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ON THE CONSIDERATION OF THE MANY SOURCES OF VARIABILITY. M J Nicolich (ExxonMobil Biomedical Sciences, Inc., Annandale, NJ 08801)

The concept of variability is frequently used in epidemiology. The word can have different meanings in different situations and we are using the phrase to represent the idea of one's confidence in an estimate from statistical modeling of an epidemiological study or experiment. In this sense, variability is most often presented as a confidence interval around the estimate with the width of the interval representing the variability of the estimate. However, for many analyses only the sampling variability portion of the total variability is considered. These analyses ignore two other important sources of variability and thus tend to underestimate the true, or total, variability. One set of the usually unconsidered sources of variability is statistically based: sampling from different sub-populations, selecting the 'most significant' model from among many, errors in computer approximations, etc. The variance from these sources can often be measured through hierarchical Bayes methods, or Bayesian model averaging. But, these techniques also add their own unique sources of variation. The other less appreciated group of sources may be more difficult to quantify. Among the items in this group are: inappropriate data choices, confounded variables, and incorrect model assumptions. These sources are usually not incorporated into the final variance estimate, cause overly precise estimates and lead to difficulties such as estimating statistically significant risks in the 1.5 to 1.005 range. We do not have an overall magic bullet to correct the frequent underestimates of the variability of estimates from statistical models, but we provide examples of the sources of unconsidered variability, some suggested methods of dealing with them, and the consequences of ignoring them.

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IMPACT OF THE TORONTO BAR SMOKING BAN ON EMPLOYEE ETS EXPOSURE. *S Bondy, R Ferrence, P Selby, N Kreiger, H Travis, A Florescu, N Greenspan, M Roerecke (University of Toronto, Toronto ONT CANADA)

Ontario municipalities have been aggressive in pursuing tobacco control by-laws. Up until June 2004, bar workers in Toronto remained excluded from protection from environmental tobacco smoke (ETS), through smoking restriction by-laws. The present study obtained biomarker evidence of a reduction in exposure to ETS, for these workers, attributable to the new protective by-law. In a pre-test, post-test comparison group design, non-smoking employees of Toronto bars were recruited prior to the enactment of the ban, and followed for eight months afterward, to document changes in ETS exposure. A parallel group of non-smoking employees of licensed establishments, in the city of Windsor (where smoking was permitted throughout the study period) was also followed. Non-smoking status was verified, throughout the study, by self-report, exhaled carbon monoxide and urinalysis. Exposure was documented through high-sensitivity urinalysis for cotinine, and verified in two laboratories. Self-reports were used to assess non-work ETS exposure as a potential confounder. Work-time was a major contributor to total time spent exposed to ETS for these workers and total exposure declined markedly for Toronto workers, after the ban. Urine cotinine levels, for Toronto workers were significantly reduced at times 2, 3 and 4, relative to prior to the by-law change; whereas there was no decline in biomarker evidence of exposure in Windsor during the same time period. Ontario is about to celebrate a province-wide ban on smoking in restaurants and bars. This study provides direct evidence of the impact such legislation can have on protecting workers from toxic exposures related to smoking.

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IMPROVING NATIONAL HEALTH SURVEYS THROUGH DATA LINKAGE: IMPLICATIONS FOR EPIDEMIOLOGIC RESEARCH. *K Lochner and C Cox (National Center for Health Statistics, Hyattsville, MD 20782)

Federally sponsored health surveys are a critical source of information on public health in the United States. Yet, they must balance the range of health topics covered against the burden imposed on survey respondents and cost constraints. Linking individual survey records to administrative records and other sources provides a powerful and efficient means to augment information on national health surveys and increase their analytic potential for epidemiologic research. For example, linkage of the National Health Interview Surveys and the National Health and Nutrition Examination Surveys to the National Death Index provides a longitudinal component to these surveys, thus permitting the study of behavioral, clinical, social and economic impacts on mortality in the United States. Recently the National Center for Health Statistics (NCHS) has expanded its data linkage program for its population-based surveys, allowing for epidemiologic research that can advance our understanding of the multiple factors influencing population morbidity, disability, and mortality. This paper will describe the new data linkage activities of NCHS, present empirical examples highlighting the variety of epidemiologic research possible with the newly linked NCHS data, such as health disparities, aging, nutritional factors in health, and health care/services utilization, and introduce procedures for extramural researchers to obtain data access.

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CALCULATING THE COMPARATIVE MORTALITY RISK FROM SMOKELESS TOBACCO VS. SMOKING. *C V Phillips, C Sargent, *D Rabiou, B Rodu (University of Alberta, Edmonton, Alberta T6G 2L9)

The possibility of using smokeless tobacco (ST), particularly moist snuff, as a reduced-harm substitute for cigarettes is gaining traction in North America. A key statistic in the discussion is the risk of premature mortality from ST compared to that from smoking. Published estimates range from less than 1% to more than 10%. The authors have published 2% (an old calculation) and 1% (a rough estimate). A recent study solicited expert opinions and produced results in the range of 10%. None of these are based on robust quantitative methods. To improve upon these estimates, we used disease- and age-specific smoking-attributable mortality estimates from the 2004 US Surgeon General's report and epidemiologic estimates of disease risk from ST. Because of the substantial uncertainty, we avoid overstating our precision and provide a variety of sensitivity analyses based on different input values. Our results suggest it is very difficult to justify a comparative risk estimate for premature mortality from ST as high as 5% that from cigarettes. Despite the emphasis on cancer risk in discussions of ST, the uncertainty is dominated by cardiovascular disease (CVD) risk, likely from nicotine (it is not clear there is any such risk from ST, but some studies suggest it). If we believe there is nontrivial CVD risk from ST, in the range of a recent estimate, comparative risk estimates of 1-2% appear reasonable. Absent CVD risk, plausible estimates based on cancer risk alone yield values under 1%. Our calculations offer clear advantages over the guesses that dominate the literature, particularly by showing that high estimates of comparative risk can only plausibly result from high CVD risk estimates.