

## Public Health Classics

This section looks back to some ground-breaking contributions to public health, reproducing them in their original form and adding a commentary on their significance from a modern-day perspective. To complement this month's theme of the *Bulletin*, Elisa Ong and Stanton A. Glantz review the 1981 paper by Takeshi Hirayama on the risk of lung cancer from passive smoking. The original paper is reproduced with permission from the *British Medical Journal*.

## Hirayama's work has stood the test of time

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In January 1981, Takeshi Hirayama published his epidemiological study demonstrating that second-hand smoke increased the risk of lung cancer in non-smoking Japanese women married to men who smoked compared with non-smoking women married to non-smoking men (1). Hirayama is generally credited with publishing the first evidence linking passive smoking and lung cancer, though there were two other studies published at about the same time, by Trichopoulos et. al (2) from Greece and Garfinkel (3) from the USA. While both studies showed an elevation in the point estimate of lung cancer risk associated with passive smoking, Garfinkel's study did not reach statistical significance.

Moving well beyond its usual efforts to create controversy about scientific studies that reach bothersome conclusions, the tobacco industry responded with a multimillion-dollar advertising campaign designed specifically to discredit Hirayama's paper (4). The industry commissioned epidemiologist Nathan Mantel to write a critique and used it, together with a cleverly worded description of the Garfinkel study, to suggest that it disputed the passive smoking–lung cancer connection, in advertisements that reached an estimated 80% of the American population (5). This campaign was particularly cynical since it was run despite the fact that the industry's own scientists, after reviewing Hirayama's work, concluded "Hirayama is a good scientist and his non-smoking wives publication was correct" and "that Hirayama was correct, that TI [Tobacco Institute] knew it, and that TI published its

statement about Hirayama knowing that the work was correct" (6, 7).

The *British Medical Journal* took note of these public attacks and re-opened correspondence about Hirayama's paper to provide him with an opportunity to respond in a scientific forum. The editors took the exceptional step of publishing Mantel's criticisms, which had been addressed to the Tobacco Institute and not the *British Medical Journal*, nine months after Hirayama's paper was originally published (9, 10). Hirayama and others demolished the criticisms (9, 10).

The campaign against Hirayama's findings was not limited to the United States. The tobacco industry ran similar advertisements worldwide. In Australia, the Australian Federation of Consumer Organizations took the Australian Tobacco Institute to court for misleading advertising over these claims, and won on the grounds that the advertisement was false and misleading (11).

The controversy generated by the tobacco industry attracted the attention of other epidemiologists who sought to see who was right. As a result, by 1986, 13 studies had been done on passive smoking and lung cancer, and the evidence was strong and consistent enough for the US Surgeon General to issue the first report dealing entirely with the effects of passive smoking (12), which concluded that "involuntary smoking causes disease, including lung cancer, in healthy nonsmokers". A few weeks later, the US National Academy of Sciences issued a similar report reaching the same conclusion (13). Concerning anything other than tobacco, the issue would have been considered closed at that point.

As time passed, several independent scientific bodies around the world reviewed the evidence that passive smoking causes lung cancer (and a wide variety of other diseases) and reached similar conclusions (Table 1). These reports helped stimulate the passage of clean indoor air ordinances, which not only protect non-smokers from second-hand smoke but also create an environment that makes it easier for smokers to stop (14, 15).

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Since publication of Hirayama's original paper, 37 studies of passive smoking and lung cancer have been published (16). Yet, needless to say, the tobacco industry continues to fight against the conclusion that second-hand smoke causes lung cancer. Recently the International Agency for Research on Cancer (IARC) published a study (17) similar to Hirayama's and supported the large body of evidence that second-hand smoke is a carcinogen (18). Years before the IARC report was published, however, the tobacco industry organized a sophisticated campaign against the study in an effort to prevent worldwide smoking restrictions, with the same kinds of misrepresentations it used against Hirayama (19).

Almost two decades have passed since publication of Hirayama's work and, despite the tobacco industry's best efforts, his conclusion that passive smoking causes lung cancer has stood the test of time. ■

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## References

- Hirayama T. Non-smoking wives of heavy smokers have a higher risk of lung cancer: a study from Japan. *British Medical Journal*, 1981, **282**: 183–185.
- Trichopoulos D et al. Lung cancer and passive smoking. *International Journal of Cancer*, 1981, **27**: 1–4.
- Garfinkel L. Time trends in lung cancer mortality among non-smokers and a note on passive smoking. *Journal of the National Cancer Institute*, 1981, **66**: 1061–1066.
- Glantz S. Tobacco industry response to the scientific evidence on passive smoking. In: *Proceedings of the 12th World Conference on Tobacco and Health 1983, Winnipeg, Manitoba*: 287–292.
- Chilcote cites growing need for unified action. *United States Tobacco Journal*, 8 May 1983.
- Wells J, Pepples E. *Re: Smoking and health — Tim Finnegan*. Brown and Williamson, 1981 (memorandum 24 July 1981 available at <http://www.library.ucsf.edu/tobacco/docs/html/1825.01>).
- Barnes D et al. Environmental tobacco smoke. *Journal of the American Medical Association*, 1995, **274**: 248–253.
- Glantz S et al. *The cigarette papers*. Berkeley, University of California Press, 1996.
- Non-smoking wives of heavy smokers have a higher risk of lung cancer: correspondence. *British Medical Journal*, 1981, **283**: 1464–1466.
- Non-smoking wives of heavy smokers have a higher risk of lung cancer: correspondence. *British Medical Journal*, 1981, **283**: 914–917.
- Tobacco litigation: AFCO v. TIA, the case against passive smoking*. Redfern, Australia, Legal Books, 1991.
- US Department of Health and Human Services. *The health consequences of involuntary smoking. Report of the Surgeon General*. Washington, DC, Public Health Service, 1986.
- National Research Council. *Environmental tobacco smoke. Measuring exposures and assessing health effects*. Washington, DC, National Academy Press, 1986.
- Pierce J et al. *Tobacco use in California. An evaluation of the tobacco control program, 1989–1993*. La Jolla, CA, University of California at San Diego, 1994: 170.
- Chapman S et al. The impact of smoke-free workplaces on declining cigarette consumption in Australia and the United States. *American Journal of Public Health*, 1999, **89** (7): 1018–1023.
- Hackshaw A, Law M, Wald N. The accumulated evidence on lung cancer and environmental tobacco smoke. *British Medical Journal*, 1997, **315**: 980–988.
- Boffetta P et al. Multicenter case-control study of exposure to environmental tobacco smoke and lung cancer in Europe. *Journal of the National Cancer Institute*, 1998, **90**: 1440–1450.
- Blot W, McLaughlin JK. Passive smoking and lung cancer risk: what is the story now? Editorial. *Journal of the National Cancer Institute*, 1998, **90**: 1416–1417.
- Ong E, Glantz S. Tobacco industry efforts to subvert a secondhand smoke study by the International Agency for Research on Cancer. *Lancet*, 2000; **355**: 1253–1259.
- US Environmental Protection Agency. *Respiratory health effects of passive smoking. Lung cancer and other disorders*. Washington, DC, United States Environmental Protection Agency, Office of Research and Development, 1992.
- California Environmental Protection Agency. *Health effects of exposure to environmental tobacco smoke*. Oakland, CA, California Environmental Protection Agency, 1997.
- The health effects of passive smoking: a scientific information paper*. Canberra, National Health and Medical Research Council, 1997.
- Report of the Scientific Committee on Tobacco and Health*. London, Scientific Committee on Tobacco and Health, 1998: 1253–1259.

Table 1. **Risk of lung cancer in passive smokers: results of study by Hirayama (1) confirmed by major international consensus reports**

Report	Year	Country	Relative risk	Confidence interval <sup>a</sup>
Hirayama (1, 9, 10)	1981	Japan		
1–19 cigarettes a day			1.61	1.09–2.39
20 cigarettes a day or more			2.08	1.39–3.11
US Environmental Protection Agency (20)	1992	USA	1.19	1.01–1.39
National Research Council (13)	1986	USA	1.34	1.18–1.53
Surgeon General (12)	1986	USA	1.53	na
California Environmental Protection Agency (21)	1997	USA	1.20	na
National Health and Medical Research Council (22)	1997	Australia	1.32	1.10–1.69
Scientific Committee on Tobacco and Health (23)	1998	UK	1.20–1.30	na

<sup>a</sup> Confidence intervals are two-tailed 95%, except US EPA which is one-tailed 95% (two-tailed 90%).

na = not available.