

EPIDEMIOLOGICAL EVIDENCE ON ENVIRONMENTAL TOBACCO SMOKE AND LUNG CANCER

1. Over 60 epidemiological studies of lung cancer among lifelong nonsmokers have been published.
2. The overall evidence shows no statistically significant increased risk of lung cancer in relation to ETS exposure from parents in childhood, or in social situations, or to non-spousal ETS exposure at home.
3. The overall evidence shows that lung cancer risk among nonsmoking women is significantly associated with having a husband who smokes (with a similar association seen in nonsmoking men in relation to smoking by the wife, though based on far less data). There is also evidence of a dose-response relationship,¹ with risk higher if the husband smokes more cigarettes per day or for a longer period of time. However, there are a number of reasons why this association and dose-response relationship cannot be interpreted as indicating a causal effect of ETS exposure including:
 - the association is weak and is not statistically significant in the great majority of studies; about 80% show no statistically significant association between smoking by the husband and the development of lung cancer;
 - the combined results vary over time, with the association being significantly weaker in the studies published since 1989 than in those published in the 1980s;
 - some of the very largest studies show no association, including four of the five studies involving over 400 lung cancer cases. One² of these reported no statistically significant association between lung cancer and any index of ETS exposure, while another³ even reported a statistically significantly reduced risk of lung cancer for non-smoking women married to smokers;
 - about 20% of the studies have not adjusted for age in the analysis, a standard procedure in epidemiology to avoid bias. These studies report much stronger associations with spousal exposure than those that did age-adjust.
 - spousal studies are particularly susceptible to various biasing factors. These include:
 - i) failure to consider diet, lifestyle, family medical history, education, socio-economic status and other factors believed to differ between smoking and non-smoking households; and
 - ii) the inappropriate inclusion of some misclassified current and former smokers among the lifelong non-smokers.
 - reliance on reported rather than objectively measured ETS exposure data, and failure to publish negative studies.

No-one has yet designed a study in such a way as to eliminate all these sources of bias. However, recent statistical analyses have demonstrated formally that the weak association and dose-response relationship between lung cancer and smoking by the husband would essentially disappear were proper adjustment made for age, diet, education and misclassification of smoking habits.^{4,5,6}

4. There is also some indication from the overall evidence that lung cancer risk among non-smokers might be weakly associated with workplace ETS exposure. However, only three of 31 relative risk estimates are statistically significant and biases that apply to the spousal data are also likely to apply to the workplace data.
5. Taken as a whole, the epidemiology does not support the claim that ETS causes lung cancer in non-smokers.

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1. Fry JS et al "*Revisiting the association between environmental tobacco smoke exposure and lung cancer risk. I. The dose-response relationship with amount and duration of smoking by the husband*" Indoor Built Environ 9:303-316 (2000).
 2. Brownson RC et al "*Passive smoking and lung cancer in nonsmoking women*" Am J Publ Health 82:1525-1530 (1992).
 3. Wu-Williams AH et al "*Lung cancer among women in north-east China*" Br J Cancer 62:982-987 (1990).
 4. Fry JS et al "*Revisiting the association between environmental tobacco smoke exposure and lung cancer risk. II. Adjustment for the potential confounding effects of fruit, vegetables, dietary fat and education*" Indoor Built Environ 10:20-39 (2001).
 5. Lee PN et al "*Revisiting the association between environmental tobacco smoke exposure and lung cancer risk. III. Adjustment for the biasing effect of misclassification of smoking habits*" Indoor Built Environ 10:384-398 (2001).
 6. Lee PN et al "*Revisiting the association between environmental tobacco smoke exposure and lung cancer risk. V. Overall conclusions*" Indoor Built Environ 11:59-82 (2002).

ENVIRONMENTAL TOBACCO SMOKE AND LUNG CANCER

THE DATA

The tables and figures that follow summarize the key evidence in relation to:

smoking by the husband (Figure 1, Table 1),
smoking by the wife (Figure 2, Table 2),
ETS exposure in the workplace (Figure 3, Table 3), and
ETS exposure in childhood (Figure 4, Table 4).

Relative risk estimates and 95% confidence limits in Tables 1 to 4 are adjusted for covariates if adjusted data are available, and otherwise are unadjusted. Where, in some cases, the source publication provides more than one adjusted estimate, the data that are normally presented are those adjusted for most covariates. Where studies present appropriate data on numbers of cases and controls (or populations at risk) unadjusted relative risks and 95% confidence limits are calculated, or checked, using the CIA program described by Morris and Gardner.⁷

Some studies reported adjusted relative risks and confidence intervals only by level of the exposure of interest. These adjusted risks and intervals were used to estimate corresponding “effective numbers” of cases and controls (or subjects at risk) at each level, which could then be combined to allow estimation of risks and intervals for overall exposure.¹

The relative risks and 95% confidence limits are plotted graphically in the figures. In the figures the points indicate the relative risk estimates, with the confidence limits indicated by the error bars. The width of the error bars is proportional to the inverse of the variance of the relative risk estimate, which is closely related to the number of lung cancers studied. By this means of presentation, large studies, which contribute more to the overall evidence, are seen more clearly than small studies.

The tables and figures are based on results from a total of 63 studies (1-63). An appendix explains why results from certain other studies, which might have been thought to cite relevant data, are not included in the tables and figures.

⁷ Morris JA and Gardner MJ “Calculating confidence intervals for relative risks (odds ratios) and standardised ratios and rates” Br Med J 296:1313-1316 (1988).

Figure 1 - LUNG CANCER AND HUSBAND'S SMOKING

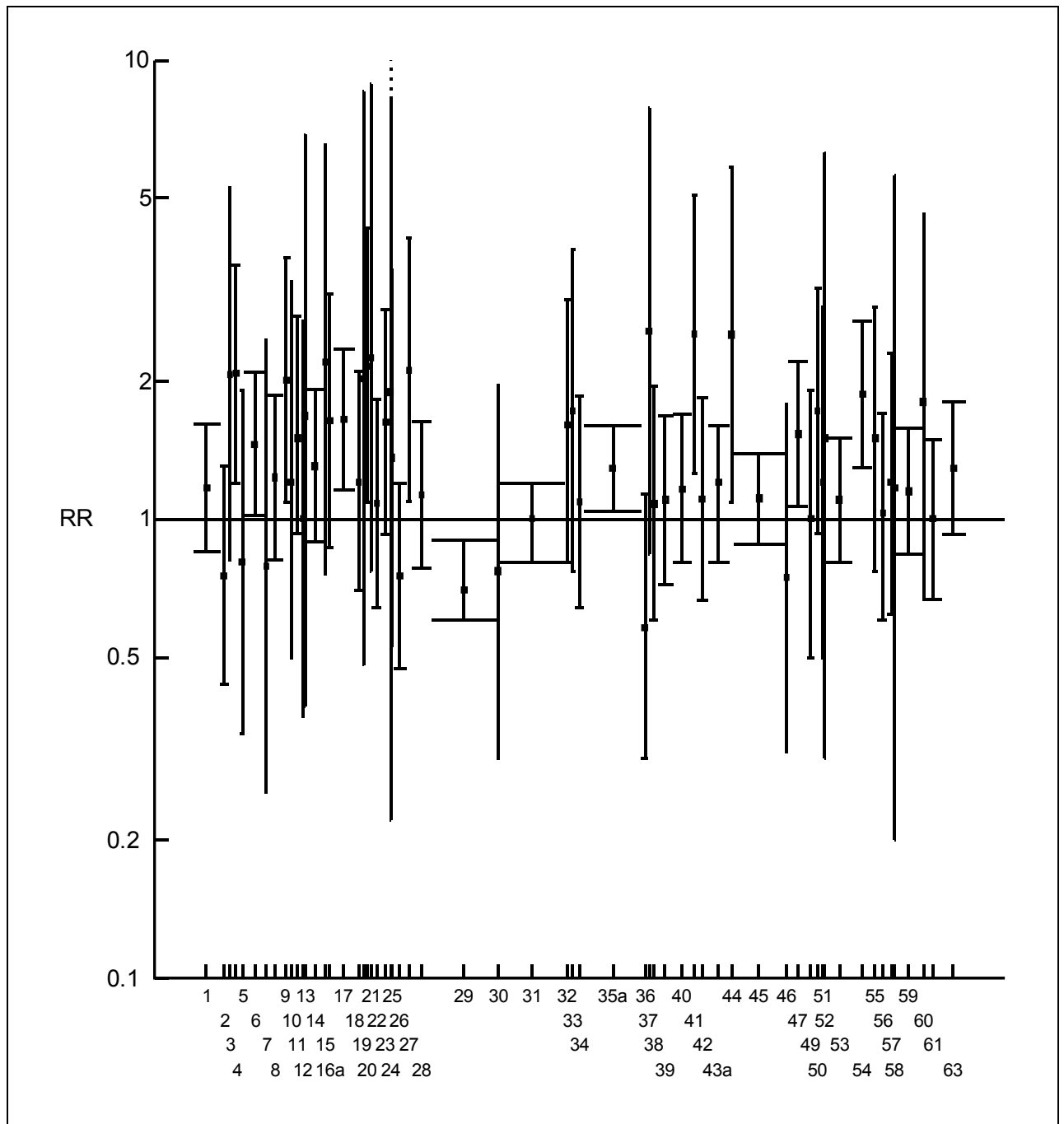


TABLE 1: Relative risk of lung cancer among lifelong nonsmoking women in relation to smoking by the husband

| Study | | | | | Number of lung cancers | Relative risk (95% confidence limits) | Significance | Notes |
|-------|--------------|------|----------------|------|------------------------|---------------------------------------|--------------|-------|
| Ref | Author | Year | Location | Type | | | | |
| 1 | Garfinkel 1 | 1981 | USA | P | 153 | 1.17 (0.85-1.61) | | a |
| 2 | Chan | 1982 | Hong Kong | CC | 84 | 0.75 (0.43-1.30) | | u |
| 3 | Correa | 1983 | USA | CC | 25 | 2.07 (0.81-5.25) | | u |
| 4 | Trichopoulos | 1983 | Greece | CC | 77 | 2.08 (1.20-3.59) | + | u |
| 5 | Buffler | 1984 | USA | CC | 41 | 0.80 (0.34-1.90) | | u |
| 6 | Hirayama | 1984 | Japan | P | 200 | 1.45 (1.02-2.08) | + | a |
| 7 | Kabat 1 | 1984 | USA | CC | 53 | 0.79 (0.25-2.45) | | mr |
| 8 | Garfinkel 2 | 1985 | USA | CC | 134 | 1.23 (0.81-1.87) | | mr |
| 9 | Lam W | 1985 | Hong Kong | CC | 75 | 2.01 (1.09-3.72) | + | u |
| 10 | Wu | 1985 | USA | CC | 31 | 1.20 (0.50-3.30) | | a |
| 11 | Akiba | 1986 | Japan | CC | 94 | 1.50 (0.93-2.76) | | ar |
| 12 | Lee | 1986 | UK | CC | 32 | 1.00 (0.37-2.71) | | a |
| 13 | Brownson 1 | 1987 | USA | CC | 19 | 1.68 (0.39-6.90) | | ar |
| 14 | Gao | 1987 | China | CC | 246 | 1.30 (0.89-1.91) | | ar |
| 15 | Humble | 1987 | USA | CC | 20 | 2.20 (0.76-6.56) | | ar |
| 16a | Koo | 1987 | Hong Kong | CC | 88 | 1.64 (0.87-3.09) | | ar |
| 17 | Lam T | 1987 | Hong Kong | CC | 202 | 1.65 (1.16-2.35) | + | u |
| 18 | Pershagen | 1987 | Sweden | CC | 83 | 1.20 (0.70-2.10) | | ar |
| 19 | Butler | 1988 | USA | P | 8 | 2.02 (0.48-8.56) | | a |
| 20 | Geng | 1988 | China | CC | 54 | 2.16 (1.08-4.29) | + | u |
| 21 | Inoue | 1988 | Japan | CC | 28 | 2.25 (0.77-8.85) | | a |
| 22 | Shimizu | 1988 | Japan | CC | 90 | 1.08 (0.64-1.82) | | mr |
| 23 | Choi | 1989 | Korea | CC | 75 | 1.63 (0.92-2.87) | | u |
| 24 | Hole | 1989 | Scotland | P | 6 | 1.89 (0.22-16.12) | | uv |
| 25 | Svensson | 1989 | Sweden | CC | 38 | 1.36 (0.53-3.49) | | a |
| 26 | Janerich | 1990 | USA | CC | 146 | 0.75 (0.47-1.20) | | mrz |
| 27 | Kalandidi | 1990 | Greece | CC | 91 | 2.11 (1.09-4.08) | + | ar |
| 28 | Sobue | 1990 | Japan | CC | 144 | 1.13 (0.78-1.63) | | ar |
| 29 | Wu-Williams | 1990 | China | CC | 417 | 0.70 (0.60-0.90) | - | ar |
| 30 | Liu Z | 1991 | China | CC | 54 | 0.77 (0.30-1.96) | | ar |
| 31 | Brownson 2 | 1992 | USA | CC | 432 | 1.00 (0.80-1.20) | | ar |
| 32 | Stockwell | 1992 | USA | CC | 210 | 1.60 (0.80-3.00) | | ar |
| 33 | Liu Q | 1993 | China | CC | 38 | 1.72 (0.77-3.87) | | r |
| 34 | Du | 1993 | China | CC | 75 | 1.09 (0.64-1.85) | | mrdr |
| 35a | Fontham | 1994 | USA | CC | 653 | 1.29 (1.04-1.60) | + | ar |
| 36 | Layard | 1994 | USA | CC | 39 | 0.58 (0.30-1.13) | | ar |
| 37 | deWaard | 1995 | Netherlands | CC | 23 | 2.57 (0.84-7.85) | | u |
| 38 | Kabat 2 | 1995 | USA | CC | 69 | 1.08 (0.60-1.94) | | mr |
| 39 | Schwartz | 1996 | USA | CC | 185 | 1.10 (0.72-1.68) | | arz |
| 40 | Sun | 1996 | China | CC | 230 | 1.16 (0.80-1.69) | | ar |
| 41 | Wang S-Y | 1996 | China | CC | 82 | 2.53 (1.26-5.10) | + | u |
| 42 | Wang T-J | 1996 | China | CC | 135 | 1.11 (0.67-1.84) | | m |
| 43a | Cardenas | 1997 | USA | P | 246 | 1.20 (0.80-1.60) | | ar |
| 44 | Zheng | 1997 | China | CC | 69 | 2.52 (1.09-5.85) | + | u |
| 45 | Boffetta 1 | 1998 | West Europe | CC | 509 | 1.11 (0.88-1.39) | | ar |
| 46 | Shen | 1998 | China | CC | 70 | 0.75 (0.31-1.78) | | a |
| 47 | Zaridze | 1998 | Russia | CC | 189 | 1.53 (1.06-2.21) | + | ar |
| 49 | Boffetta 2 | 1999 | Europe | CC | 66 | 1.00 (0.50-1.90) | | ar |
| 50 | Jee | 1999 | Korea | P | 79 | 1.72 (0.93-3.18) | | ar |
| 51 | Rapiti | 1999 | India | CC | 41 | 1.20 (0.50-2.90) | | ar |
| 52 | Speizer | 1999 | USA | P | 35 | 1.50 (0.30-6.30) | | a |
| 53 | Zhong | 1999 | China | CC | 504 | 1.10 (0.80-1.50) | | ar |
| 54 | Lee C-H | 2000 | Taiwan | CC | 268 | 1.87 (1.29-2.71) | + | arv |
| 55 | Malats | 2000 | Europe/Brazil | CC | 105 | 1.50 (0.77-2.91) | | arz |
| 56 | Wang L | 2000 | China | CC | 200 | 1.03 (0.60-1.70) | | ar |
| 57 | Johnson | 2001 | Canada | CC | 71 | 1.20 (0.62-2.30) | | arv |
| 58 | Kubik | 2001 | Czech Republic | CC | 24 | 1.17 (0.20-5.60) | | ar |
| 59 | Lagarde | 2001 | Sweden | CC | 242 | 1.15 (0.84-1.58) | | artz |
| 60 | Nishino | 2001 | Japan | P | 24 | 1.80 (0.67-4.60) | | ar |
| 61 | Ohno | 2002 | Japan | CC | 191 | 1.00 (0.67-1.49) | | acr |
| 63 | Seow | 2002 | Singapore | CC | 176 | 1.29 (0.93-1.80) | | u |

TABLE 1 (continued) Relative risk of lung cancer among lifelong nonsmoking women in relation to smoking by the husband

Index of exposure based on smoking by the spouse or, if not available, the nearest equivalent, as described below.

- Study 48, which only concerns men, and study 61, which only concerns childhood ETS exposure, are not considered in Table 1.
- Study author is name of first author in publication from which data extracted, see references.
- Study year is year of that publication.
- Study type: CC case control; P prospective
- Number of lung cancers in lifelong nonsmokers are study totals for females; for specific exposures numbers may be less.
- Where necessary, relative risks and 95% confidence limits were estimated from data presented.
- Significance: + statistically significant increase at 95% confidence level - significant decrease.

Notes

- a adjusted for age;
- c based on hospital controls. Data for population controls not used as non-response rate very high;
- d based on data for two control groups combined;
- m lifelong nonsmoking cases and controls matched for age but no age adjustment in analysis;
- r adjusted or matched for other factors (shown below);
- t relative risks are presented by radon exposure;
- u unadjusted for age or other factors;
- v relative risks were presented adjusted for age but only by level of exposure;
- z relative risks were presented for sexes combined and assumed to apply to each sex separately, with confidence intervals weighted according to numbers of subjects by sex.

**Factors other than age taken account of by adjustment or matching
(applies to all studies considered in Tables 1-4, except where stated in the Notes)**

| Study | Factors | Study | Factors |
|-------|--|-------|--|
| 7 | race; hospital | 39 | race |
| 8 | hospital | 40 | education |
| 11 | city; vital status; participation in medical examinations | 43 | race; education; blue collar employment; vegetable consumption; fat consumption; occupational exposure to asbestos; history of chronic lung disease |
| 13 | income; occupation | 45 | study centre |
| 14 | education | 47 | education |
| 15 | ethnicity | 49 | centre |
| 16 | live births; years since exposure ceased; schooling | 50 | socio-economic status; residence; husband's vegetable consumption; husband's occupation |
| 18 | vital status | 51 | residence, religion |
| 22 | hospital | 53 | income; vitamin C; respondent status; smokiness of kitchen; family history of lung cancer; potentially high risk occupation |
| 26 | residence, direct/surrogate interview | 54 | residential area; education; occupation; tuberculosis; cooking fumes; fume extractor |
| 27 | years of schooling; interviewer; total energy intake; fruit consumption | 55 | centre |
| 28 | education | 56 | ownership of colour TV; number of cattle; prefecture; childhood ETS exposure; |
| 29 | education; study area | 57 | province; education; total fruit and vegetables |
| 30 | age of start and years of cooking | 58 | education; residence |
| 31 | history of lung disease | 59 | radon; SES; occupation; residence; urban/rural |
| 32 | race; education | 60 | alcohol; green and yellow vegetables; fruit; meat; study area; history of respiratory disease |
| 33 | education, occupation and living area | 61 | research institution (region) |
| 34 | residence | 62 | beer; vodka; milk; butter; margarine; cheese; meat; fruit; vegetables; carrots; spinach; siblings with cancer; tuberculosis; place of residence; occupational exposure to any of six defined sources |
| 35 | race; area; education; fruits; vegetables and supplemental vitamin index; family history of lung cancer; employment in high risk occupations | | |
| 36 | race | | |
| 38 | race; hospital; date of interview; years of education | | |

TABLE 1 (continued 2) Relative risk of lung cancer among lifelong nonsmoking women in relation to smoking by the husband

Indices of ETS exposure used other than husband smoked

| Study | Index | Study | Index |
|-------|---|-------|--|
| 5 | Household smoker smokes regularly | 44 | Household exposure |
| 13 | Presence of persons smoking 4+ hours/day | 46 | Any exposure |
| 24 | Household smoker ever smoked | 52 | Exposure in adulthood |
| 25 | Exposure at home and/or at work as an adult | 56 | Exposed at home |
| 30 | Smoker in household | 57 | Exposed at home |
| 37 | Urinary cotinine >9.2 ng/mg creatinine | 58 | Exposed at home and/or work >3 hrs/day |
| 39 | Exposed at home | 59 | Exposed at home |
| 41 | Exposed at home and/or work | 63 | Exposed at home at least weekly |

Figure 2 - LUNG CANCER AND WIFE'S SMOKING

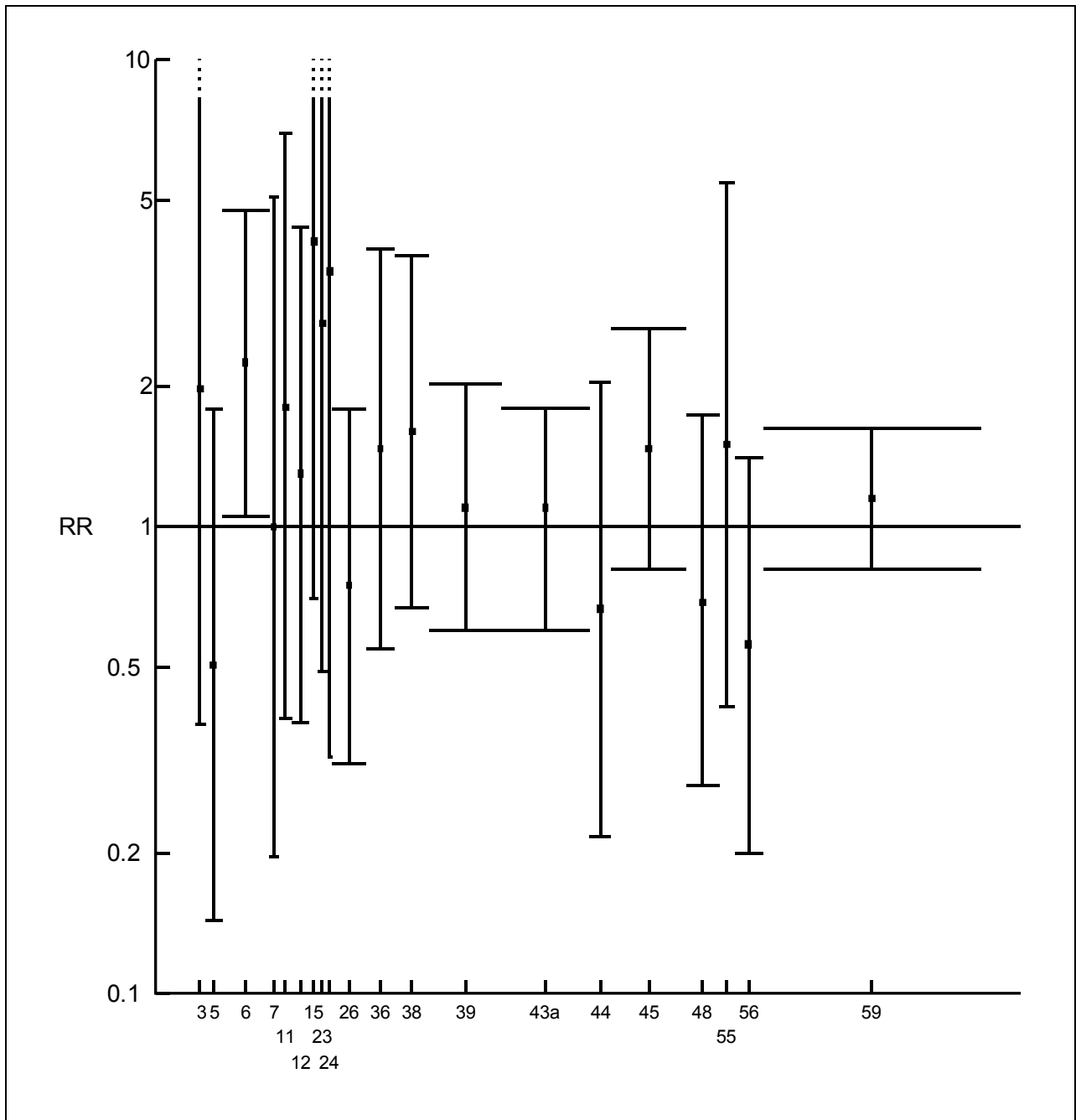


TABLE 2: Relative risk of lung cancer among lifelong nonsmoking men in relation to smoking by the wife

| Study | | | | | Number of lung cancers | Relative risk (95% confidence limits) | Significance | Notes |
|-------|------------|------|---------------|------|------------------------|---------------------------------------|--------------|-------|
| Ref | Author | Year | Location | Type | | | | |
| 3 | Correa | 1983 | USA | CC | 10 | 1.97 (0.38-10.32) | | u |
| 5 | Buffler | 1984 | USA | CC | 11 | 0.51 (0.14-1.79) | | u |
| 6 | Hirayama | 1984 | Japan | P | 64 | 2.25 (1.05-4.76) | + | a |
| 7 | Kabat 1 | 1984 | USA | CC | 25 | 1.00 (0.20-5.07) | | mr |
| 11 | Akiba | 1986 | Japan | CC | 19 | 1.80 (0.39-6.96) | | ar |
| 12 | Lee | 1986 | UK | CC | 15 | 1.30 (0.38-4.39) | | a |
| 15 | Humble | 1987 | USA | CC | 8 | 4.08 (0.70-23.91) | | ar |
| 23 | Choi | 1989 | Korea | CC | 13 | 2.73 (0.49-15.21) | | u |
| 24 | Hole | 1989 | Scotland | P | 3 | 3.52 (0.32-38.65) | | u |
| 26 | Janerich | 1990 | USA | CC | 45 | 0.75 (0.31-1.78) | | mrz |
| 36 | Layard | 1994 | USA | CC | 21 | 1.47 (0.55-3.94) | | ar |
| 38 | Kabat 2 | 1995 | USA | CC | 41 | 1.60 (0.67-3.82) | | mr |
| 39 | Schwartz | 1996 | USA | CC | 72 | 1.10 (0.60-2.03) | | arz |
| 43a | Cardenas | 1997 | USA | P | 116 | 1.10 (0.60-1.80) | | ar |
| 44 | Zheng | 1997 | China | CC | 25 | 0.67 (0.22-2.04) | | u |
| 45 | Boffetta 1 | 1998 | West Europe | CC | 141 | 1.47 (0.81-2.66) | | ar |
| 48 | Auvinen | 1998 | Finland | CC | 44 | 0.69 (0.28-1.74) | | as |
| 55 | Malats | 2000 | Europe/Brazil | CC | 17 | 1.50 (0.41-5.43) | | arz |
| 56 | Wang L | 2000 | China | CC | 33 | 0.56 (0.20-1.40) | | ar |
| 59 | Lagarde | 2001 | Sweden | CC | 191 | 1.15 (0.81-1.63) | | artz |

Index of exposure based on ever smoking by the spouse or, if not available, the nearest equivalent, as described below.

- Study author is name of first author in publication from which data extracted, see references.
- Study year is year of that publication.
- Study type: CC case control P prospective
- Number of lung cancers in lifelong nonsmokers are study totals for males; for specific exposures numbers may be less.
- Where necessary, relative risks and 95% confidence limits were estimated from data presented.
- Significance: + statistically significant increase at 95% confidence level - significant decrease.

Notes

- a adjusted for age;
- m lifelong nonsmoking cases and controls matched for age but no age adjustment in analysis;
- r adjusted or matched for other risk factors (see Table 1);
- s adjusted for sex; data only given for sexes combined but as 93% of cases were male the result has been assumed to apply to males;
- t relative risks presented by radon exposure;
- u unadjusted for age or other factors;
- z relative risks were presented for sexes combined and assumed to apply to each sex separately, with confidence intervals weighted according to numbers of subjects by sex.

Indices of ETS exposure used other than wife smoked

| Study | Index |
|-------|-----------------------------------|
| 5 | Household member smokes regularly |
| 24 | Household member ever smoked |
| 39 | Exposed at home |
| 44 | Household exposure |
| 48 | Passive smoking |
| 56 | Exposed at home |
| 59 | Exposed at home |

Figure 3 - LUNG CANCER AND WORKPLACE ETS EXPOSURE

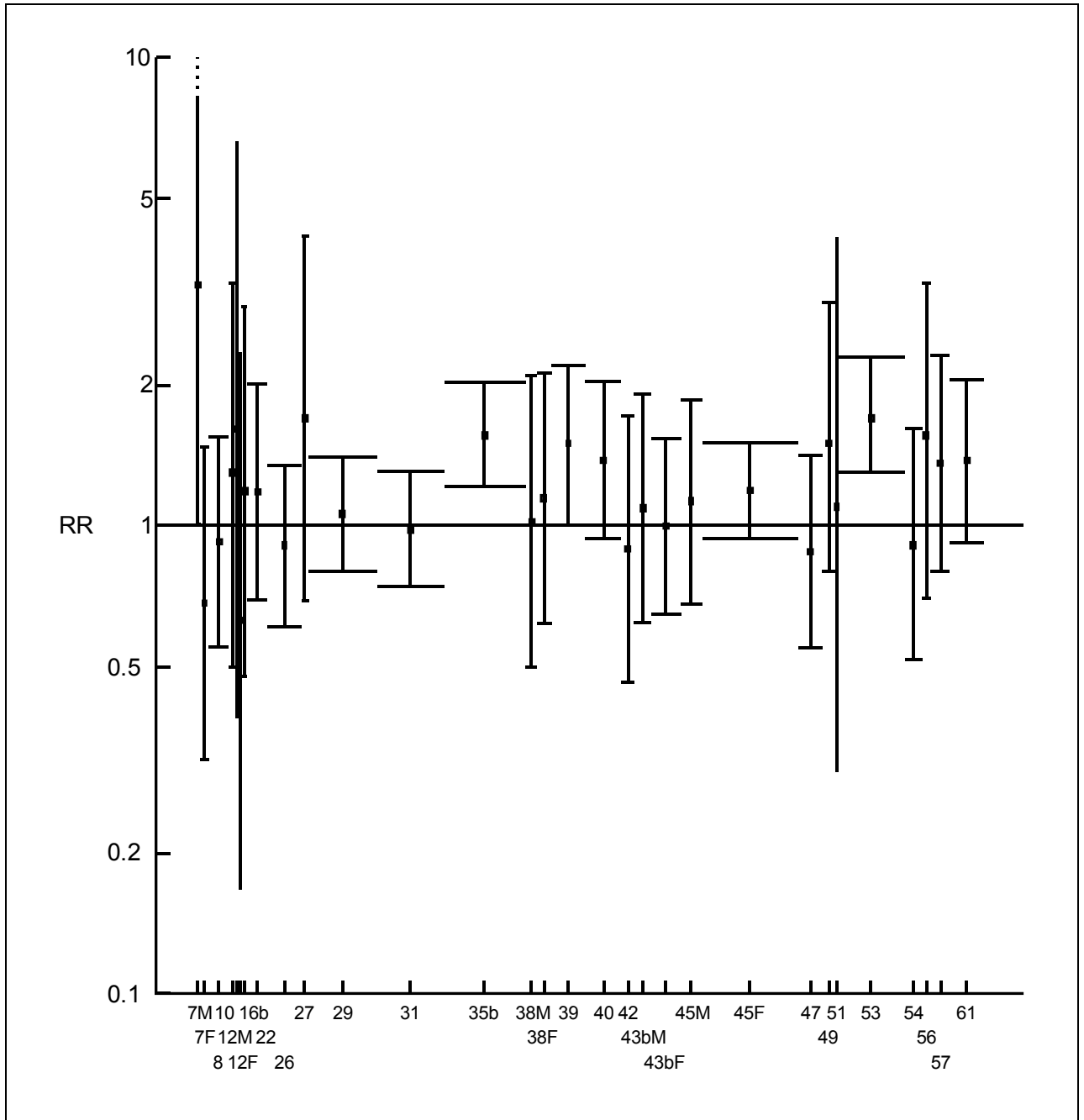


TABLE 3: Relative risk of lung cancer among lifelong nonsmokers in relation to ETS exposure in the workplace

| Study | Relative risk (95% confidence limits) | Significance | Notes | | |
|----------------|---|------------------|---------------------------------------|---|----------|
| Ref Author | Location | Sex | | | |
| 7 Kabat 1 | USA | Males Females | 3.27 (1.01-10.62) 0.68 (0.32-1.47) | + | mr mr |
| 8 Garfinkel 2 | USA | Females | 0.93 (0.55-1.55) | | mr |
| 10 Wu | USA | Females | 1.30 (0.50-3.30) | | a |
| 12 Lee | UK | Males Females | 1.61 (0.39-6.60) 0.63 (0.17-2.33) | | u u |
| 16b Koo | Hong Kong | Females | 1.19 (0.48-2.95) | | u |
| 22 Shimizu | Japan | Females | 1.18 (0.70-2.01) | | mr |
| 26 Janerich | USA | Combined | 0.91 (0.61-1.35) | | mr |
| 27 Kalandidi | Greece | Females | 1.70 (0.69-4.18) | | uy |
| 29 Wu-Williams | China | Females | 1.06 (0.80-1.40) | | arw |
| 31 Brownson 2 | USA | Females | 0.98 (0.74-1.31) | | arz |
| 35b Fontham | USA | Females | 1.56 (1.21-2.02) | + | ar |
| 38 Kabat 2 | USA | Males Females | 1.02 (0.50-2.09) 1.15 (0.62-2.13) | | mr mr |
| 39 Schwartz | USA | Combined | 1.50 (1.00-2.20) | ? | ar |
| 40 Sun | China | Females | 1.38 (0.94-2.04) | | ar |
| 42 Wang T-J | China | Females | 0.89 (0.46-1.73) | | m |
| 43b Cardenas | USA | Males Females | 1.09 (0.62-1.91) 1.00 (0.65-1.54) | | ar ar |
| 45 Boffetta 1 | West Europe | Males Females | 1.13 (0.68-1.86) 1.19 (0.94-1.51) | | ar |
| 47 Zaridze | Russia | Females | 0.88 (0.55-1.41) | | ar |
| 49 Boffetta 2 | Europe | Combined | 1.50 (0.80-3.00) | | ar |
| 51 Rapiti | India | Combined | 1.10 (0.30-4.10) | | ar |
| 53 Zhong | China | Females | 1.70 (1.30-2.30) | + | ar |
| 54 Lee C-H | Taiwan | Females | 0.91 (0.52-1.62) | | ar |
| 56 Wang L | China | Combined | 1.56 (0.70-3.30) | | arh |
| 57 Johnson | Canada | Females | 1.36 (0.80-2.31) | | arv |
| 61 Ohno | Japan | Females | 1.38 (0.92-2.05) | | ar |

- Study author is name of first author in publication from which data extracted, see references.
- Where necessary, relative risks and 95% confidence limits were estimated from data presented.
- Significance: + statistically significant increase at 95% confidence level -significant decrease ? borderline.

Notes

- | | | | |
|---|--|---|---|
| a | adjusted for age; | v | relative risks were presented adjusted for age but only |
| c | based on hospital controls; | w | estimate comes from California EPA report; |
| h | adjusted for household ETS exposure; | x | risk per 150 person-years of exposure; |
| m | lifelong nonsmoking cases and controls | y | some vs. minimal exposure; |
| r | matched for age but no age adjustment in analysis; | z | results reported in 1994 by WJ Butler in comments |
| u | unadjusted for age or other factors; | | submitted to OSHA on their proposed indoor air quality |
| | | | rules, reference 31 merely reporting finding |
| | | | no association and giving no detailed results. |

Footnote

The Stockwell study (32) also reported finding no association but gave no detailed results.

Figure 4 - LUNG CANCER AND CHILDHOOD ETS EXPOSURE

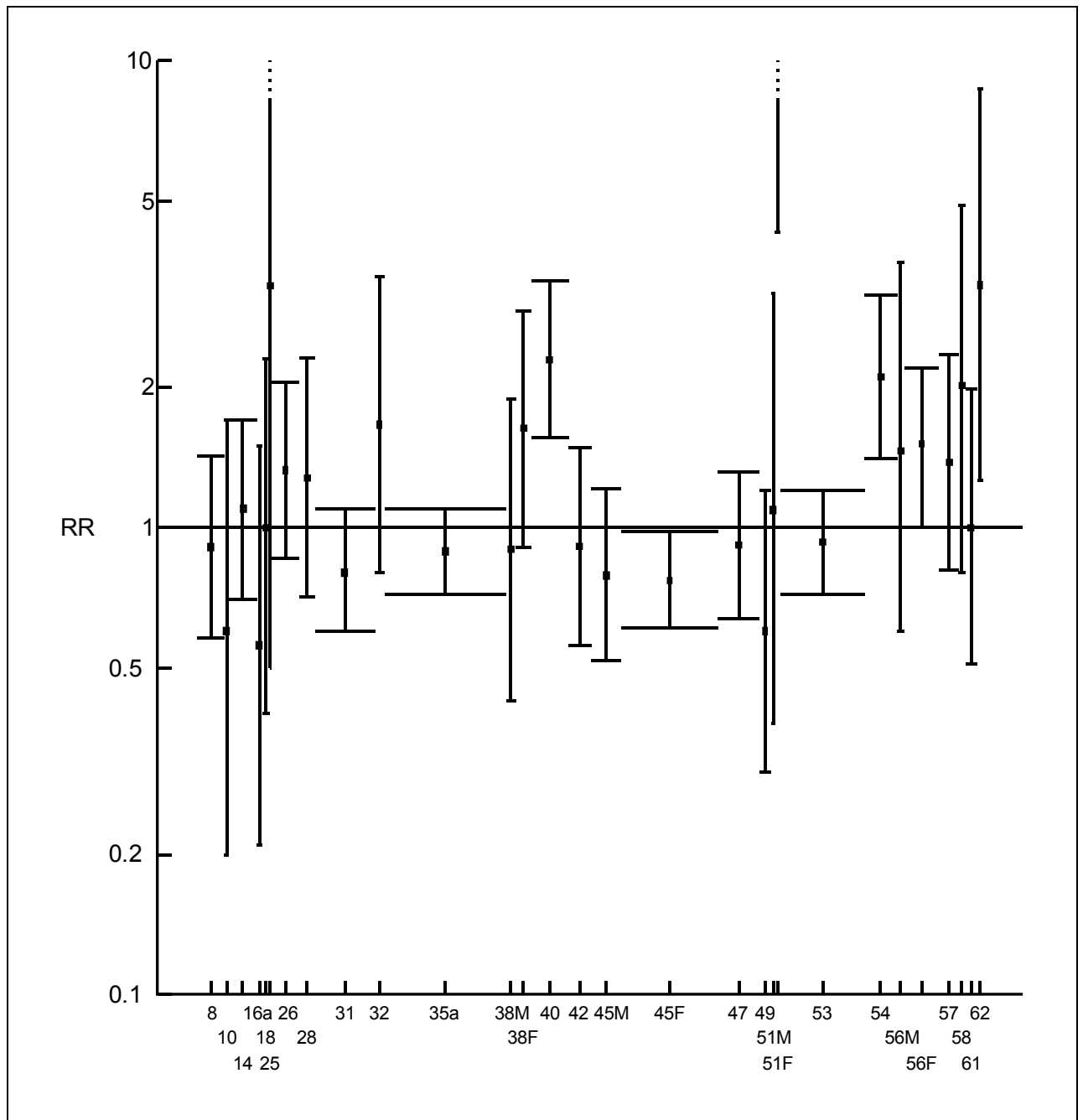


TABLE 4: Relative risk of lung cancer among lifelong nonsmokers in relation to ETS exposure in childhood

| Study | | Location | Sex | Relative risk (95% confidence limits) | Significance | Notes |
|-------|-------------|----------------|------------------|---|--------------|-------|
| Ref | Author | | | | | |
| 8 | Garfinkel 2 | USA | Females | 0.91 (0.58-1.42) | | mr |
| 10 | Wu | USA | Females | 0.60 (0.20-1.70) | | a |
| 14 | Gao | China | Females | 1.10 (0.70-1.70) | | ar |
| 16a | Koo | Hong Kong | Females | 0.56 (0.21-1.50) | | ar |
| 18 | Pershagen | Sweden | Females | 1.00 (0.40-2.30) | | ar |
| 25 | Svensson | Sweden | Females | 3.30 (0.50-18.80) | | a |
| 26 | Janerich | USA | Combined | 1.33 (0.86-2.06) | | mr |
| 28 | Sobue | Japan | Females | 1.28 (0.71-2.31) | | ar |
| 31 | Brownson 2 | USA | Females | 0.80 (0.60-1.10) | | ar |
| 32 | Stockwell | USA | Females | 1.66 (0.80-3.44) | | ar |
| 35a | Fontham | USA | Females | 0.89 (0.72-1.10) | | ar |
| 38 | Kabat 2 | USA | Males | 0.90 (0.43-1.89) | | mr |
| | | Females | 1.63 (0.91-2.92) | | mr | |
| 40 | Sun | China | Females | 2.29 (1.56-3.37) | + | ar |
| 42 | Wang T-J | China | Females | 0.91 (0.56-1.48) | | m |
| 45 | Boffetta 1 | West Europe | Males | 0.79 (0.52-1.21) | | ar |
| | | | Females | 0.77 (0.61-0.98) | - | ar |
| 47 | Zaridze | Russia | Females | 0.92 (0.64-1.32) | | ar |
| 49 | Boffetta 2 | Europe | Combined | 0.60 (0.30-1.20) | | ar |
| 51 | Rapiti | India | Males | 1.09 (0.38-3.18) | | ar |
| | | | Females | 12.0 (4.30-32.0) | + | ar |
| 53 | Zhong | China | Females | 0.93 (0.72-1.20) | | ar |
| 54 | Lee C-H | Taiwan | Females | 2.10 (1.40-3.14) | + | ar |
| 56 | Wang L | China | Males | 1.46 (0.60-3.70) | | arh |
| | | | Females | 1.51 (1.00-2.20) | + | arh |
| 57 | Johnson | Canada | Females | 1.38 (0.81-2.34) | | arv |
| 58 | Kubik | Czech Republic | Females | 2.02 (0.80-4.90) | | ar |
| 61 | Ohno | Japan | Females | 1.00 (0.51-1.98) | | acr |
| 62 | Rachtan | Poland | Females | 3.31 (1.26-8.69) | + | ar |

- Where study provided multiple relative risk estimates for individual sources of ETS exposure, that for maternal smoking was used.
- Study author is name of first author in publication from which data extracted, see references.
- Where necessary, relative risks and 95% confidence limits were estimated from data presented.
- Significance: + statistically significant increase at 95% confidence level - significant decrease.

Notes

- a adjusted for age;
- c based on hospital controls, smoking by mother of subject in primary/junior high school;
- h adjusted for household ETS exposure;
- m lifelong nonsmoking cases and controls matched for age but no age adjustment in analysis;
- r adjusted or matched for other risk factors (see Table 1);
- u unadjusted for age or other factors;
- v relative risks were presented adjusted for age but only by level of exposure.

Footnote

Two other studies, Correa (3) and Akiba (11), reported finding no association but gave no detailed results.

REFERENCES TO DATA SOURCES

- 1 Garfinkel L, *"Time trends in lung cancer mortality among nonsmokers and a note on passive smoking"* J Natl Cancer Inst 66:1061-1066 (1981).
- 2 Chan W, Fung S, *"Lung cancer in non-smokers in Hong Kong"* In: Eds E Grundmann *"Cancer Campaign 6, Cancer Epidemiology"* Stuttgart, Gustav Fischer Verlag, 199-202 (1982).
- 3 Correa P et al, *"Passive smoking and lung cancer"* Lancet II:595-597 (1983).
- 4 Trichopoulos D et al, *"Lung cancer and passive smoking. Conclusion of the Greek study"* Lancet 2:677-678 (1983).
- 5 Buffler P et al, *"The causes of lung cancer in Texas"* In: Eds M Mizell and P Correa *"Lung cancer causes and prevention, Proceedings of the International Lung Cancer Update Conference"* New Orleans, Louisiana, 83-89 (1984).
- 6 Hirayama T, *"Lung cancer in Japan: effects of nutrition and passive smoking"*. In: Eds M Mizell and P Correa *"Lung cancer causes and prevention, Proceedings of the International Lung Cancer Update Conference"* New Orleans, Louisiana, 175-195 (1984).
- 7 Kabat G, Wynder E, *"Lung cancer in nonsmokers"* Cancer 53:1214-1221 (1984).
- 8 Garfinkel L et al, *"Involuntary smoking and lung cancer: a case-control study"* J Natl Cancer Inst 75:463-469 (1985).
- 9 Lam W, *"A clinical and epidemiological study of carcinoma of lung in Hong Kong"* [Doctoral thesis] University of Hong Kong (1985).
- 10 Wu A et al, *"Smoking and other risk factors for lung cancer in women"* J Natl Cancer Inst 74:747-751 (1985).
- 11 Akiba S et al, *"Passive smoking and lung cancer among Japanese women"* Cancer Res 46:4804-4807 (1986).
- 12 Lee P et al, *"Relationship of passive smoking to risk of lung cancer and other smoking-associated diseases"* Br J Cancer 54:97-105 (1986).
- 13 Brownson R et al, *"Risk factors for adenocarcinoma of the lung"* Am J Epidemiol 125:25-34 (1987) (including revised data as given in US Environmental Protection Agency: Respiratory health effects of passive smoking: lung cancer and other disorders. Washington DC, 1992, EPA/600/6-90/006F).
- 14 Gao Y-T et al, *"Lung cancer among Chinese women"* Int J Cancer 40:604-609 (1987).
- 15 Humble C et al, *"Marriage to a smoker and lung cancer risk"* Am J Public Health 77:598-602 (1987).
- 16a Koo L et al, *"Measurements of passive smoking and estimates of lung cancer risk among non-smoking Chinese females"* Int J Cancer 39:162-169 (1987).
- 16b Koo L et al, *"Is passive smoking an added risk factor for lung cancer in Chinese women?"* J Exp Clin Cancer Res 3:277-283 (1984).
- 17 Lam T et al, *"Smoking, passive smoking and histological types of lung cancer in Hong Kong Chinese women"* Br J Cancer 56:673-678 (1987).
- 18 Pershagen G et al, *"Passive smoking and lung cancer in Swedish women"* Am J Epidemiol 125:17-24 (1987).
- 19 Butler TL, *"The relationship of passive smoking to various health outcomes among Seventh-day Adventists in California"* [Doctoral thesis] University of California, Los Angeles (1988).

- 20 Geng G et al, "*On the relationship between smoking and female lung cancer*" In: Eds M Aoki et al "*Smoking and health 1987*" Elsevier Science Publishers BV 483-486 (1988).
- 21 Inoue R, Hirayama T, "*Passive smoking: Passive smoking and lung cancer in women*" In: Eds M Aoki et al "*Smoking and health 1987*" Elsevier Science Publishers BV 283-285 (1988).
- 22 Shimizu H et al, "*A case control study of lung cancer in nonsmoking women*" *Tohoku J Exp Med* 154:389-397 (1988).
- 23 Choi S-Y et al, "*A case-control study on risk factors in lung cancer*" *Korean J Epidemiol* 11:66-80 (1989).
- 24 Hole D et al, "*Passive smoking and cardiorespiratory health in a general population in the west of Scotland*" *BMJ* 299:423-427 (1989).
- 25 Svensson C et al, "*Smoking and passive smoking in relation to lung cancer in women*" *Acta Oncologica* 28:623-639 (1989).
- 26 Janerich D et al, "*Lung cancer and exposure to tobacco smoke in the household*" *N Engl J Med* 323:632-636 (1990).
- 27 Kalandidi A et al, "*Passive smoking and diet in the etiology of lung cancer among nonsmokers*" *Cancer Causes and Control* 1:15-21 (1990).
- 28 Sobue T, "*Association of indoor air pollution and lifestyle with lung cancer in Osaka, Japan*" *Int J Epidemiol* 19:562-566 (1990).
- 29 Wu-Williams A et al, "*Lung cancer among women in north-east China*" *Br J Cancer* 62:982-987 (1990).
- 30 Liu Z et al, "*Smoking and other risk factors for lung cancer in Xuanwei, China*" *Int J Epidemiol* 20:26-31 (1991).
- 31 Brownson R et al, "*Passive smoking and lung cancer in nonsmoking women*" *Am J Public Health* 82:1525-1530 (1992).
- 32 Stockwell H et al, "*Environmental tobacco smoke and lung cancer risk in nonsmoking women*" *J Natl Cancer Inst* 84:1417-1422 (1992).
- 33 Liu Q et al, "*Indoor air pollution and lung cancer in Guangzhou, People's Republic of China*" *Amer J Epidemiol* 137:145-154(1993).
- 34 Du Y et al, "*Exposure to environmental tobacco smoke and female lung cancer in Guangzhou, China*" *Proceedings of Indoor Air '93, Vol 1, 511-516* (1993).
- 35a Fontham E et al, "*Environmental tobacco smoke and lung cancer in nonsmoking women. A multicenter study*" *JAMA* 271:1752-1759(1994).
- 35b Reynolds P et al, "*Occupational exposure to environmental tobacco smoke [Letter]*" *JAMA* 275:441-442 (1996).
- 36 Layard M "*Ischemic heart disease, lung cancer and spousal smoking in the National Mortality Followback Survey*". Submitted to OSHA re Proposed Rules, Federal Register Vol 59, No 65, Docket No H-122 (1994).
- 37 de Waard F et al, "*Urinary cotinine and lung cancer risk in a female cohort*" *Br J Cancer* 72:784-7 (1995).
- 38 Kabat G et al, "*Relation between exposure to environmental tobacco smoke and lung cancer in lifetime nonsmokers*" *Am J Epidemiol* 142:141-148 (1995).

- 39 Schwartz A et al, "Familial risk of lung cancer among nonsmokers and their relatives" Am J Epidemiol 144:554-562 (1996).
- 40 Sun X-W et al, "Environmental tobacco smoke (ETS) and lung cancer among nonsmoking women in Harbin, China" Lung Cancer 14(Suppl 1):S237 (1996).
- 41 Wang S et al, "A comparative study of the risk factors for lung cancer in Guangdong, China" Lung Cancer 14(Suppl 1):S99-S105 (1996).
- 42 Wang T et al, "Lung cancer in nonsmoking Chinese women: a case-control study" Lung Cancer 14(Suppl 1):S93-S98 (1996).
- 43a Cardenas VM et al, "Environmental tobacco smoke and lung cancer mortality in the American Cancer Society's Cancer Prevention Study II" Cancer Causes Control 8:57-64 (1997).
- 43b Cardenas VM, "Environmental tobacco smoke and lung cancer mortality in the American Cancer Society's Cancer Prevention Study II [Thesis]" Atlanta, Georgia, Emory University (1994).
- 44 Zheng S et al, "Studies on relationship between passive smoking and lung cancer in non-smoking women" Chung Hua Yu Fang I Hseuh Tsa Chih 31:163-165 (1997).
- 45 Boffetta P et al, "Multicenter case-control study of exposure to environmental tobacco smoke and lung cancer in Europe" J Natl Cancer Inst 90:1440-1450 (1998).
- 46 Shen XB et al, "Relation of exposure to environmental tobacco smoke and pulmonary adenocarcinoma in non-smoking women: A case control study in Nanjing" Oncol Rep 5: 1221-1223 (1998).
- 47 Zaridze D et al, "Exposure to environmental tobacco smoke and risk of lung cancer in non-smoking women from Moscow, Russia" Int J Cancer 75:335-338 (1998).
- 48 Auvinen A et al, "Indoor radon exposure and risk of lung cancer: a nested case-control study in Finland [Erratum letter]" J Natl Cancer Inst 90:401-402 (1998).
- 49 Boffetta P et al, "Exposure to environmental tobacco smoke and risk of adenocarcinoma of the lung" Int J Cancer 83:635-639 (1999).
- 50 Jee SH et al, "Effects of husbands' smoking on the incidence of lung cancer in Korean women" Int J Epidemiol 28:824-828 (1999).
- 51 Rapiti E et al, "Passive smoking and lung cancer in Chandigarh, India" Lung Cancer 23:183-189 (1999).
- 52 Speizer FE et al, "Prospective study of smoking, antioxidant intake, and lung cancer in middle aged women (USA)" Cancer Causes Control 10:475-482 (1999).
- 53 Zhong L et al, "A case-control study of lung cancer and environmental tobacco smoke among nonsmoking women living in Shanghai, China" Cancer Causes Control 10:607-616 (1999).
- 54 Lee C-H et al, "Lifetime environmental exposure to tobacco smoke and primary lung cancer of non-smoking Taiwanese women" Int J Epidemiol 29:224-231 (2000).
- 55 Malats N et al, "Lung cancer risk in nonsmokers and GSTM1 and GSTT1 genetic polymorphism" Cancer Epidemiol Biomarkers Prev 9:827-833 (2000).
- 56 Wang L et al, "Lung cancer and environmental tobacco smoke in a non-industrial area of China" Int J Cancer 88:139-145 (2000).
- 57 Johnson KC et al, "Lifetime residential and workplace exposure to environmental tobacco smoke and lung cancer in never-smoking women, Canada 1994-97" Int J Cancer 93:902-906 (2001).
- 58 Kubik A et al, "A case-control study of lung cancer among Czech women" Lung Cancer 31:111-122 (2001).

- ⁵⁹ Lagarde F et al, "Residential radon and lung cancer among never-smokers in Sweden" *Epidemiology* 12:396-404 (2001).
- ⁶⁰ Nishino Y et al, "Passive smoking at home and cancer risk: a population-based prospective study in Japanese nonsmoking women" *Cancer Causes Control* 12:797-802 (2001).
- ⁶¹ Ohno Y, Wakai K, Ando M, Shimokata K, Saka H, Yamamoto M, *et al.* 151: Studies on health effects of passive smoking - multicancer case-control study of the relationship between passive smoking and lung cancer in lifetime nonsmokers. In: *SRF Annual Report 2001*. 2002;857-61.
- ⁶² Rachtan J. Smoking, passive smoking and lung cancer cell types among women in Poland. *Lung Cancer* 2002;**35**:129-36.
- ⁶³ Seow A, Poh W-T, Teh M, Eng P, Wang Y-T, Tan W-C, *et al.* Diet, reproductive factors and lung cancer risk among Chinese women in Singapore: evidence for a protective effect of soy in nonsmokers. *Int J Cancer* 2002;**97**:365-71.

APPENDIX

STUDIES/ANALYSES NOT CONSIDERED IN SUMMARY REVIEW

In preparing the tables and figures in this document certain papers which might be thought to cite relevant data have not been referred to. The studies (their year of publication, country of origin and reference) and the reasons for not referring to them are given in this appendix.

Hirayama (1981, Japan, ref A1) - results superseded by 1984 paper (ref 6).

Trichopoulos (1981, Greece, ref A2) - results superseded by 1983 paper (ref 4).

Knoth (1983, Germany, ref A3) - no control population.

Koo (1983, Hong Kong, ref A4) - results superseded by 1984 paper (ref 16b) and 1987 paper (ref 16a).

Gillis (1984, Scotland, ref A5) - results superseded by Hole paper (ref 24).

Hirayama (1984, Japan, ref A6) - results given in other 1984 paper (ref 6).

Miller (1984, USA, ref A7) - only five cases of lung cancer included and results for these not separately presented.

Ziegler (1984, USA, ref A8) - data only presented (by Dalager, ref A12) in combination with those of Buffler (ref 5) and Correa (ref 3). One can infer (see Lee, 1992) there was some negative association in males with ETS exposure but no relative risk estimates can be obtained.

Hirayama (1985, Japan, ref A9) - results already given in 1984 paper (ref 6).

Koo (1985, Hong Kong, ref A10) - results already given in 1984 (ref 16b) and 1987 paper (ref 16a).

Sandler (1985, USA, refs A11a-c) - only two cases of lung cancer included.

Dalager (1986, USA, ref A12) - the paper only presents combined results from three studies already considered, Buffler (ref 5), Correa (ref 3) and Ziegler (ref A8).

Lloyd (1986, Scotland, ref A13) - results not presented for never smokers.

Reynolds (1987, USA, ref A14) - results presented only for cancers of smoking-related sites, and not lung cancer.

Varela (1987, USA, ref A15) - results superseded by 1990 Janerich paper (ref 26).

Axelsson (1988, Sweden, ref A16) - study designed to investigate effects of radon and not ETS and, as such, the controls, many with smoking-related diseases, were inappropriate; furthermore, not stated whether ETS findings related to never smokers, non-smokers, or whole population.

Katada (1988, Japan, ref A17) - numbers of never smoking cases and controls unexposed to ETS too small for any sort of reliable risk estimates to be calculated.

Pershagen (1988, Sweden, ref A18) - results already given in 1987 paper (ref 18).

Svensson (1988, Sweden, ref A19) - results superseded by 1989 paper (ref 25).

Li (1989, China, ref A20) - results not presented for never smokers.

Sandler (1989, US, ref A21) - results presented only for cancers of smoking-related sites and not for lung cancer.

Chen (1990, Taiwan, ref A22) - results seem not to be presented for never smokers, and no details given of index of ETS exposure used.

Hirayama (1990, Japan, ref A23) - results already given in 1984 paper (ref 6).

Kabat (1990, USA, ref A24) - results superseded by 1995 paper (ref 38).

Miller (1990, US, ref A25) - results concern respiratory, not lung cancer and only include three cases in spousal smoking analyses.

Sobue (1990, Japan, ref A26) - results given in other 1990 paper (ref 28).

Ye (1990, China, ref A27) - results not presented for never smokers.

Fontham (1991, USA, ref A28) - results superseded by 1994 paper (ref 35a).

He (1991, China, ref A29) - results already given in 1991 Liu paper (ref 30).

Holowaty (1991, Canada, ref A30) - results not presented for never smokers.

Ger (1992, China, ref A31) - results not presented for never smokers.

Jockel (1992, Germany, ref A32) - results mainly included as part of Boffetta 1 study (ref 45).

Fontham (1993, USA, refs A33 and A34) - results superseded by 1994 paper (ref 35a).

Ger (1993, China, ref A35) - results not presented for never smokers.

Järholm (1993, Sweden, ref A36) - only six lung cancers in never smoking women and cited odds ratio for ETS inconsistent with data presented.

Lan (1993, China, ref A37) - index of ETS exposure not given, not stated whether results applied to never smokers and odds ratios and confidence limits cited inconsistent with each other and with tabular data given.

Siegel (1993, USA, ref A38) - review paper of lung cancer risk in food-service workers, data generally relating to smokers and non-smokers combined.

Alavanja (1994, USA, ref A39) - results already given in 1992 Brownson paper (ref 31).

Geng (1994, China, ref A40) - results already given in 1988 paper (ref 20).

Kabat (1994, USA, ref A41) - results superseded by 1995 paper (ref 38).

Miller (1994, USA, ref A42) - control group, formed from decedents from all causes of death except lung cancer, contains many with diseases associated with smoking, and the index of ETS exposure does not separate out spousal, childhood and workplace exposure.

Wang (1994, China, ref A43) - believed to be based on subset of subjects from the Wu-Williams study (ref 29).

Zaridze (1994, Russia, ref A44) - results superseded by the 1998 paper (ref 47).

Alavanja (1995, USA, ref A45) - results already given in 1992 Brownson paper (ref 31).

Auvinen (1996, Finland, ref A46) - corrected results given in 1998 (ref 48).

Dai (1996, China, ref A47) - exposure to ETS recorded (source unstated) but not significant in regression analysis and relative risk not given.

Du (1996, China, ref A48) - results already given in 1993 Du paper (ref 33).

Lei (1996, China, ref A49) - results already given in 1993 Du paper (ref 33).

Luo (1996, China, ref A50) - results not presented for never smokers.

Shen (1996, China, ref A51) - results not presented for never smokers.

Wang (1996, China, ref A52) - believed to be based on subset of subjects from the Wu-Williams study (ref 29).

Yu S-Z (1996, China, ref A53) - gives pooled odds ratio for ETS from three case-control studies in China. Two studies are refs A20 and A27, already rejected, and the third is a study by Xu (ref A54) which actually presents no ETS data at all.

Yu Z-F (1996, China, ref A55) - results not presented for never smokers.

Dai (1997, China, ref A56) - results not presented for never smokers.

Joeckel (1997, Germany, ref A57) - results mainly included as part of Boffetta 1 study (ref 45).

Ko (1997, Taiwan, ref A58) – results superseded by Lee C-H report (ref 55).

Nyberg (1997, Sweden, ref A59) - results mainly included as part of Boffetta 1 study (ref 45).

Yang (1997, USA, ref A60) - results not presented for never smokers.

Joeckel (1998, Germany, ref A61) - results mainly included as part of Boffetta 1 study (ref 45).

Bennett (1999, USA, ref A62) - main results already given in 1992 Brownson paper (ref 31).

Boffetta (1999, West Europe, ref A63) - main results already given by Boffetta (ref 45).

Brennan (2000, West Europe, ref A64) - main results already given by Boffetta (ref 45).

Johnson (2000, USA, ref A65) - results superseded by 2001 paper (ref 57).

Kleinerman (2000, China, ref A66) - results only presented for sexes combined and for adult and childhood ETS exposure combined.

Ko (2000, Taiwan, ref A67) - results superseded by Lee C-H paper (ref 55).

Kreuzer (2000, Germany, ref A68) - results mainly included as part of Boffetta 1 study (ref 45).

Zhou (2000, China, ref A69) - results not presented for never smokers.

Kreuzer (2001, Germany, ref A70) - results mainly included as part of Boffetta 1 study (ref 45).

Lee (2001, Taiwan, ref A71) - results not presented for never smokers. Results for never smokers given in 2000 paper (ref 54).

Hu (2002, Canada, ref A72) - similar analyses to those given by Johnson (ref 57), but based on fewer controls.

Kreuzer (2002, Germany, ref A73) - results mainly included as part of Boffetta 1 study (ref 45).

Miller (2002, USA, ref A74) - abstract with no relative risks cited.

Rachtan (2002, Poland, ref A75) - results not presented for never smokers. Results for never smokers given in other Rachtan paper (ref 62).

Sasco (2002, Morocco, ref A76) - results not presented for never smokers.

It should also be noted that, when citing results from the Butler study (ref 19), results only presented for the "Spouse-Pairs Cohort". Results not presented for "AHSMOG Cohort" as those reported not for never smokers.

REFERENCES TO APPENDIX

- A1 Hirayama T, "Non-smoking wives of heavy smokers have a higher risk of lung cancer: a study from Japan" *Br Med J* 282:183-185 (1981).
- A2 Trichopoulos D et al, "Lung cancer and passive smoking" *Int J Cancer* 27:1-4 (1981).
- A3 Knoth A et al, "Passive smoking as cause of lung cancer in female smokers" *Med Klin* 78:54-59 (1983).
- A4 Koo LC, Ho JH-C, Saw D. Active and passive smoking among female lung cancer patients and controls in Hong Kong. *J Exp Clin Cancer Res* 1983;4:367-75.
- A5 Gillis C et al, "The effect of environmental tobacco smoke in two urban communities in the west of Scotland" *Eur J Respir Dis* 65 (suppl 133):121-126 (1984).
- A6 Hirayama T. Cancer mortality in nonsmoking women with smoking husbands based on a large-scale cohort study in Japan. *Prev Med* 1984;13:680-90.
- A7 Miller G, "Cancer, passive smoking and nonemployed and employed wives" *West J Med* 140:632-635 (1984).
- A8 Ziegler R et al, "Dietary carotene and vitamin A and risk of lung cancer among white men in New Jersey" *J Natl Cancer Inst* 73:1429-1435 (1984).
- A9 Hirayama T. Passive smoking - A new target of epidemiology. *Tokai J Exp Clin Med* 1985;10:287-93.
- A10 Koo LC, Ho JH-C, Lee N. An analysis of some risk factors for lung cancer in Hong Kong. *Int J Cancer* 1985;35:149-55.
- A11a Sandler D et al, "Cumulative effects of lifetime passive smoking on cancer risk" *Lancet* i:312-315 (1985).
- A11b Sandler D et al, "Passive smoking in adulthood and cancer risk" *Am J Epidemiol* 121:37-48 (1985).
- A11c Sandler D et al, "Cancer risk in adulthood from early life exposure to parents' smoking" *Am J Public Health* 75:487-492 (1985).
- A12 Dalager N et al, "The relation of passive smoking to lung cancer" *Cancer Res* 46:4808-4811 (1986).
- A13 Lloyd O et al, "Respiratory cancer in a Scottish industrial community: a retrospective case-control study" *J Soc Occup Med* 36:2-8 (1986).
- A14 Reynolds P et al, "Passive smoking and cancer incidence: prospective evidence from the Alameda County study" [paper]. Amherst, Society for Epidemiologic Research (1987).
- A15 Varela LR. *Assessment of the association between passive smoking and lung cancer* [Thesis]. New Haven, Conn: Faculty of the Graduate School of Yale University; 1987.
- A16 Axelson O et al, "Indoor radon exposure and active and passive smoking in relation to the occurrence of lung cancer" *Scand J Work Environ Health* 14:286-292 (1988).
- A17 Katada H et al, "Effect of passive smoking in lung cancer development in women in the Nara region" *Gan No Rinsho* 34:21-72 (1988).

- A18 Pershagen G, Svensson C, Hrubec Z, MORE. Environmental tobacco smoke and lung cancer in Swedish women. In: Seifert B, MORE, editors. *Indoor Air 87, Proceedings of the 4th International Conference on Indoor Air Quality and Climate*. Berlin: Institute for Water, Soil and Air Hygiene, 1988;34-8. 2.
- A19 Svensson C. *Lung cancer etiology in women* [Thesis]. Stockholm: Departments of Oncology and Environmental Hygiene, Karolinska Institute; 1988.
- A20 Li W-X et al, "A case-control study of female lung cancer at Xuhui district in Shanghai" *Chin J Prev Med* 23:93-95 (1989).
- A21 Sandler D et al, "Deaths from all causes in non-smokers who lived with smokers" *Am J Public Health* 79:163-167 (1989).
- A22 Chen C-J et al, "Epidemiologic characteristics and multiple risk factors of lung cancer in Taiwan" *Anticancer Res* 10:971-976 (1990).
- A23 Hirayama T. Wahrendorf J, editor. *Life-style and mortality: A large scale census based cohort study in Japan. Contributions to epidemiology and biostatistics*. Basle: Karger; 1990. 6.
- A24 Kabat G "Epidemiological studies of the relationship between passive smoking and lung cancer" In: "Toxicology Forum: 1990 Annual Winter Meeting" Washington DC 187-199 (1990).
- A25 Miller G, "The impact of passive smoking: cancer deaths among nonsmoking women" *Cancer Detect Prev* 14:497-503 (1990).
- A26 Sobue T. Association of indoor air pollution and lifestyle with lung cancer in Osaka, Japan. *Int J Epidemiol* 1990;**19**(Suppl 1):S62-S66.
- A27 Ye Z et al, "The environmental factors of lung cancer in family women, Tianjin" *Chin J Clin Oncol* 17:195-198 (1990).
- A28 Fontham E et al, "Lung cancer in nonsmoking women: A multicenter case-control study" *Cancer Epid Biomarkers & Prevention* 1:35-43 (1991).
- A29 He X, Chen W, Liu Z, Chapman RS. An epidemiological study of lung cancer in Xuan Wei County, China: Current progress. Case-control study on lung cancer and cooking fuel. *Environ Health Perspect* 1991;**94**:9-13.
- A30 Holowaty E et al, "Lung cancer in women in the Niagara region, Ontario: A case-control study" *Can J Public Health* 82:304-309 (1991).
- A31 Ger L-P, Liou S-H, Shen C-Y, Kao S-J, Chen K-T. Risk factors of lung cancer. *J Formos Med Assoc* 1992;**91**:S222-S231.
- A32 Jöckel K-H, Ahrens W, Wichmann H-E, Becher H, Bolm-Audorff U, Jahn I, et al. Occupational and environmental hazards associated with lung cancer. *Int J Epidemiol* 1992;**21**:202-13.
- A33 Fontham ETH, Correa P, Buffler PA, Greenberg R, Reynolds P, Wu-Williams A. Environmental tobacco smoke and lung cancer. *Cancer Bul* 1993;**45**:92-4.
- A34 Fontham ETH, Correa P, Chen VW. Passive smoking and lung cancer. *J La State Med Soc* 1993;**145**:132-6.
- A35 Ger L-P et al, "Risk factors of lung cancer by histological category in Taiwan" *Anticancer Res* 13:1491-1500 (1993).
- A36 Järholm B et al, "Quantitative importance of asbestos as a cause of lung cancer in a Swedish industrial city: a case-referent study" *Eur Respir J* 6:1271-1275 (1993).

- A37 Lan Q et al, "Risk factors for lung cancer in non-smokers in Xuanwei County of China" *Biomedical and Environmental Sciences* 6:112-118 (1993).
- A38 Siegel M, "Involuntary smoking in the restaurant workplace. A review of employee exposure and health effects" *JAMA* 270:490-493 (1993).
- A39 Alavanja MCR, Brownson RC, Benichou J, Swanson C, Boice JD, Jr. Attributable risk of lung cancer in nonsmoking women. In: *International symposium on lifestyle factors and human lung cancer. Dec 12-16 1994, Guangzhou, People's Republic of China.* 1994;1-13. Paper 4.
- A40 Geng G, Liang Z, Xu R, Liu J, Shi P. The relationship between smoking and lung cancer in humans. In: *International symposium on lifestyle factors and human lung cancer. Dec 12-16 1994, Guangzhou, People's Republic of China.* 1994;-8. Paper 25.
- A41 Kabat GC. Aspects of the epidemiology of lung cancer in smokers and nonsmokers in the United States. In: *International symposium on lifestyle factors and human lung cancer. Dec 12-16 1994, Guangzhou, People's Republic of China.* 1994;-27. Paper 2.
- A42 Miller G et al, "Women and lung cancer, a comparison of active and passive smokers with nonexposed nonsmokers" *Cancer Detection & Prevention* 18:421-430 (1994).
- A43 Wang F-L et al, "Childhood and adolescent passive smoking and the risk of female lung cancer" *Int J Epidemiol* 23:223-230 (1994).
- A44 Zaridze D, Zemlyanaya G, "Indoor air pollution and lung cancer risk in non-smoking women in Moscow" *Experimental Oncology* 16: 441-445 (1994) (in Russian) with corrections to Table 3 as given by Prof D G Zaridze in a letter to Prof N Wald dated Feb 5th, 1996.
- A45 Alavanja MCR, Brownson RC, Benichou J, Swanson C, Boice JD, Jr. Attributable risk of lung cancer in lifetime nonsmokers and long-term ex-smokers (Missouri, United States). *Cancer Causes Control* 1995;6:209-16.
- A46 Auvinen A et al, "Indoor radon exposure and risk of lung cancer: a nested-case-control study in Finland" *J Natl Cancer Inst* 88:966-972 (1996).
- A47 Dai X-D et al, "The etiology of lung cancer in nonsmoking females in Harbin, China" *Lung Cancer* 14 Suppl 1:S85-S91 (1996).
- A48 Du Y, Cha Q, Chen X, Chen Y, Huang L, Feng Z, et al. An epidemiological study of risk factors for lung cancer in Guangzhou, China. International symposium on lifestyle factors and human lung cancer, Guangzhou, China, 12-16 December 1994. *Lung Cancer* 1996;14(Suppl 1):S9-S37.
- A49 Lei Y-X, Cai W-C, Chen Y-Z, Du Y-X. Some lifestyle factors in human lung cancer: a case-control study of 792 lung cancer cases. International symposium on lifestyle factors and human lung cancer, Guangzhou, China, 12-16 December 1994. *Lung Cancer* 1996;14(Suppl 1):S121-S136.
- A50 Luo R-X et al, "Indoor burning coal air pollution and lung cancer - a case-control study in Fuzhou, China" *Lung Cancer* 14 Suppl 1:S113-S119 (1996).
- A51 Shen X-B et al, "Analyses and estimates of attributable risk factors for lung cancer in Nanjing, China" *Lung Cancer* 14 Suppl 1:S107-S112 (1996).
- A52 Wang F-L et al, "A case-control study of childhood and adolescent exposure to environmental tobacco smoke (ETS) and the risk of female lung cancer"[Abstract] *Lung Cancer* 14 Suppl 1:S238 (1996).
- A53 Yu S-Z, Zhao N, "Combined analysis of case-control studies of smoking and lung cancer in China" *Lung Cancer* 14 Suppl 1:S161-S170 (1996).
- A54 Xu ZY et al, "Smoking, air pollution, and high rates of lung cancer in Shenyang, China" *J Natl Cancer Inst* 6:1800-1806 (1989).

- A55 Yu Z-F et al, "Environmental factors and lung cancer" [Abstract] Lung Cancer 14 Suppl 1: S240-S241 (1996).
- A56 Dai WC, Wang SY, Chen Y, Hu Y, Wu Y. Fraction analysis of the involvement of multiple risk factors in the etiology of lung cancer: risk factor interactions in a case-control study for lung cancer in females. *Chung Hua Liu Hsing Ping Hseuh Tsa Chih* 1997;**18**:341-4.
- A57 Joeckel K-H et al, "Lung cancer risk due to occupational exposure - passive smoking" Paper handed out at a public meeting with the German Govt (1997) (In German) - data for BIPS study.
- A58 Ko Y-C et al, "Risk factors for primary lung cancer among non-smoking women in Taiwan" Int J Epidemiol 26:24-31 (1997).
- A59 Nyberg F et al, "Environmental tobacco smoke and lung cancer - does time since exposure play a role?" Epidemiology 8(Suppl):S38 (1997).
- A60 Yang P, Schwartz AG, McAllister AE, Aston CE, Swanson GM. Genetic analysis of families with nonsmoking lung cancer probands. *Genet Epidemiol* 1997;**14**:181-97.
- A61 Joeckel K-H et al, "Environmental tobacco smoke and lung cancer" Epidemiology 9:672-675 (1998).
- A62 Bennett WP, Alavanja MCR, Blomeke B, Vähäkangas K, Castrén K, Welsh JA, et al. Environmental tobacco smoke, genetic susceptibility, and risk of lung cancer in never-smoking women. *J Natl Cancer Inst* 1999;**91**:2009-14.
- A63 Boffetta P, Nyberg F, Agudo A, Benhamou E, Jöckel K-H, Kreuzer M, et al. Risk of lung cancer from exposure to environmental tobacco smoke from cigars, cigarillos and pipes [Letter]. *Int J Cancer* 1999;**83**:805-6.
- A64 Brennan P, Butler J, Agudo A, Benhamou S, Darby S, Fortes C, et al. Joint effect of diet and environmental tobacco smoke on risk of lung cancer among nonsmokers [Letter]. *J Natl Cancer Inst* 2000;**92**:426.
- A65 Johnson KC et al, "Passive and active smoking and breast cancer risk in Canada, 1994-97" Cancer Causes Control 11:211-221 (2000).
- A66 Kleinerman RA et al, "Lung cancer and indoor air pollution in rural China [Abstract] Ann Epidemiol 10:469 (2000).
- A67 Ko Y-C, Cheng LS-C, Lee C-H, Huang J-J, Huang M-S, Kao E-L, et al. Chinese food cooking and lung cancer in women nonsmokers. *Am J Epidemiol* 2000;**151**:140-7.
- A68 Kreuzer M et al, "Environmental tobacco smoke and lung cancer: a case-control study in Germany" Am J Epidemiol 151:241-250 (2000).
- A69 Zhou B-S, Want T-J, Guan P, Wu JM. Indoor air pollution and pulmonary adenocarcinoma among females: a case-control study in Shenyang, China. *Oncol Rep* 2000;**7**:1253-9.
- A70 Kreuzer M et al, Lung cancer in lifetime nonsmoking men – results of a case-control study in Germany" Br J Cancer 84:134-140 (2001).
- A71 Lee C-H, Ko Y-C, Cheng LS-C, Lin Y-C, Lin H-J, Huang M-S, et al. The heterogeneity in risk factors of lung cancer and the difference of histologic distribution between genders in Taiwan. *Cancer Causes Control* 2001;**12**:289-300.
- A72 Hu J, Mao Y, Dryer D, White K. Risk factors for lung cancer among Canadian women who have never smoked. *Cancer Detect Prev* 2002;**26**:129-38.

- A73 Kreuzer M, Heinrich J, Kreienbrock L, Rosario AS, Gerken M, Wichmann HE. Risk factors for lung cancer among nonsmoking women. *Int J Cancer* 2002;**100**:706-13.
- A74 Miller DP, Christiani DC. Association between self reported environmental tobacco smoke exposure and lung cancer: modification by GSTP1 polymorphism [Abstract]. Society for Epidemiologic Research 35th Annual Meeting, Palm Desert, California, June 18-21, 2002. *Am J Epidemiol* 2002;**155**:S4.
- A75 Rachtan J. A case-control study of lung cancer in Polish women. *Neoplasma* 2002;**49**:75-80.
- A76 Sasco AJ, Merrill RM, Dari I, Benhaïm-Luzon V, Carriot F, Cann CI, *et al.* A case-control study of lung cancer in Casablanca, Morocco. *Cancer Causes Control* 2002;**13**:609-16.

ADDITIONAL REFERENCE

Lee PN, "Environmental Tobacco Smoke and Mortality" Karger (1992).