "nonsmoker B" was exposed to the equivalent of one-sixth of the average 1977 cigarette per day, "nonsmoker C" to one per day, and "nonsmoker D" to one-sixteenth. It might be more pertinent to consider the tar delivery of cigarettes that were smoked about 20 years ago. The average cigarette in 1959 delivered about 29 mg in ten puffs. Thus, the model nonsmokers then would have been exposed to the equivalent of one-third to five puffs per day.

To be sure, we do not know that any level of cigarette smoke is harmless. The model nonsmokers were exposed to levels exceeding the primary annual National Ambient Air Quality Standards. Small amounts of smoke are irritating to many nonsmokers and may physically impair some. Such effects by themselves are sufficient cause for concern about passive exposure to cigarette smoke. Risk of

cancer and other diseases for which dose is important should not, however, be imputed from comparisons of nonsmokers with the least affected 2 percent of the smoking population.

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References

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2. J. C. Maxwell, Jr., personal communication.
3. C. J. Lynch and G. B. Gori, in *Banbury Report 3: A Safe Cigarette?*, G. B. Gori and F. G. Bock, Eds. (Cold Spring Harbor Laboratory, Cold Spring Harbor, N.Y., 1980), pp. 37-48.
4. E. L. Wynder and S. D. Stellman, *J. Natl. Cancer Inst.* **62**, 471 (1979).

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Bock raises an important issue: How is the estimated range of exposure of nonsmokers to cigarette smoke translated into an increased risk of incurring the diseases of smoking? However, Bock both misinterprets our analysis and understates the risks. First, we did not derive an exposure-response relation between tobacco smoke and risk on the basis of low-tar cigarette equivalents inhaled by nonsmokers. Rather, we expressed the range of exposure in terms of such equivalents and confined our assessment of risk to the statement that such exposure represents a serious risk to the health of nonsmokers. We justified this not only by comparison with low-tar cigarettes, but also by references to outdoor air standards, pulmonary lavage experiments, coke-oven emissions, and carcinogenic potency. Second, we do not agree with Bock's assertion that comparisons with low-tar cigarettes are inappropriate because such cigarettes are smoked by the "least affected 2 percent of the smoking population." The latest report of the Surgeon General (1) advises that "there is no safe cigarette and no safe level of consumption" and

that although lower yields of tar and nicotine reduce the risk of lung cancer and "to some extent improve the smoker's chance for longer life . . . it is not clear what reductions in risk may occur in the case of diseases other than lung cancer."

More to the point, Bock's comparisons of nonsmokers' exposures to those of inhaling smokers of high-tar cigarettes are misleading. As we have shown, the exposure of certain nonsmokers to tobacco smoke appears to be similar to the exposure of low-tar cigarette smokers. The cloud of pollution surrounding low-tar smokers appears to be not very different from the cloud surrounding high-tar smokers who are noninhalers. In fact, our low-tar cigarette produces side-stream emissions that are nearly 80 percent of those of the 1977 cigarette and nearly 40 percent of those of the 1959 cigarette (2). This is significant because a study begun in 1959 (3) has shown that 45- to 54-year-old male smokers who were noninhalers suffered a 41 percent higher mortality rate than male "nonsmokers" (4). A number of studies now indicate that carcinogenic, respiratory, and cardiovascular effects result from nonsmokers' exposure to indoor tobacco smoke (5).

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References and Notes

1. Office of the Surgeon General, *The Health Consequences of Smoking: The Changing Cigarette* (Department of Health and Human Services, Washington, D.C., 1981).
2. J. L. Repace and A. H. Lowrey, *ASHRAE Trans.*, in press.
3. Office of the Surgeon General, *Smoking and Health* (Department of Health, Education, and Welfare, Washington, D.C., 1979).
4. This increase is understated, since "nonsmokers" include a large number of persons who are exposed to the effects of indoor air pollution from tobacco smoke.
5. J. L. Repace, *Bull. N.Y. Acad. Med.*, in press.

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