BRITISH MEDICAL JOURNAL

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LEADING ARTICLES

Guillain-Barré syndrome J M K SPALDING 873
Assessment of insomnia IAN OSWALD 874
Transdermal drug administration—a nuisance becomes an opportunity JANE E SHAW, JOHN URQUHART 875
Signed editorials STEPHEN LOCK 876

CLINICAL RESEARCH • PAPERS AND SHORT REPORTS • PRACTICE OBSERVED

Changes in glycosylated haemoglobin after oral glucose load I N SCOBIE, F ONYANGA-OMARA, M SINGARAVELOO, A R W FORREST, A C MACCUISH, W G MANDERSON 877
Carbon monoxide and exercise tolerance in chronic bronchitis and emphysema P M A CALVERLEY, R J E LEGGETT, D C FLENLEY 878
Pulmonary hypertension and fenfluramine J G DOUGLAS, J F MUNRO, A H KITCHIN, A L MUIR, A T PROUDFOOT 881
Antibiotic use in otitis media: patient simulations as an aid to audit D MARK CHAPUT DE SAINTONGE, N R HATHAWAY 883
Orchidectomy alone for stage I testicular teratoma R STOUT, R D HUNTER 885
Clonazepam: effective treatment for restless legs syndrome in uraemia D J READ, T G FEEST, M A NASSIM 885
Outbreak of rotavirus gastroenteritis among premature infants G ROCCHI, S VELLA, S RESTA, S COCHI, G DONELLI, F TANGUCCI, D MENICHELLA, A VARVERI, R INGLESE 886
Metastatic Crohn's disease of the umbilicus R K S PHILLIPS, GEOFFREY GLAZER 887
Burns caused by striking underground electricity cables M J TIMMONS 887
Spinal cord degeneration in a case of "recovered" spinal decompression sickness A C PALMER, I M CALDER, R I MCCALLUM, F L MASTAGLIA 888
Diseases in Children: Upper respiratory tract infection in children HARVEY MARCOVITCH, J G R HOWIE, S E JOSSE 889
Simple SOAP system J S BHOPAL 892

MEDICAL PRACTICE

Squash ball to eye ball: the likelihood of squash players incurring an eye injury G V BARRELL, P J COOPER, A R ELKINGTON, J M MACFADYEN, R G POWELL, P TORMEY 893
Alcohol and Alcoholism: The relation between consumption and damage RICHARD SMITH 895
ABC of 1 to 7: Development at 2 years H B VALMAN 899
Statistics in Question: Assessing methods—many variables SHEILA M GORE 901
Lesson of the Week: Opiate toxicity in elderly patients T H CARADOC-DAVIES 905
Medicine and the Bomb: Long-term effects of radiation JANE SMITH, TONY SMITH 907
Any Questions? 898, 906
Medicine and Books 909
Personal View MOLLY NEWHOUSE 913

CORRESPONDENCE—List of Contents 914
OBITUARY 922

NEWS AND NOTES

Views 923
Epidemiology—Food poisoning and salmonellosis surveillance in England and Wales, 1980 924
Medical News 925
BMA Notices 926

SUPPLEMENT

The Week 927
From the CCCM: Community medicine and reorganisation; training of community health doctors 928
RAWP—new injustice for old? G P A WINYARD 930

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CORRESPONDENCE

Non-smoking wives of heavy smokers have a higher risk of lung cancer
H R Kornegay and M A Kastenbaum, PHD; N Mantel; J E Harris, MD, and W H DuMouchel, PHD; Eleanor J Macdonald, MD; T Hirayama, MD 914
Statistics in question
M F Grayson, MRCP 917
Caution on preventing neural tube defects
V C Talwalkar, MD 917
The right to live and the right to die
R B Zachary, FRCS 918
Microcomputers in antenatal care
J R Davies, FFARCS 918
Diving is dangerous for diabetics
J D King, MB 918
Dealing with epileptics
Rachel Tavriger 918
Management of asthma in the child aged under 6 years
I Blumenthal, MRCP 918
Minor orthopaedic problems in children
A N Conner, FRCSED, and J E Robb, FRCSED 919
Reversible renal damage due to glue sniffing
Mary D King, MB 919
Audit in renal failure
H J Goldsmith, FRCP, and others 919
Vitamin A toxicity and hypercalcaemia in chronic renal failure
M O'Fearghail, MB, and others 919
Treatment of acute mountain sickness
P McDonald, FRCS 919
Proposals for a trial marriage between primary and secondary health care in one or two districts in inner London
C J Dickinson, FRCP 920
Junior posts and expansion of the consultant grade
A W Banks, FRCOG 920
Changes in the MRCP examination
M Ross, MRCP, and D M F Gibb, MRCP ... 920
Will doctors miss out again?
R C L Feneley, FRCS 920
Doctors' contracts: an urgent case for legislation
J L Taylor, MRCGP; F E Weale, FRCS 921
Consultant contracts
B A Kamdar, FRCSED 921
New technique of drug promotion?
J Iqbal, MRCGP 921
Corrections: Hypokalaemia due to salbutamol overdosage (Corea *et al*); **Dealing with epileptics** (Beran and Sutton) ... 921

Non-smoking wives of heavy smokers have a higher risk of lung cancer

The United States Tobacco Institute issued a press release in June disputing the conclusions of Dr T Hirayama's paper "Non-smoking wives have a higher risk of lung cancer," published in the BMJ of 17 January 1981. This received wide publicity. We have received many letters and other documents on the subject and have therefore decided to reopen our correspondence. The following letters were sent to Dr Hirayama, who replies at the end.

Although two of the communications were not written as letters to the BMJ they are an essential part of the story and we have taken the exceptional step of printing them as they stand.—ED, *BMJ*.

SIR,—Dr Takeshi Hirayama (17 January, p 183) claimed a higher risk of lung cancer among non-smoking wives of smokers than in non-smoking wives of non-smokers in his Japanese study population. Other scientists in Europe and the United States have since questioned the study (28 February, p 733; 21 March, p 985; 4 April, p 1156; 25 April, p 1393). In a larger population Garfinkel[1] has found no such higher risk among United States women.

Meanwhile, several US experts had found an apparent statistical error in the Japanese calculations—raising serious questions about the study. We regard this discovery as very grave, particularly because of the effect in the United States, where popular media and legislative bodies have used the presumption of danger expressed in the Japanese study as a rationale for regulations designed to restrict smoking in public areas.

Early in March 1981 we submitted many questions to the author of the study—questions which addressed major scientific concerns about the study. For reasons not known to us, the author chose not to reply to these questions. Among the most important questions raised in this correspondence were these:

(1) "You report that mortality rates are 'age-occupation standardised annual mortality rates.' I have not been able to reproduce these numbers because the ages and occupations of your subjects are not available to me, nor do I know the population against which your data were standardised. Could you please furnish this information so that I may reproduce the reported rates?"

(2) "One of your groups of husbands included both non-smokers and occasional smokers. How is an occasional smoker defined? Why were these two classes combined? Another group of husbands consisted of ex-smokers and smokers of 19 or fewer cigarettes daily. How many ex-smokers were included in this group? Why were these two classes combined?"

(3) "Did you measure the times, if any, that the non-smoking wives were present when their husbands smoked? If yes, how was this done?"

In light of these questions and others raised by members of the scientific and medical communities, we believe the claims in the Japanese study to be unsubstantiated.

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[1] Garfinkel L. *J Nat Cancer Inst* 1981;**66**:1061-6.

To Dr Marvin A Kastenbaum, Tobacco Institute

This paper by Dr Takeshi Hirayama (17 January, p 183) reports certain results of a major prospective investigation on the effects of cigarette smoking, the novel feature emphasised in the paper being on the implications relating to indirect or passive smoking and lung cancer.

As part of the report, the author gives standardised lung cancer mortality rates for women subdivided by the smoking habits of their husbands or by their husbands' ages or both, presumably at the initiation of the study. By standardised mortality rates the author would have meant age-standardised mortality rates. To have properly obtained such standardised rates the author would have had to consider each individual year of life to which a woman survived, and presumably he did so. The data covered the period 1966-79.

The statistical analysis of the resulting data would be rather complex, though readily handled by procedures which I have published, and some short cuts are possible. Because of the rapid rise of cancer rates with age, I would stratify the non-smoking married women into comparatively narrow initial age groupings, say two years in width. Each age grouping would be followed year by year so as to contribute information on persons at risk in each of the three husbands' smoking categories (non-smoker, light smoker or ex-smoker, heavy smoker—that is, $\geqslant$20 cigarettes per day; since only individuals 40 and over were initially recruited, we can ignore any change in husband's status), and also on the number of women among them dying of cancer each year. Since the women are homogeneous on age initially, they will continue to be so over the entire period.

Other factors would be readily incorporated into this analysis. Dr Hirayama emphasises in particular as stratifying factors the husband's initial age, 40-59 years versus $\geqslant$60 years, and the husband's broad occupational grouping, agricultural versus non-agricultural. Either, neither, or both of these factors can be incorporated into the analysis. Actually, there would be 12 possible analyses: adjusting for neither A nor B; adjusting only for A; adjusting only for B; adjusting for both A and B; examining separately in each of two levels of A ignoring B; examining separately in each of two levels of B ignoring A; examining separately in each of the four A $\times$ B combinations.

To some extent Dr Hirayama has done something much akin to this. He reports in tabular form summary data which would correspond to six of the 12 possible analyses, while giving in the text the data which would correspond to yet a seventh. For statistical methodology he notes my extended χ^2 procedure, which would suggest that he is treating the wives of light smokers or ex-smokers as being at an exposure level midway between non-smokers and heavy smokers. But what is surprising is that he makes no allusion to what age groupings he used in making his statistical analyses or how he took into account the passage of time in making them. Perhaps they mattered in calculating standardised rates, but not when he performed statistical analyses. (But I have my doubts even here—in one part of table I Dr Hirayama refers to occupation-standardised mortality, in another to age-standardised mortality. But the occupations characterise the husbands, not the wives, and so also might the ages.)