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### Occupational Cancer in Men Exposed to Dust and Other Environmental Hazards

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# Occupational Cancer in Men Exposed to Dust and Other Environmental Hazards

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## ABSTRACT

Data using a series of approximately 14,000 patients admitted to Roswell Park Memorial Institute for Cancer Research between 1956 and 1965 have been analyzed for occupational cancer risks. A detailed epidemiological schedule involving occupational history, smoking, drinking, and various other etiological factors was taken prior to interview. A mass screening of these data for about 20 different sites of cancer and 50 suspect occupations was conducted, using age-adjusted relative risks. A number of relationships was found between particular occupations and cancers. This report gives a survey of these relationships for men in a subset of the occupations screened, i.e., those occupations where exposure to dust would be suspected.

Unlike most previous occupational studies, this one has a broad focus on a set of occupations and cancer sites rather than a narrow focus on one specific occupation or cancer site. This broader survey provides useful insights into the role of occupational hazards in the overall public health problem of cancer and is not a substitute for intensive investigation of specific occupation-site relationships (which cannot be done here). It can, however, provide guidance on which relationships are likely to be of public health significance, and what directions the deeper investigations might take. This kind of perspective is provided for the 22 occupation-cancer-site combinations where the age-adjusted relative risk is significant at the 5% probability level.

THIS IS THE FOURTH PAPER in a continuing series dealing with the hazards in a work environment that can produce cancer. It is based on a comprehensive epidemiological survey carried out by the Biostatistics Department of the Roswell Park Memorial Institute for Cancer Research (RPMI) in Buffalo, New York. It studies a series of approximately 14,000 patients who were admitted to RPMI between 1956 and 1965 and for whom a detailed epidemiological schedule involving occupational history and more than 75 other factors was taken prior to diagnosis. The data processing, biostatistical analysis, and scientific reporting of this survey was a formidable task, since there were more than 20 different sites of cancer and 50 suspect occupations to be considered and various demographic and other factors to control.

The basic data have been reported in monograph form<sup>1</sup> to the National Institute for Occupational Safety and Health (NIOSH), which has provided the contract support for the survey. Because this material includes comprehensive tabulations of the original counts and age-adjusted relative risk and probability levels for all sites and occupations surveyed, it is not necessary to include all of this material here. However, the extensive numerical tables of the monograph, while containing the basic information, are not an effective way to communicate the important

findings of the survey. Some discussion in words is needed in addition to the original numbers. The purpose of this continuing series of papers is to present these findings in a more intelligible form and, in some cases, with a somewhat deeper analysis than the original survey.

When the survey uncovered a large number of new and interesting results, it was decided to divide up the writing chores among the three senior scientists involved in the survey: Dr. Irwin Bross who originally conceived it, Dr. Enrico Viadana who carried through the initial survey, and Dr. Lorne Houten who was in charge of the later operations. The results for women were written up separately. Because a single paper would have been too unwieldy to present the results on male workers, the suspect occupations for men were divided into three roughly equal subgroups according to what seemed to be the primary etiological factors involved. Dr. Viadana has dealt with occupations with a presumed risk of exposure to combustion products and chemical fumes,<sup>2</sup> Dr. Houten with occupations, with a presumed risk of exposure to metals or metal ions,<sup>3</sup> and this paper deals with the remaining occupations with a presumed risk of exposure to dust. For the convenience of readers concerned with a specific occupation, Table 1 gives a list of occupations and their codes from the *Standard Industrial Classification Manual*<sup>4,5</sup> that was used in the four papers.

Table 1.—Occupational Classification

Occupations	Occupational Code*	Industrial Code†
<b>Male</b>		
<b>Dust</b>		
Blacksmiths	402	
Brickmasons, Stonemasons, and Tilersetters	405	
Carpenters	411	
Cranemen, Derrickmen, and Hoistmen	415	
Excavating, Grading, and Road Machinery Operators	425	
Farmers in Dairy Farms	221-222	0132‡
Farmers in General Crop and Livestock Farms	221-222	0144‡
Laborers in Lumber and Wood Products (except furniture)	979	24
Laborers in Miscellaneous Manufacturing Industry	979	35-39
Laborers in Paper and Allied Products	979	26
Millwrights	491	
Operatives in Miscellaneous Manufacturing Industry	729	35-39
Operatives in Paper and Allied Products	729	26
Operatives in Textile Mill Products	729	22
Roofers and Slaters	514	
Shoemakers and Repairers (except factory)	515	
<b>Metal</b>		
Electricians	421	
Filers, Grinders, and Polishers, Metal	653	
Furnacemen, Smeltermen, and Pourers	670	
Laborers in Fabricated Metal Industry	979	34
Laborers in Primary Metal Industry	979	33
Linemen and Servicemen, Telegraph, Telephone, and Power	453	
Machinists	465	
Mine Operatives and Laborers	685	
Molders, Metal	492	
Operatives in Fabricated Metal Industry	729	34
Operatives in Primary Metal Industry	729	33
Painters	495,694	
Plumbers and Pipe Fitters	510	
Tinsmiths, Coppersmiths, and Sheet Metal Workers	525	
Toolmakers, Diemakers, and Setters	530	
Welders and Flame-cutters	721	
<b>Chemical</b>		
Barbers	814	
Laborers in Chemical Industry	979	28
Operatives in Chemical Industry	729	28
Operatives in Leather Industry	729	31
Operatives in Rubber and Plastic Industry	729	30
Painters	495,694	
Print Workers	414,423	
	503,512	
<b>Combustion</b>		
Bakers	401	
Bus, Taxicab, Truck Drivers	641,714	
	715	
Deliverymen and Routemen	650	
Kitchen Workers	835	
Locomotive Engineers and Firemen	454,460	
Mechanics and Repairmen	470-480	
Stationary Engineers	520	
Stationary Firemen	712	

Table 1 (Continued)		
Occupations	Occupational Code*	Industrial Code†
Female		
Cooks (except private household)	825	
Cosmetologists and Hairdressers	843	
Kitchen Workers (except private household)	835	
Laborers in Food Industry	979	20
Operatives in Apparel Industry	729	23
Operatives in Chemical Industry	729	28
Operatives in Food Industry	729	20
Operatives in Leather Industry	729	31
Operatives in Lumber and Wood Industry (except furniture)	729	24
Operatives in Paper Industry	729	26
Operatives in Primary Metal Industry	729	33
Operatives in Rubber Industry	729	30
Operatives in Textile Industry	729	22
Spinners in Textile Industry	710	22
Weavers in Textile Industry	720	22
*From <i>Bureau of the Census Alphabetical Index of Occupations and Industries</i> , 1960 ed. A hyphen is used to denote combinations of consecutively numbered categories including the first and last numbers shown; a comma is used to other combinations of categories.		
†From <i>Standard Industrial Classification Manual</i> , 1957 ed. A hyphen is used to denote combinations of consecutively numbered categories including the first and last numbers shown.		
‡Farmers' major industrial group, Commercial farms (01), is further subdivided into Dairy (32) and General Crop and Livestock (44).		

## Methods and Procedures

The methods and procedures used in this article are parallel to those used in the previous papers. Since details on the sources of the data, the computerized biostatistical technology, and the rationale for the choice of the control or comparison series that have been used in the calculations of relative risks have been given in the previous papers,<sup>2, 3</sup> this information will only be sketched here.

For the past 75 years RPMI has been the only major cancer research institute in western New York and therefore tends to serve as a catchment basin for the cancer patients in this area. Hence, whereas this sample is not strictly population based, it tends to be fairly close to such a sample. Other hospitals in the area often see the patients first, and in many cases the patients do not come into the RPMI series, but a substantial proportion of the cancer patients in western New York come to RPMI.

The counties of Erie and Niagara are centers of heavy industry. Either or both counties tend to show up as "significantly high" or "in highest decile" for most of the occupation-related cancers in the *Atlas for Cancer Mortality for U.S. Counties: 1950-1969*,<sup>6</sup> which covers the time span of this survey.

Nearly all of the adult patients admitted to RPMI during the period of this survey were interviewed prior to diagnosis and the six most recent occupations were reported. These data, together with the other epidemiological information, were subsequently coded, punched,

and put into machine-usable form. Other processing steps, such as cross-tabulation by sex, age, occupation, cancer site, years in occupation, smoking habits, or other factors, were conducted by using "software" specifically developed for this class of studies under a grant for biometric research on cancer epidemiology.

Relative risks adjusted for age or other factors were calculated, using as control or comparison groups the patients found to have a diagnosis other than cancer (non-neoplastic disease) and the patients employed as clerks (occupational codes 301-370).

$$\text{Unadjusted Relative Risk} = \frac{\text{No. in suspect occupation with cancer at given site}}{\text{No. of clerks with cancer at given site}} \div \frac{\text{No. in suspect occupation with non-neoplastic diseases}}{\text{No. of clerks with non-neoplastic diseases}}$$

Actual risks shown involve related but more complicated formulas that are used for age-adjusted risks. Here the statistical analysis uses the standard Cochran<sup>7</sup> test for probabilities and the Woolf-Haldane<sup>8,9</sup> estimate of the relative risks. An extension of these procedures, the Bertell test,<sup>10</sup> was also used.

A further discussion of the rationale for this choice and the tests made to validate it can be found in a previous paper;<sup>2</sup> it has been shown that this choice is not critical.

Much the same results are found if, for example, all of the occupations not on the suspect list are used for controls. They also appear if the series on cancer of the rectum and colon are used instead of the non-neoplastic series (e.g., cancer control).

The primary screening procedure is used here to identify the cross-categories where the relative risks are numerically large or statistically significant, or both. The relative risks may be elevated for a series of related occupations or for several sites of cancer among workers in a given occupation. Age, duration of employment, smoking habits, or other collateral information may be used to further assess a given finding. The ability to view an individual finding against a broad background of related information permits a higher degree of self-validation in this type of survey than is possible in the usual study of a single site or single occupational cohort.

## Results

Age-adjusted relative risks of various cancer sites by occupations that are significantly elevated above 2 are indicated in Table 2. A number of interesting features appear in this summary table. The marks that indicate significantly elevated age-adjusted risks tend to cluster in particular occupations (rows) as well as in specific cancer sites (columns). In all of what follows, it should be remembered that these are results for men and that the occupational results for women, while sometimes similar, do not necessarily show the same pattern, especially for the period of years under study.

A general look at the table shows some 22 combinations of occupation and cancer sites that have an age-adjusted relative risk significantly elevated at the 5% probability level. Furthermore, these relative risk estimates are all greater than 3.1 and hence cannot be easily attributed to extraneous factors.<sup>11</sup>

Considering Table 2 first from the standpoint of site of cancer, both a conspicuous presence and an absence of certain site-specific risks of cancer can be noted throughout the series of dust-related occupations. The risk of melanoma is observed to be the most widespread. Substantial relative risks of melanoma, all greater than 2 and significant at the 5% level, are present in five occupations. Seven of the dust-related occupations exhibit estimated risks of stomach cancer that are elevated, although only three are significant.

On the other extreme, some cancer sites fail to demonstrate a statistically significant relationship with any of the various dust-related occupations. Colon and rectum cancers, the lymphomas, and the skin cancers other than melanoma do not show any elevated risks that are significant at the 5% probability level. Although myeloma and leukemia, and cancer of the larynx, lung, and testis showed elevated risks for some dust-related occupations, none were significantly so.

Most of the sites having an elevated risk in several occupations fall somewhere between the two previously mentioned extremes. For nearly half of the cancer sites listed the relative risk of cancer is significantly elevated among two or more occupational classifications. Most notable in

addition to melanoma are the cancers of the stomach, pancreas, and nose, each displaying significant risks greater than 2 in three occupations. Moreover, cancers of the buccal-pharyngeal cavity, esophagus, prostate, kidney, and bladder are each significantly present in at least one occupation.

## Results for Specific Occupations

Focusing now on the occupations at risk, it can be seen from Table 2 that none of the dust-related occupations under consideration is entirely risk free. Almost half of the occupational classifications show significantly elevated risks of cancer for at least two distinct sites.

Some occupations appear from Table 2 to be relatively more hazardous than others. Using the total count of cancer sites double-checked within each occupation as a crude indicator of relatively hazardous occupations, the brickmasons, the shoemakers, and the operatives in the textile industry would be prime suspects for having a more hazard-producing environment; these occupational classifications all display significantly elevated age-adjusted risks at several of the sites considered.

The age-adjusted relative risks for those men who had ever been employed as brickmasons (a category that also includes stonemasons and tilesetters) are not only elevated at several sites but in addition have a magnitude of these risk estimates that tends to be substantially larger than 2. Besides having an excessive relative risk of leukemia, the brickmasons have excessive risks of cancer to the digestive system (both esophagus and stomach cancers), the respiratory system (both nose and lung cancers), and the urinary system (both kidney and bladder cancers). The risk of nose cancer was significant at 12.4.

Slightly less pronounced patterns of elevated risks occur in the operative categories, most notably those operatives employed in the textile mill industry. Most of the significant risks are found in the digestive and respiratory systems (i.e., cancers of the nose, stomach, and pancreas). The relative risks of pancreas cancer are high in all three operative categories, two of which are significant at the 5% level.

Other occupations that have more than the expected number of sites with elevated risks include the blacksmiths, cranemen, dairy farmers, laborers engaged in the lumber and wood products industry, and shoemakers. Each of these occupations has four or five sites for suspected cancer.

Closer examination of these occupations having the intermediate number of sites at risk reveals at least one common denominator. Within each occupation, the sites of cancer that show an effect of occupational hazard are for the most part accentuated by risks in excess of 2. This may imply that only the sites strongly affected by suspect occupational environments are being detected and that some sites, less affected or masked by other factors, are being left undetected.

Under the blacksmiths classification a high significant risk appears for cancer of the prostate and for melanoma. The effect is rather strong; the risk of prostate cancer is estimated to be almost seven times that of the clerical control group.

Table 2.—Age-Adjusted Relative Risk for Males Ever Exposed to Dust-Related Occupations

Occupation	Occupational Code*	Industrial Code†	Site or Type of Cancer																
			Buccal Cavity & Pharynx	Esophagus	Stomach	Colon & Rectum	Pancreas	Nose	Larynx	Lung	Prostate	Testis	Kidney	Bladder	Melanoma	Skin (Other)	Lymphomas	Myeloma	Leukemia
Blacksmiths	402				✓							✓		✓					
Brickmasons	405			✓	✓				✓				✓	✓					✓
Carpenters	411				✓														
Cranemen	415				✓			✓							✓				
Excavators	425								✓							✓			
Dairy Farmers	221-222	0132										✓		✓					✓
Crop Farmers	221-222	0144														✓			
Lab. in Lumber	979	24		✓									✓	✓					✓
Lab. in Misc. Mfg.	979	35-39						✓								✓			
Lab. in Paper	979	26											✓			✓			
Millwrights	491				✓											✓			
Oper. in Misc. Mfg.	729	35-39						✓								✓			
Oper. in Paper	729	26						✓		✓									✓
Oper. in Textile	729	22		✓	✓			✓	✓	✓									
Roofers	514		✓											✓		✓			
Shoemakers	515		✓	✓	✓			✓											

\*From Bureau of the Census *Alphabetical Index of Occupations and Industries*, 1960 ed.  
 †From *Standard Industrial Classification Manual*, 1957 ed.

Significant at the 5% probability level; relative risk  $\geq 2$ .  
 Relative risk  $\geq 2$ .

In the two categories of farmers, significantly elevated relative risks among digestive and respiratory sites are absent. Risk of cancers of the prostate and bladder are found to be significantly elevated in dairy farmers, to 4.8 and 3.2, respectively. Melanoma shows up as a relatively high risk for crop and livestock farmers. Kidney cancer and myeloma are associated with risks greater than 2 for dairy farmers.

The laborers who were ever engaged in the lumber and wood product industry exhibit elevated age-adjusted risks of cancer in the esophagus, the testis, and the kidney, and the risk of myeloma is more than doubled.

Males ever employed as shoemakers or shoe repairers have, for the most part, significantly increased risks of cancer of the digestive and respiratory sites, namely, the buccal-pharyngeal cavity (the only such occupation with high risk at this site), stomach, and nose. The prostate and esophagus are also characterized by a similarly increased risk of cancer. Evident again is the same consistent display of risk estimates of more than 2 in all five cancer sites, with stomach cancer having a significant risk as high as 16.5.

Carpenters, excavators, laborers in miscellaneous manufacturing industries, laborers in paper and allied products, millwrights, and roofers comprise the remaining dust-related occupations that have only a relatively few cancer sites with significantly elevated risks—such as pancreas for the laborers in miscellaneous manufacturing (3.8) and stomach for the millwrights (5.5). Because of the ever-present possibility of false negatives in Table 2, however, these occupations should not be misconstrued as having relatively safe or carcinogen-free work environments.

### *Smoking and Occupations*

Certain sites of cancer such as the buccal-pharyngeal cavity, the larynx, the lung, and the bladder are known to be related to smoking. It is therefore important, when possible, to consider this additional factor when dealing with occupational risks. For uranium workers and others the occupational effect is most pronounced among smokers. Therefore the estimated relative risk of cancer at particular key sites was recalculated for each dust-related occupation, taking smoking status of the worker into account.

For each occupation within each key cancer site, the smoking standardization of the relative risk estimate was performed over two smoking categories which discriminated the “less” against the “more” hazardous forms of smoking. It should be noted that the definition of the qualifiers less and more varied slightly among sites, depending upon the site considered. Also, the smoking standardization was not accompanied by a corresponding adjustment for age, since simultaneous adjustment for both variables resulted in too many zero entries in the cross tabulations.

With few exceptions the results for the smoking-adjusted relative risks of cancer for males who were ever exposed to dust-related occupations do not differ appreciably from their corresponding age-adjusted relative risk estimates. For the most part, those occupations exhibiting high, significant, age-adjusted risks of cancer at a specific site continue to show the same or even a more pronounced effect after the adjustment is made for smoking habits.

One exception to this similar patterning of risks under both adjustment procedures can be noted. It involves the emergence of a relative risk estimate, previously non-significant under the age-adjustment procedure, but now significantly elevated when smoking habits are taken into consideration. When adjustment is made for smoking habits, an additional significant risk of cancer of the buccal cavity and pharynx is indicated among operatives in the paper products industry. This suggests that the occupational risk for buccal cancer may be obscured here by the effects of smoking.

### *Occupation vs. Ethnicity*

Whereas it is not possible to deal specifically with all of the relationships that have been found here, one of special interest is considered in more detail in this section. The several high risks of stomach cancer raise the question of whether the increased risk is due to the ethnic groups within certain occupations. Although occupational factors have previously been suggested for stomach cancer, more positive relationships were found here than was expected. The ethnic composition of Buffalo and western New York suggests a plausible counterhypothesis to an occupational explanation.

As an initial step in providing such evidence for or against ethnic factors, a simple comparison of the ethnic composition can be made between the suspect occupations that do show a significant risk of stomach cancer and the clerical occupations that have shown a deficiency of stomach cancer. Any marked differences in the ethnic composition of the two groups would warrant further investigation.

Since the incidence of stomach cancer is generally more prevalent behind the iron curtain, Hungary, Lithuania, Poland, Russia, and Czechoslovakia are considered to comprise the suspect countries of origin or birthplace; Austria has also been included. Workers born in these countries and migrating to the United States might be expected to have a greater risk of stomach cancer than native-born Americans. Therefore the ethnic counterhypothesis would imply that among those occupations with significant risks of stomach cancer one would expect to find a much greater proportion of workers from these countries than would normally be expected if these countries of origin and increased risks of stomach cancer were not related. Examination of Table 3 reveals that only 15 of the 870 white males employed in clerical occupations have come from a suspect country. This amounts to just 1.7% of the total clerical series. Furthermore, of the 14 clerical workers with stomach cancer, none gave a suspect country as birthplace.

When the suspect occupations having significant risks of stomach cancer are pooled and then similarly examined, of the total of 14 male workers with stomach cancer in this combined group, 2, or 14%, were born in suspect countries. The 2 workers observed in this category are therefore about eight times the number expected on the basis of the control series. This might suggest that the ethnic counterhypothesis is a workable alternative, but as can be read from Table 3 the occupations without significant risks of stomach cancer show an even higher ratio.

Casual arguments of this kind have often been used to refute the findings for variables under study, such as occupation. It is therefore worthwhile to take this analysis one step further. If these ethnic groups are indeed fully or partially responsible for the elevated risks of stomach cancer among several occupations, the removal of these ethnic groups from the data should eliminate many, if not all, of the significant estimates of relative risk. Therefore, after restricting the analysis to individuals born in the United States, the relative risks of stomach cancer, adjusted to age, were recomputed.

The results of this further analysis are a little surprising. Instead of the number of significant results being reduced by the elimination of the ethnic factor, there are twice as many significant results. Relative risks greater than 2 and significant at the 5% probability level are achieved for Blacksmiths (402), Brickmasons (405), Laborers in Lumber (97924), Millwrights (491), Operators in Paper Industry (72926), and Operators in Textile Industry (72922).<sup>4-5</sup> This serves to make an important analytic point that is often missed by naive critics of epidemiological studies. Removal or control of a confounding factor may actually bring out the basic relations under study even more clearly. The kind of analysis that corresponds to the top line of Table 3 is not a refutation of an observed relationship (although it is often used this way by critics). It now is apparent that even if ethnicity were to have a relationship to the risk of stomach cancer, it could not account for most of the elevated occupational risks. Most of the relative risks that are significantly elevated when the entire sample is considered persist even after the ethnic groups have been excluded.

### Discussion

A summary of the findings provided by Table 2 indicates by double check marks the combinations of occupation and cancer site that had a relative risk larger than 2, or an increased risk that was statistically significant, or both.

A number of immediate points can be seen when the results are summarized in this way. (1). Many more occupation-site combinations are double-checked than

would be expected if there were no hazards. (2). A patterning of the combinations that have been singled out for attention exists. For instance, the occupations such as brickmasons or operatives have several different cancer sites with elevated risks. Sites such as melanoma, stomach, or pancreas have elevated risks for several different occupations. (3). Some features of the patterning would be expected from what is already known about the etiologies of the sites, or the nature of the occupations, or both. Hence it is clear from Table 2 that the approach, data, and analytic technology is providing relatively clear and coherent information on occupational cancer hazards and not merely random "noise."

As one example of the concordance between the patterning in Table 2 and patterns expected on the basis of previous knowledge, let us consider the occupations with elevated risks of melanoma. From past experience it would be expected that persons working outdoors would have more risk of melanoma than those working indoors, since a known etiological factor for this site is exposure to ultraviolet radiation. From Table 2 it can be inferred that the occupations with the elevated risks are often those involving outdoor work (i.e., cranemen, excavators, roofers).

In looking for patterning of this kind, it should be kept in mind that although there may seem to be a symmetry between detection and nondetection of a relationship, this is not how the biostatistical technology actually works. In general, the circumstances that produce false positives despite these stringent criteria are unusual. On the other hand, the circumstances that produce false negatives are relatively common. Thus, whereas the number of cancer cases here are larger than those commonly reported, there are often fewer than 5 cases of cancer in a given occupation-site category. It is not unlikely that a relationship will be missed. Although the data can provide fairly reliable evidence of hazard, they cannot provide any corresponding guarantee of safety. Failure to find a positive relationship should not be interpreted as proof of no relationship.

Not all of the patterns in Table 2 are those that might be expected from previous studies. One surprising feature here is the number of positive results for stomach cancer. If it were hypothesized that ingestion of dust were involved, then one might expect elevated risks in the buccal cavity and esophagus, since these would be exposed to the same hazard. These speculative remarks are intended as an illustration of how the patterning in the summary table could be used as a guide to consideration of the more detailed tables. Without such a guide it is difficult to avoid losing the scientific implications of the data in the complexities of the numerical detail.

A detailed discussion of the similarities or differences between these findings and others reported in the literature is precluded by the sheer number of positive findings in this report. Moreover, with the ready availability of computerized literature searches, it is doubtful whether the tradition of indiscriminate citation of hundreds of references makes sense any longer.

Whereas it is always possible that an extraneous variable related to occupation and not to the occupational environment itself might explain an increased risk of cancer, the simple, face-value explanation may be much more likely

Table 3.—Suspect Birthplaces—Austria, Hungary, Lithuania, Poland, Russia, and Czechoslovakia

	Suspect Country of Origin		Total
	No	Yes	
Suspect occupations with significant risk of stomach cancer	12	2	14
Suspect occupations without significant risk of stomach cancer	53	16	69
Clerks with stomach cancer	14	0	14
Total number of clerks	855	15	870

than a complicated indirect explanation. For relative risks that are much larger than 2, indirect explanations become increasingly unlikely.<sup>11-12</sup> Sometimes the patterning such as that in Table 2 makes the explanation unlikely. In other cases, as with cigarette smoking or ethnicity, further analysis of the data is possible and may directly contradict the counterhypothesis. Finally, it is possible to invoke the principle of scientific simplicity, Occam's razor, or the principle of public health responsibility. The latter says that the benefit of the doubt should go to the humans exposed to risk and not to the products or processes that may have to be restricted. For some or all of these reasons, interpretation of the results here at face value is by no means as naive or unscientific as it is sometimes made out to be.

\* \* \* \* \*

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