

STATISTICAL SIGNIFICANCE AND THE DISTRACTION OF “SCIENTIFIC PROOF”

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The related topics of statistical significance and the distraction of “scientific proof” are sometimes critical to an understanding of expert evidence. This article relates primarily to the causes of disability and death in the context of claims for damages, workers’ compensation, motor-vehicle insurance benefits, disability insurance, claims under some other types of insurance, and military pensions for disabilities and deaths resulting from military service. This article can also be relevant in Charter cases,¹ and in criminal proceedings, though comments on the burden and standard of proof would need to be modified for that context. It can also be relevant to academic research, public policy choices, and the roles of business corporations, universities, and professional bodies.

La signification statistique et la « preuve scientifique » sont des sujets liés qui sont parfois essentiels à la compréhension de la preuve d’un expert. Le présent article porte principalement sur les causes de l’invalidité et du décès dans le cadre de demandes visant à obtenir des dommages-intérêts; d’indemnisation des accidentés du travail; d’indemnité d’assurance automobile; d’assurance-invalidité; de demandes découlant d’autres types d’assurance et de pensions pour invalidité et décès résultant du service militaire. L’article peut également s’avérer pertinent dans le cadre d’affaires fondées sur la Charte et de poursuites criminelles; toutefois, il faudrait modifier les propos sur le fardeau de la preuve et la norme de preuve dans de tels contextes. L’article peut aussi s’avérer utile pour ce qui est de la recherche théorique, du choix de politiques publiques et du rôle des sociétés par actions, des universités et des associations professionnelles.

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¹ *Canadian Charter of Rights of Freedoms*, Part I of the *Constitution Act, 1982*, being Schedule B to the *Canada Act 1982* (U.K.), 1982, c.11 [*Charter*]. The relevance of this discussion would probably arise on an issue of justification under s. 1 of the *Charter*, or equality under s. 15.

1. Introduction

Previous articles on the significance of “statistical significance” have generally been written in the context of another discipline, they reflect experience in that discipline, and are written in the language of that discipline.² This article focuses primarily on the context of legal decision-making. It is intended to show some of the cautions that are needed when the literature of other disciplines relating to statistics or “scientific proof” becomes a component of expert evidence. It is not a synthesis of case-law, nor does it present a theme. Like the research projects of the author, this article reflects the view that how legal systems work, the influences upon them, and the significance of structural and procedural choices, are at least as important as legal doctrine or theory.

The article draws on over four decades of scholarship, including fifteen empirical research projects (in Canada and overseas), augmented by practical experience.³ The academic research and practical experience have included surveys, attendances at places of treatment and other fieldwork, reading case files, reading court and tribunal decisions as well as other legal and medical literature, attending conferences, and discussions with medical and para-medical personnel and practising lawyers. Because this article draws primarily on multiple sources from that long-term experience, the citation of sources is limited to points that are based on a particular published source. The word “physician” is used broadly to include a surgeon or other specialist, as well as a general practitioner.

2. Statistical Significance

a) Meanings

A common meaning of “statistical significance” is that the difference in the numbers between two groups, read in conjunction with the total numbers, is wide enough to discount the possibility that the difference may have resulted from chance. That definition, or some variation of it, is the common meaning of “statistical significance” when that term is used by

² See e.g. Ronald P. Carver, “The Case Against Statistical Significance Testing” (1978) 48 *Harvard Educational Review* 378; Frank L. Schmidt, “Statistical Significance Testing and Cumulative Knowledge in Psychology: Implications for Training of Researchers” (1996) 1 *Psychological Methods* 115.

³ This experience has included adjudication (mainly as Chairman of the Workers’ Compensation Board (WCB) in British Columbia (BC)), administration, providing expert evidence to courts and public enquiries, appointments as an arbitrator, opinions for government agencies and other lawyers, and advocacy as counsel in court proceedings.

statisticians or scientists. This article does not elaborate on that definition because, for reasons explained below, this confined meaning is seldom relevant in legal decisions. One reason for this is that “statistical significance” refers to only one component of statistical significance — the chance aspect. Seeing that as the exclusive meaning reflects a perception of statistics as simply a branch of applied mathematics. That confined meaning excludes other important components of statistical significance such as:

- *validity* of the source data; including
 - factual accuracy,
 - completeness, and
 - comparability;
- *impression accuracy* – whether the data tends to create a false impression, having regard to the choices of which data to record, and which are left unrecorded;
- *descriptive accuracy* – for example, whether the heading on a statistical table correctly describes the statistics in the table;
- *relevance* of the data to the purpose for which they are being used – for example, whether the medical issue to be decided relates to negligence, etiology, treatment, prognosis, or the nature and gravity of any residual disability.

When “statistical significance,” in the more confined sense, is discussed in the context of particular data, the discussion is commonly irrelevant because the source data are invalid or at best of no known validity. Moreover, there is probably an inverse relationship between “statistical significance” and the validity of data. For example, if a scholarly physician undertakes a study by converting her patient information into anonymous data, the resulting statistics may well be valid, but the numbers too small to be “statistically significant.” If a research scholar or team undertakes a massive project to obtain data about a vast number of people, the results may well be “statistically significant;” but if the validity of the source data was not investigated by fieldwork, the resulting statistics will probably be invalid. If fieldwork investigation of the source data was part of the project, there may then be the difficulties for the scholar of monitoring the validity of data from diverse sources, including the difficulties of selecting, training and supervising a large staff. These problems can sometimes make the resulting statistics invalid, or at least of no known validity.

When an expert opinion uses statistics, but with no mention of any uncertainties, problems or qualifications relating to the data, that might be professional misconduct, depending on the circumstances.⁴

b) Causes of Death as an Example of the Problems

Mortality statistics were chosen as the prime example for this article because they are commonly used in the adjudication of claims for damages or other types of compensation, as well as in other legal proceedings, and they are often a basis for expert opinions. Mortality statistics are also commonly used for decisions on prevention and policy choices. Many studies, for example some on the effects of occupational or environmental exposures, and some on the effects of prescription drugs, use official mortality data. Because of the frequent use and importance of mortality statistics, the tedious detail in some paragraphs under this sub-heading is necessary to explain what is required for a lawyer or adjudicator to estimate the validity of the data, and the cogency of any expert opinion that has a statistical basis.

A basic limitation on the usefulness of mortality statistics in legal claims, and in public policy, is that the system for gathering and presenting the data focuses only on the medical causes of death, and confines the recorded data to those causes. The result is statistical tables showing only physiological causes of death. Some statistics are produced on the non-medical causes of death – for example, the police produce statistics on the causes of road traffic accidents – but statistics on the non-medical causes are only produced for a small minority of deaths.

A common assumption is that if statistics are published by Statistics Canada, or another government agency, the validity of the data must have been checked. That assumption is not easily displaced by the literature showing it not to be so.⁵ The checks made by Statistics Canada do not include fieldwork investigations at the multitude of original source locations (mostly hospitals, doctors offices, and in some jurisdictions, coroners offices) and processing locations to investigate by sample the validity (accuracy, completeness and comparability) of the data received. If a study gathers its own data by empirical research, the same objections would apply unless the study includes a good fieldwork program to verify the validity of the source data, and a monitoring of the coding.

⁴ *General Medical Council v. Meadow et. al.*, [2006] EWCA Civ. 1390, [2007] 2 WLR 286 [*Meadow*].

⁵ Statistics Canada, *Vital Statistics – Death Databases: Detailed information for 2005*, online: Statistics Canada <<http://www.statcan.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SDDS=3233&lang=en&db=IMDB&dbg=f&adm=8&dis=2>>.

One would expect mortality data to be mostly valid with regard to basic facts, such as numbers of deaths, age at time of death, and place of death, but it would be unrealistic to expect mortality data to be valid with regard to judgmental variables, such as causes of deaths. Thus a study would probably be using valid mortality data if it only uses numbers of deaths among various categories of people. The portion of mortality data commonly used in adjudication, in expert evidence, and in journal articles, however, relates to the *causes* of death, even though that portion of mortality data is of unknown validity. The lack of validity confirmation may be one reason why the courts are sometimes sceptical about opinions based on statistics.

Our mortality data recording system is based on the “International Classification of Diseases and Related Health Problems” produced by the World Health Organization (WHO).⁶ That classification is used by Statistics Canada (and other governments) to produce national mortality statistics. The data for mortality statistics are obtained from the vital statistics offices of the provinces, and from the three territories. The vital statistics offices produce their figures from the medical certificates of death, which are usually completed by the physician who last attended the deceased prior to the death, but sometimes by a pathologist or a coroner.⁷ There is a cut-off date for corrections to be made in the recorded tabulations.

The standard form of the medical certificate of death⁸ also shows why mortality statistics are bound to be invalid in relation to causes of death; they are incomplete and lack comparability. The first space asks for “the immediate cause of death.”⁹ The singular is used (in contrast to the plural elsewhere) and there is a space for only one answer. Yet many deaths result from what a lay person might call “old age.” A physician might be able to identify multiple concurrent causes. If one of them was a triggering event, that might be called “the immediate cause,” but if there was no triggering event, it is hard to see how, except by arbitrary choice, one out of several

⁶ World Health Organization, *International Statistical Classification of Diseases and Related Health Problems, 10th Revision* (2007), online: World Health Organization <<http://www.who.int/classifications/apps/icd/icd10> online/>.

⁷ See e.g. British Columbia, College of Physicians and Surgeons, *Resource Manual for Physicians: Death Certificates*, online: College of Physicians and Surgeons of British Columbia <https://www.cpsbc.ca/cps/physician_resources/publications/resource_manual/deathcertificates>; British Columbia, Vital Statistics Agency, *Medical Certificate of Death Form* (Victoria: Vital Statistics Agency Medical Coding Unit).

⁸ The form referred to here is the one issued by the Vital Statistics Agency of British Columbia. Other jurisdictions use a form that is similar, but not identical.

⁹ *Ibid.*

concurrent causes could be selected as “*the* immediate cause.” When one of the concurrent causes is selected, regardless of how that is done, the other concurrent causes might be omitted.

The next question asks for “Antecedent causes, if any, giving rise to the immediate cause (a) above, stating the underlying causes last.”¹⁰ There are spaces for three answers; but there is nothing to indicate whether the certifying physician considered the last antecedent cause to be “underlying,” the last two, all three or none of them. The form contains no definition of “antecedent,” but since the question follows the one about the immediate cause, this seems to imply that an antecedent cause must precede the immediate cause. It cannot be another concurrent cause. But suppose, for example, the deceased contracted a disease ten years ago. It gradually worsened until it became a contributing cause of death. It was an antecedent disease, but since it was current and contributory at the time of death, it would not appear to be an antecedent cause of death. This is one example of how the questions in the form deal with multiple *consecutive* causes (a chain of events), but not multiple *concurrent* causes.

It is also unclear how much time should elapse between two events to classify one as antecedent and the other as immediate. For example, if a traumatic event that happened ten years ago was a cause of death, it should obviously be classified as antecedent. The appropriate classification is less obvious if the traumatic event occurred the day before death.

It would be unrealistic to assume that in respect of any death, all physicians would classify the same cause as antecedent or immediate. Heart attacks can illustrate the point. Suppose a car drives off the road and rolls over. The driver is found dead. A pathologist or other physician finds only minor traumatic injuries, and concludes that the driver died of a heart attack. If no other evidence is available, however, it could be unrealistic to expect the physician to express a professional opinion on whether the heart attack caused the car to drive off the road — in which case the traffic accident might not have been causative at all — or the fright of the car going off the road triggered the heart attack. The selection for statistical purposes of traffic accident as the underlying cause of death, or a health condition underlying the heart attack, could be an arbitrary choice, rather than a professional judgment.

In the portion of the form used for the published mortality statistics, the last question asks for “Other significant conditions contributing to the death but not resulting in the underlying cause...”¹¹ The singular here in

¹⁰ *Ibid.* [emphasis added].

¹¹ *Ibid.*

relation to an underlying cause is incompatible with the plural used in the previous question. Having regard to the two previous questions, this one has no clear meaning, and it is surely unrealistic to believe that all physicians will understand the question to mean the same thing.

The definition of “underlying cause” published by the WHO is “the disease or injury which initiated the train of morbid events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury.”¹² That definition raises more questions than it answers. With regard to traumatic deaths, for example, that definition seems to refer to immediate causes, rather than any underlying cause. With regard to deaths from disease, that definition assumes that all such deaths result from multiple consecutive causes and none from multiple concurrent causes.

Suicides illustrate the point. If a certifying physician follows the WHO definition of “underlying cause,” read in light of the WHO classification system, a medical certificate of death might show “gunshot wound” as the “immediate cause” of death, and “suicide” as the “antecedent cause,” which will be coded as the “underlying cause.” That would seem like splitting hairs. For mortality statistics to be relevant in legal claims, as well as for public policy decisions and medical services, one might well see suicide as the immediate cause, and the events or circumstances creating the suicidal state of mind as the underlying cause.

Since the word “underlying” is not defined in the certificate form, it would also be unrealistic to expect all physicians to remember the WHO definition when completing a certificate, or to all understand this word to mean the same thing in all circumstances. One might also think that the underlying causes of a death could include background decisions, such as:

- a policy or administrative decision of government;
- a decision of a business corporation relating to purchasing, production or marketing; or
- a decision of the deceased, perhaps relating to hobbies, recreation or diet.

Such underlying causes of death never seem to appear in mortality statistics, but they are probably the most relevant for public policy decisions, and can be the most relevant in legal advice and claims adjudication.

¹² World Health Organization, *About the WHO Mortality Data*, online: World Health Organization <[http://www.who.int/healthinfo/statistics/mortdata /en/index.html](http://www.who.int/healthinfo/statistics/mortdata/en/index.html)>.

Vital statistics offices use a software program to convert the information from medical certificates of death into the international classification. This can help to achieve a consistency in processing, but it cannot help to achieve accuracy or comparability of the data. As the information received in the medical certificates of death is coded, the software program selects one reported cause of death as “*the underlying cause.*” An arbitrary rule is generally to treat the last answer on the list of antecedent causes as the underlying cause, regardless of whether the certifying physician might have felt that none of the antecedent causes was underlying, or that all of them were. *The published mortality statistics then show figures for only one cause of a death; and that is the one coded in the vital statistics offices as the “underlying cause.”* The answers in the certificates that are not used to supply data to Statistics Canada for publication are not otherwise published. They may, however, be used to supply statistics to order.

In some cases, usually accident cases, a physician may be able to contribute fewer thoughts on the cause of death than could a lay witness. For example, suppose a construction worker is killed by falling eight metres from a scaffold, landing on concrete. One might expect a physician to report the fall as the “immediate cause” of death. Perhaps the physician might also be able to determine if the deceased had a health problem that was likely to have impaired his balance, and therefore be an antecedent cause. But if the physician finds no physiological cause of the fall, what could be certified as an “underlying cause,” distinct from the “immediate cause?” Witnesses of the accident might see the underlying cause as an exceptional gust of strong wind, the unnecessary use of scaffolding, instability of the scaffold due to the omission of structural features, the platform being too narrow, lack of guard rails, failure of the employer to provide fall-prevention equipment, failure of the deceased to use the equipment provided, or failure of a government agency to enforce safety regulations.

In that example, when a medical certificate of death is coded by the software program for conversion into statistics, the “underlying cause” of death would probably be recorded as a “Non-motor-vehicle accident.” But for most purposes, the underlying causes as seen by witnesses of the fall would probably be more useful to know. The non-medical causes of death might be determined by a health and safety inspector, or by a coroner; but their determinations could depend on such variables as whether the site had been changed before it was inspected, which witnesses are willing to provide evidence, and what conflicts of interest might underlie witness statements. For these reasons, it may not be feasible to determine the non-medical causes in each case and record the answers for mortality statistics,

even if the system provided for that to be done. There is the added difficulty of achieving comparability when the data being recorded are judgmental. Such explanations of why it is not done do not detract, however, from the point that the official mortality data can sometimes be a distraction from the information that would be more useful for preventive purposes, as well as for a damages claim (if still available in the particular situation), and for the consideration of criminal or other sanctions.

There are subsequent questions on the certificate of death form, including “Environmental/occupational/lifestyle (e.g. pesticides, asbestos, abuse of tobacco, alcohol, etc.)” with a small space for a single answer.¹³ These possible causes of death do *not* appear in the parts of the certificate dealing with the immediate, antecedent, underlying or other significant causes. So the answers to this question do not form part of the published mortality statistics. Even if the answers to this question were published, a certifying physician will commonly have no knowledge of causative exposures, and if they are not mentioned in the available medical file, it would be unrealistic to expect any physician to make the enquiries that would be necessary to respond to that question. Even for a living patient, it is not usual for a physician to take an environmental history, an occupational history, an employment history,¹⁴ or other exposure history. Questions about a possible exposure might be raised by a physician or by a patient, and it might sometimes be possible to find an answer, but nobody tries to maintain a historical record of all exposures; and even if anyone tried, the resulting record would only be a tiny fraction of actual exposures. This problem is common for diseases with a long latency period. An employer might maintain a record of in-plant pollution, but that record will commonly be based on measurements of a particular contaminant at particular sampling points. It might be useful as an indicator of possibilities, but it will not provide a record of all the exposures of a particular worker. Even as a record of exposure of a particular worker to the contaminant that was being measured, it may be less accurate than personal recollection if no regular sample was collected at the work-station of that worker.

For accidents, the medical certificate of death form includes the question “How did the accident occur? (*describe circumstances*).”¹⁵ This suggests that the answer should not be purely medical; but unless the certifying physician was a witness, the answer will consist of hearsay,

¹³ See e.g. form cited at *supra* note 7.

¹⁴ A disease may result from a worker’s occupation, but it may result from aspects of the worker’s employment, or the industry, that are unrelated to that worker’s particular occupation.

¹⁵ See e.g. form cited at *supra* note 7.

possibly even second-hand hearsay, and may depend on nothing more than the coincidence of which witness remained available to speak to the physician. In the exceptional cases in which the certificate is completed by a coroner following an inquest, the answers are likely to be more reliable, but they would still be judgmental. For that reason, the answers may still be of questionable significance as a base for statistical data on the causes of death. In any event, the answers to this question do not become part of the published mortality statistics.

There are also other validity problems. For example, if taking a prescription drug for five years caused a driver's vision to decline, resulting in a traffic accident that killed a pedestrian, that death would probably appear in mortality statistics as resulting from a traffic accident. It may be less likely to appear as resulting from the drug, or from the condition being treated by the drug. Another example of multiple consecutive etiology might be a patient who is in hospital for surgery required by prostate or breast cancer. The patient contracts an infection while there, and dies from the infection. That death may appear in the mortality statistics as caused by the infection. It may be less likely to appear as being caused by cancer, or the causes of the cancer. It is even less likely to be attributed to government cuts in the funds to maintain hospital hygiene standards, even if it is the opinion of the certifying physician that this was the underlying cause of death.

Other problems relate to deaths from multiple concurrent causes, such as several infections, cancers, or other deteriorations of several organs. Where a patient was suffering from a variety of conditions at the time of death, it is commonly beyond the capacity of medical science, or beyond the time available to the certifying physician, to determine which among those conditions were contributing causes of the death. It is also unrealistic to assume that there will be a consistency among all physicians about how multiple successive or concurrent contributing causes will be identified and recorded. Related to this, while it is reasonable to expect a physician to allocate the time to identify the causes of a condition in a living patient, where etiology may be relevant to treatment and to prevention, it would be unrealistic to expect a physician to allocate the same time if identification of the causes of death is seen as needed only for statistics.

The problems of multiple concurrent causes are mitigated, though not solved, by grouping some concurrent causes into a single cause, and recording that group as one underlying cause in the statistics. For example, if a person died of cancer in several organs, the "underlying cause" of death would probably appear in the mortality statistics as "neoplasms," whether the cancers had a common etiology, or separate etiologies.

It would also be unrealistic to assume that all physicians are equally conscientious in completing a medical certificate of death, or that all physicians are equally capable, or even that the same physician is equally good at diagnosing every type of condition and assessing its causative significance in relation to death. One would also expect variations in the levels of precision or generality with which conditions are described. These are some of the many problems of validity when statistics are attempted for judgmental variables.

Another limitation of mortality data can be the difficulty of deciding whether a vulnerability was also a cause of death. Suppose someone died of an infection causing a disease. The deceased had been on a drug. The certifying physician believes that the drug would have caused a rise in acidic levels in the body, and that this probably made the deceased vulnerable to the disease. If most people contracting the same disease do not have that vulnerability, however, it could be a rare case in which the physician could then record an opinion on whether the vulnerability was a cause of the particular death.

Related to the problems mentioned above is the question of whether all physicians would be using the same standard of proof in identifying causes of death. The certificate form does not say whether a cause should be noted if it was possible, or if it was probable, or only if it was close to a certainty.

Guidelines are available for completing a medical certificate of death;¹⁶ but even if all physicians could always remember what they say, the guidelines do not provide answers to most of the questions and problems mentioned above, and in some ways, they aggravate the problems. For example, the guidelines state that when certifying the causes of death “... any disease, abnormality, injury, or poisoning, believed to have adversely affected the decedent should be reported...”¹⁷ Suppose a certifying physician believes that the deceased was adversely affected by a leg amputation that occurred ten years before the death. The guidelines, if read to mean what they say, provide that this should be reported as a cause of death, even if the certifying physician believes that it had no causative significance at all.

¹⁶ See e.g. Nova Scotia, Vital Statistics, *A Handbook for Physicians and Medical Examiners: Medical Certification of Death and Stillbirth* (Halifax, NS.: Service Nova Scotia and Municipal Relations Registry and Information Management Services Vital Statistics, 2000), online: Nova Scotia Vital Statistics <http://www.gov.ns.ca/snsmr/vstat/pdf/Physicians_Handbook.pdf>.

¹⁷ *Ibid.* at 10.

Completing a medical certificate of death can also involve conflicts of interest. For the certifying physician, some attributions of cause might create the risk of a lawsuit, disciplinary action, collegial displeasure, expressions of outrage, or powerful lobbying. Other attributions of cause might not create such a risk.

The broadest classifications of causes of death might seem reliable. For example, the tables produced by Statistics Canada classify deaths as resulting from accidents, suicides, or disease. At first impression, those classifications seem simple, but it is unrecorded how many of the accidents or suicides were caused by disease, or how many diseases or suicides were a subsequent consequence of accidents. The problems mentioned above also illustrate that questions about causes of death are too judgmental to assume that the answers are comparable. When the answers are used for statistics, comparability is an element of validity. This is one reason why statistics on the causes of death are of no known validity.

As well as the validity problems of mortality statistics, there is often a dilemma about whether the mortality data used in any study should be accompanied by morbidity data (ill-health data). This dilemma can arise whether a study uses official statistics or numbers produced by empirical research. The dilemma can arise, for example, in a study on the effects of drugs, nutrients or foods, or occupational or environmental exposures. If, as commonly happens, mortality statistics are used without morbidity statistics, any health consequences of a drug, nutrient, food or exposure might be underestimated, creating a false impression. If morbidity statistics are also used, however, that creates another range of problems. One is the more limited availability of morbidity data. Another is that the validity problems of data on the causes of morbidity are even greater than those on the causes of death.

The problems mentioned above can explain the abusive language sometimes used about statistics, such as the classic phrase “lies, damned lies and statistics,” but such language does not prevent the continuing use of statistics of unknown validity.

c) Impression Accuracy

Even if statistics are valid (including factual accuracy, completeness, and comparability) their publication can still give a false impression. Statistics on the causes of occupational disabilities and deaths illustrate the point; showing how a false impression can result from decisions to produce certain statistics, but not others. In *From Awareness to Action: WorkSafeBC Statistics 2005*, the Workers’ Compensation Board of British

Columbia produced a table similar to that produced annually in B.C. and in other jurisdictions.¹⁸ Table B-1 includes the following information:

Short-term Disability, Long-term Disability, and Fatal Claims First Paid in 2005 Number of Claims by Type of Accident¹⁹		
%		
Struck Against	4,010	6.45
Struck By	10,510	16.91
Falls from Elevation	5,670	9.12
Falls on Same Level	6,325	10.17
Caught In	2,275	3.66
Rubbed or Abraded	1,025	1.65
Over-exertion, Bodily Motion	25,515	41.04
Harmful Substances	2,790	4.49
Transportation	2,610	4.20
Miscellaneous	1,440	2.32
TOTAL	62,171	100.01%

This table, unaccompanied by others, can leave the impression that most occupational disabilities and deaths are simply caused by behaviour at the time of the event, usually worker behaviour. No table is produced of the disabilities and deaths caused by employers' decisions such as decisions relating to the location and design of plant; choice of machinery, product, components or materials used; ergonomics; selection and training of workers; or financial incentives to management or workers. An added importance of employers' decisions is that employers can, to a large extent, determine the decisions and behaviour of workers; but workers have no corresponding power over the decisions of employers.

Similarly, no table is produced of the disabilities and deaths caused by decisions of governments, or government departments or agencies, such as decisions relating to trade, transport or subsidies.

The bulk of accidents probably result from some combination of contributing causes, such as the situation in which the accident occurred, earlier decisions creating that context (such as design or equipment

¹⁸ British Columbia: WorkSafeBC Annual Report Publications, 2005, online: <http://www.worksafebc.com/publications/reports/statistics_reports/assets/pdf/stats2005.pdf>; the Workers' Compensation Board is the Board's statutory title, though the Board now calls itself by the exhortation "WorkSafeBC."

¹⁹ *Ibid.* at 40. Table B-1 has been edited to omit the breakdowns by type of industry. The percentage column has also been added; the error of 1 in the total is in the original.

choices), behaviour at the time of the event, factors inducing that behaviour, unexpected hazards (such as a premature equipment failure), or natural phenomena.²⁰

The published tables on immediate activities as causes of disability and death can be useful if treated cautiously. But they have a superficial appearance of recording basic non-judgmental facts, and when *not* accompanied by other statistics on causation, they tend to create the false impression that most accidents in the course of employment result, primarily or solely, from worker behaviour. It would logically follow that preventive measures should focus primarily on worker behaviour. Preventive action may then not be taken, or sanctions applied, in respect of the critical underlying causes. These may be the causes that are more amenable to prevention. Such statistics can also distract from any consideration of when actions for damages might lie.²¹

Of course there are explanations for the choice of what statistics to produce. Data about what happened at the time of injury can easily be produced from the standard reports received by workers' compensation boards from employers, workers and attending physicians. Data about underlying causes of disabilities and deaths, the decisions of employers, third parties and governments, could only be produced by careful investigation in each case, or by research projects. Also, data relating only to physical acts are not subject to as many validity problems as data relating to more judgmental variables. These explanations do not, however, impair the point that the table gives an incomplete picture, and a false impression.

The differences between statistics, such as those in the table shown above, and more complete evidence of the causes of disabilities and deaths, illustrate some of the difficulties of using statistics in adjudication, or for making other decisions. Invalid or misleading statistics, however, commonly *are* used (by expert witnesses or otherwise) in adjudication, as well as for making policy decisions. An aggravating factor is the old adage that the person who decides what statistics to record plays a key role in policy-making. It could be added that sometimes such a person also plays

²⁰ Summaries of contemporary studies (Canadian and foreign) of the causes of occupational accidents and diseases can be found in the weekly *OHS Canada* email newsletter. *OHS Canada* is a Canadian occupational health and safety online and print news-service published by the Business Information Group, division of Hollinger Canadian Newspapers, Toronto, online: OHS Canada, <<http://www.ohscanada.com/>>.

²¹ In Canada, damages might usually be claimed against a person who was neither a worker nor an employer, or at least, not in the jurisdiction in which the disabled or deceased worker was employed.

a key role in the formation of medical opinions and in adjudication. Those roles are not widely recognized.

Financial figures published by government give a similar false impression. A classic example is the GDP (Gross Domestic Product). The total market value of goods produced and services rendered is estimated and published. The media usually portray an increase in the GDP as good. But the GDP makes no set-off for the cost of disabilities, deaths and other damaging human consequences of the production and distribution of goods, or the provision of services. Moreover, if tax revenues are spent to remedy any damage caused by production, for example, on the removal of polluted soil, that expenditure is *added* to the GDP, instead of being deducted. An estimate of the *net* domestic product would be far more useful for making policy decisions in the public interest, as well as for other purposes.

d) Relevance

As one aspect of relevance, the courts require that opinions be received only from those who are qualified to express them. There is no such requirement with regard to opinions on public policy. Public opinion polls illustrate the concern. A poll can be relevant and useful on a question that depends on the experience of the respondents. For example, a poll showing that the bulk of people in Canada thought that telemarketing should be prohibited would be informative. Most of the respondents would at least know the significance of telemarketing for themselves. However, many polls taken by or for the media, or an interest group, ask questions when the respondents are unlikely to know the significance of the answers. A recent example was a “news” report of a poll asking whether judges should be elected.²² The poll reported 63 percent of respondents in favour. The poll was not reported to have been among people who had read some of the studies on the significance of judges being elected or appointed. Data produced by such simplistic polls distract from rational thought, and they distract from public policy decisions, or adjudicative decisions, being made on a rational basis.

e) Explanations for the Widespread Use of Invalid Statistics

There are several possible explanations why most of the statistics that are published or otherwise used are based on data that are invalid, or of unknown validity, or that give a false impression.

²² Kirk Makin, “Two-thirds Back Electing Judges” *The Globe and Mail* (9 April 2007) A1.

1) Background of Statisticians

Statisticians commonly have a strong mathematical background, and a consequential expertise in statistical analysis. They usually have no comparable background in, or aptitude for, the techniques of investigating the accuracy, completeness and comparability of data at their original source locations.

2) Conflict of Interest

Statisticians have a conflict of interest. If the statistics published and used were confined to those that are checked by fieldwork investigation to ensure the validity of the source data, and that do not give a false impression, the work available for statisticians would be a small fraction of what it now is.

3) Illusion of Accuracy Created by Statistics

For some expert witnesses and other authors, using statistics can create an image of scientific professionalism, however illusory that image may be. It is common for scientists to disparage the use of anecdotal evidence. For all of the above reasons, however, in any study that depends on the causes of death or ill-health, a scholarly survey of anecdotal evidence can be more scientific than the use of official mortality or morbidity statistics.

Medical research has also proved that anecdotal evidence and empirical research are often far more valid than official statistics on mortality or morbidity. Asbestos-related diseases may be the best example of the point. Following the widespread use of asbestos, decades went by during which no volume of deaths or disabilities were being attributed to its production or use. Eventually, it was proved by epidemiological research²³ that there was a large and continuing volume of deaths and disabilities resulting from asbestos-related diseases, including asbestosis, mesothelioma, and a portion of lung and other cancers. That research also proved that during the preceding decades, the anecdotal evidence,²⁴ the “unscientific” views of many general practitioners, and the opinions of industrial workers,²⁵ had all been more accurate than official mortality or

²³ Particularly the many research projects of Dr. Irving J. Selikoff in 1968 and subsequent years. These studies are also a good example of how a sound methodology to assure the validity of the source data far outweighed the importance of sample size.

²⁴ Including that from the early twentieth century.

²⁵ Including many in the ship-building industry, and the asbestos miners of Quebec involved in the strike of 1949.

morbidity statistics, and more accurate than the specialists’ opinions that mentioned statistics or “scientific proof.”

4) Funding of Statistical Research

For Statistics Canada, its revenues might be maximised by the volume of its output, rather than the quality. The total cost of fieldwork investigations to monitor the validity of source data and coding practices could be several times its present budget. Related to this, it is normal in a budgeting process to focus on the cost of doing something. Commonly, the cost of not doing it is not even estimated, particularly if that cost will be external to the institution preparing the budget.

5) Pervasiveness of Numeric Standards

The last 30 years have seen:

- An expansion in the role of accountants beyond their expertise in accounting, and into the efficiency of administration and adjudication.
- A contraction in the perception and role of economics, counting only goals that are numerically measurable, distracting from the externalization of costs, and degrading non-market values.
- In the universities, a downgrading of the social sciences and humanities, and a priority for business, technology, and the natural sciences.
- A resurrection of MBO (Management by Objectives) and its use in government departments and agencies, regardless of its negative effects on efficiency, including the production of false or misleading statistics on costs and output. Also, like the phenomena just mentioned above, MBO focuses on numeric goals to the neglect of quality and human impact, and to the neglect of other goals that are hard to measure numerically. In an apparent effort to rebut this criticism, invalid surveys are sometimes used to produce misleading statistics on user satisfaction.
- Related to the first and fourth of these points, reports by government auditors demanding the use of bureaucratic

normalcy by adjudicative bodies;²⁶ overlooking the incompatibility of that with adjudication according to law.

These circumstances and developments combine to give misleading numeric goals a priority over quality and human values. In the process, they combine to generate invalid and misleading statistics.

6) Illusion that Technology Eliminates Problems

It is sometimes suggested that statistics do not involve the same problems nowadays as they did, because the evolution of computer-related technology has achieved a scientific accuracy that avoids the limitations of human output. This is only true to a limited extent. The colloquial axiom “garbage in, garbage out” seems unrefined, but it makes a good point. With regard to statistics, computers can improve the consistency of data-processing and increase accuracy of the mathematics; but computers do not check the validity of the information at source, nor the coding of diverse verbal information into classifications for the production of numeric data. Nor can computers ensure that any mathematical formula applied is relevant. These limitations of computers are critical with regard to statistics relating to judgmental variables, such as the causes of death or disability.

f) The Etiology of Disease

Some of the points mentioned above are most cogent in relation to the etiology of disease. The following limitations also commonly impair the statistics used in the adjudication of etiological issues.

²⁶ See e.g. Canada, Office of the Auditor General of Canada, *Report on the Workers' Compensation Board of the Northwest Territories and Nunavut* (Ottawa: Communications, 2006) online: Office of the Auditor General <http://www.oag-bvg.gc.ca/internet/docs/200606wcbce.pdf>>. One example of bureaucratic normalcy is that government auditors or senior administrators commonly require that adjudicators be supervised. These requirements do not distinguish between constructive types of supervision (such as spot checks for quality control and the prevention of fraud) and the types of supervision that are incompatible with quasi-judicial adjudication (such as some decisions on a claim being made by a supervisor who has not read the file, and who is not the person who has engaged in oral communication with the parties, representatives and witnesses, and received their evidence and arguments). Another common requirement of bureaucratic normalcy is annual budgeting. If anyone suggested that a chief justice should prepare an annual budget, estimating the total amount of damages to be awarded by the court in the next year, this would be recognized as absurd, and an improper influence on achieving justice case by case. It is just as incompatible with the goal of justice according to law when the same demand is made in a social insurance system.

1) The Irrelevance of “Statistical Significance”

Some reasons have been explained above why statistics are commonly insignificant, even when “statistically significant” in the confined meaning of that term. What can more easily be overlooked by a lawyer, an expert witness, a judge or other adjudicator, is that the converse is also true. Occasionally, statistics can be legally relevant and significant as a basis for a medical opinion, even if the data are *not* “statistically significant” in the confined meaning of that term. This is because, as mentioned above, “statistical significance” is determined by a mathematical formula designed to discount the possibility that a difference in the numbers relating to two groups might have occurred by chance. A mathematical formula designed for that purpose will use a standard of proof much higher than the balance of probabilities. To require “statistical significance” would, therefore, be to require a standard of proof much higher than the standard required in law. However, there is a more compelling and more broadly applicable reason why “statistical significance” is usually an irrelevant fine line in adjudication on issues of etiology.

Suppose, for example, the issue is whether disease A was caused by employment in industry B. Epidemiological research, including medical examinations, and any adjustments that may be needed to the numbers, shows that the incidence of disease A is 3 percent higher among workers in industry B than among other people in the same age range, and who live in the same area upwind of the industry. An expert witness might explain that, to be “statistically significant,” the difference would need to be at least 4 percent. That opinion would have been reached by applying a strict mathematical formula to the numbers. When the legal standard of proof is the balance of probabilities, a difference as low as 1 percent would be sufficient to warrant a conclusion that employment in industry B causes disease A in some cases, unless that conclusion is contradicted by other evidence.

If those statistics are the only evidence of etiology, however, the most common reason why “statistical significance” is irrelevant is that whichever side of the line the numbers fall, the balance of probabilities would still warrant a conclusion that the disease was not caused by employment in the particular case. On the figures mentioned above, the difference between a “statistically significant” 5 percent, and a “statistically insignificant” 3 percent, is an irrelevant fine line. If the difference was 1 percent, 30 percent or 90 percent, the result would be the same. It would still appear that, on a balance of probabilities, the particular claimant would have contracted disease A if never employed in industry B. But this is usually unrelated to “statistical significance.” This is why

mathematical expertise on exactly how and where the fine line of “statistical significance” should be drawn is not usually relevant. To be proof of a claim, the proportion of workers in industry A who contracted disease B would need to be higher than the proportion in the control group by at least about 100 percent of the proportion in that group (or in Quebec, more than 100 percent higher). Of course, the higher the proportion between 1 percent and 100 percent, the greater the probability that the employment was causative in the particular case; but this would only become relevant if the statistics are used in conjunction with other evidence of employment causation in that case.

Although usually irrelevant when issues of etiology arise in the context of claims adjudication, “statistical significance” can become relevant in the context of prevention.

2) *Negative Usage*

Epidemiological research also has its limitations when used in support of a negative conclusion:

- It can be relevant to epidemiological studies, as well as to official statistics, that many of the problems of data validity relate to omissions. For this reason, validity problems are at their greatest if the statistics are used in an exclusionary way.
- Epidemiological studies usually focus on one contaminant, one drug, or one other item of consumption.²⁷ A negative conclusion of such a study may show nothing persuasive when a claimant has been exposed to that contaminant, drug, or other item, in combination with others.
- A negative conclusion of an epidemiological study would not show whether the particular claimant had an unusual susceptibility to the particular contaminant, drug or other item (in which case the “thin-skull rule” would apply).

3) *The Healthy Worker Effect*

Sometimes, a negative conclusion on causation is sought or explained by

²⁷ In relation to occupational causes, some epidemiological studies seek to avoid this problem by focussing on a particular occupation or type of industrial site, rather than a particular contaminant; see e.g. James T. Brophy *et al.* “Cancer and Construction: What Occupational Histories in a Canadian Community Reveal” (2007) 13 *Int'l J. Occup. Environ. Health* 32.

reference to data showing that the incidence of a disease among the workers in an industry is no higher than among the public at large. That suggestion assumes that the public is otherwise a comparable group with the workers in the industry. If the workers have been selected, by the employer or by themselves, for being particularly healthy, the public at large is not a comparable group. The statistical comparison is then invalid unless an adjustment has been made for the healthy worker effect.

g) Conclusions

The gravity of the validity problems mentioned above will vary with any use made of the statistics, and examples may be found of mortality statistics being used constructively in the development of medical knowledge, in public policy decisions, and in the reports of expert witnesses used in adjudication. Even when statistics are otherwise relevant, however, “statistical significance,” in the confined meaning of that term, is only one element in estimating the significance of mortality, morbidity and other statistics. Similarly in non-medical subjects, empirical research can often produce more accurate results than published aggregated data, at least if the empirical research has produced statistics for which the scholar has done the field-work to investigate the validity of the source data.

Statistics are commonly used in adjudication, whether by an expert witness or otherwise, without discussion of the problems of data validity.²⁸ But medical evidence for a court or other adjudicative body, and medical advice to government departments and agencies, and to other organizations, needs to be read with a healthy scepticism if it justifies the use of statistics by the phrase “statistically significant” when the statistics are of unknown validity. Moreover, the validity problems do not diminish only because larger numbers are involved. The confined and misleading meaning of “statistical significance” is sometimes compounded when that term is used in the same study or opinion as the phrase “scientific proof.”

With regard to causes of death, many of the validity problems relate to omissions from the medical certificate of death, and the further omissions when the data is processed to select only one item from those certificates for use in the published mortality statistics. For this reason, the validity problems are at their greatest if the statistics are used in an exclusionary way, and at their least when the statistics are used in an inclusionary way.

²⁸ For an exception see *Meadow*, *supra* note 4.

3. *The Distraction of “Scientific Proof”*

a) Meaning

In the context of a medical opinion for adjudication, “scientific proof” of diagnosis usually refers to whether an opinion is supported by scientific testing, such as X-rays, magnetic resonance imaging (MRI), or laboratory tests. Where the issue is etiology, “scientific proof” might consist of animal studies or epidemiological research.

A related and sometimes alternative phrase is “objective medical evidence.” It is sometimes asserted that an affirmative medical opinion should be rejected because it is not “objective.” In adversarial proceedings, “objective” can mean unbiased. But in inquisitorial proceedings²⁹ such as workers’ compensation, and sometimes in the courts, the two common meanings of this assertion are:

1. The conclusion in the medical opinion depends on symptoms or other facts described by the patient to the physician, and which the physician cannot corroborate; or
2. The conclusion of the opinion is not supported by “scientific proof.”

When the first meaning is intended, any adjudicator who rejects a medical opinion because it is not “objective” has made three erroneous assumptions of law:

- At least with regard to the symptoms of an injury, or other facts necessary for a medical opinion, evidence of the claimant is inadmissible (or should be disbelieved) unless it is corroborated;

²⁹ Probably the bulk of adjudicative decisions on claims for disability or death are made in an inquisitorial system. This is because the bulk of actions for damages are either settled or abandoned. It was a goal of workers’ compensation, for example, to save disabled workers and dependants from having to bargain from a position of disadvantage, and provide them instead with prompt and economical adjudication. In most social insurance and social security systems, the proceedings are inquisitorial, though it has been normal to avoid the use of that word, probably because of the traditional hostility of the legal profession in Canada to inquisitorial proceedings, and its dedication to the adversary system. This probably explains why, in the *Meredith Report* that was the basis for our present systems of workers’ compensation, Chief Justice Meredith was determined to have an inquisitorial system, even for appeals, and to save disabled workers and dependants from the bias, injustice and other problems inherent in the adversary system. Yet he never used the word “inquisitorial” in his report, and workers’ compensation became known as an

- Any medical opinion that is based on such evidence of the claimant is inadmissible, or should be discarded; and
- If any question relating to the existence, diagnosis or etiology of a disability cannot be answered in the affirmative without evidence from the claimant, that question should be answered in the negative.

Adopting any of these rules of exclusion is clearly illegal, unless such a rule is specifically prescribed by statute. It follows that a “medical” report based only on the lack of “objective” medical evidence is not a medical opinion at all. It is an erroneous opinion on a question of law, and therefore inadmissible.

Where the inquisitorial system applies, if symptoms or other facts described by a claimant to a physician cannot be corroborated by the physician, and if the credibility of the claimant is doubted, the adjudicator has a legal duty to resolve that doubt. Usually, an efficient way of doing so would be for the adjudicator to question the claimant, either by an oral hearing, or in an informal sit-down discussion with the claimant.³⁰ The doubt cannot lawfully be resolved by a practice of discarding any medical opinion if it depends on evidence of the claimant.

Such a rule of exclusion is also incompatible with one of the rationales for the original establishment of workers’ compensation boards, and some other social insurance bodies — that adjudicators should admit a *broader* range of evidence than would be admissible in the courts. The adoption of such an exclusionary rule by any board would make it *more restrictive* than the courts in the admission of evidence.

Another objection to such an exclusionary rule is that it often defies common sense. As well as the normal propensity of most people to be honest, there are cogent incentives for patients to be honest when reporting symptoms to attending physicians. Patients usually want their physicians

“enquiry system;” see Ontario, Commission of Inquiry into the laws relating to the liability of employers to make compensation to their employees for injuries received in the course of their employment which are in force in other countries, and as to how far such laws are found to work satisfactorily, *Final Report*, by Hon. Sir William Ralph Meredith C.J.O. (Toronto: Legislative Assembly of Ontario, 1913) [*Meredith Report*].

³⁰ This was recognized in workers’ compensation when the decentralization of claims adjudication and administration began in 1974 in BC. The primary reason for that change was to facilitate a hearing (then called an oral enquiry) by the adjudicator, or an informal sit-down discussion with the claimant, as well as with an employer, a physician, or another witness.

to be well-informed so that they can make the right diagnosis, the best choice of treatment, and sometimes so that they can give good advice on rehabilitation. Also, most patients do not know the limitations of medical science. They do not know when, or to what extent, a physician can tell if they are speaking the truth. Thus a patient who lied to a treating physician could be taking the risk of being found out, as well as the risk of being badly treated. A treating physician who has examined a claimant on several occasions, perhaps many occasions over many years, is also usually in a good position to assess the truth of what the patient says.

Sometimes, the medical issue is the existence of a disability, or whether a disability precludes a return to work. A common example is chronic pain syndrome. The credibility of the claimant is often further enhanced in these cases because the truth of what the claimant says puts the claimant at a financial, as well as social, disadvantage. This commonly happens because the claimant would receive much less in compensation than would be received in earnings if the claimant was fit to return to work.

Information from a claimant to a specialist or other physician is more likely to be questionable when the issue is etiology. Those are the cases in which a claimant usually has a financial incentive to pursue the claim. They are, therefore, more likely to be cases in which investigation is sometimes needed, such as oral questioning of claimants by the adjudicator, or other enquires.

When the second meaning of “objective” is intended, that word is a synonym for “scientific proof.”

b) The Problem

If an expert witness in court has not been properly instructed, a negative opinion is occasionally based on nothing but the lack of “scientific proof” of the affirmative. The witness is assuming that the absence of “scientific proof” of the affirmative warrants a presumption of the negative. That is not a medical opinion. It is an erroneous legal opinion, irrelevant, and inadmissible. Also, any decision based on such an opinion could, in effect, be an unwarranted delegation to the witness of the jurisdiction to decide the general issue. The same problem arises if a negative conclusion is reached for no reason except that the affirmative medical opinion was not “objective.”

It is common to find decisions of public bodies and departments, and decisions of tribunals relating to social insurance and social security systems, that were reached by “medical” reports based only on the lack of

“objective medical evidence,” or “scientific proof” of the affirmative. Similar decisions can be found of arbitrators and some insurance companies.³¹ The problem is most common when the physician is on the staff of the adjudicating body, and is not instructed by a good lawyer. The physician is then commonly the *de facto* decision-maker on questions of law as well as medicine.

c) Availability and Relevance

Nowadays, “scientific proof” is commonly available for opinions on diagnosis, but commonly unavailable for opinions on etiology.

In the courts, definitive “scientific proof” is seldom available to resolve a medical issue. This is because when a medical question is one for which definitive “scientific proof” is available, that question seldom becomes an issue. “Scientific proof,” however, like statistics, may be available for some components of an answer, and can then provide a basis for estimating possibilities and probabilities relating to a larger medical question. When no “scientific proof” at all is available, any “medical” opinion that rests on nothing but the absence of “scientific proof” is irrelevant, and a distraction.

Because claims for damages, workers’ compensation, military pensions and benefits under some other systems provide for entitlement to depend on etiology, they are bound to raise medical questions that lie outside the capacity of medical science to answer. When a medical specialist is retained to provide an opinion for a legal proceeding, the specialist has usually been retained because the answer to a medical question is difficult. It should be no surprise, therefore, that in legal decision-making, it is commonly possible to reach a conclusion on a medical issue only by drawing inferences from the circumstances.

d) Misuses of the Phrase

The bulk of cases in which “scientific proof” of the affirmative is demanded, and a presumption of the negative is sought, are cases in which “scientific proof” is unavailable. With regard to etiology in particular, any requirement of “objective medical evidence” or “scientific proof” would result in an escalating level of injustice. This is because of two continuing trends.

³¹ See e.g. *Lumsden v. Manitoba*, 2007 MBQB 227, 219 Man.R. (2d) 97 in which an insurance company was administering a “Long Term Disability Income Plan” of the Government of Manitoba for its employees.

- The continuous introduction of new chemicals, new chemical compounds, and new uses of chemicals, as well as other exposures, in industrial production and distribution, and into our air, food and water.³² Research on etiology cannot keep pace with this accelerating escalation of possible causes of disability and death.
- The decline in government funding for independent medical research, and the extension of patent protection for prescription drugs. These financial shifts combine to increase the dependency of research scholars on funding from the drug industry. This has led to a shift in the resources of epidemiology from studies of etiology to studies of treatment.

For this combination of reasons, the prospects of “scientific proof” being available on a question of etiology are constantly declining. Some additions are made every year to the known causes of disability and death, but diseases of unknown etiology are most likely increasing at a faster pace.

Two other related points are:

- Identification of the causative link. As part of a demand for “scientific proof,” or independently, it is sometimes asserted or assumed that causation cannot be found unless the causative contaminant or circumstance is identified. That might be a requirement for prevention or treatment, but it is not a requirement of eligibility for compensation or damages.
- Diagnosis. It is sometimes asserted or assumed that a diagnosis is required for any affirmative opinion on etiology. Commonly, the medical profession will see a diagnosis as necessary for an opinion on etiology, but in some cases the etiology of a disability or death can be determined or inferred more readily than diagnosis. Sometimes a presumptive schedule in a statute requires a diagnosis for the presumption to apply, but where a decision does not depend on such a presumptive schedule, there is no legal requirement of a diagnosis as a prelude to a conclusion on etiology.³³

³² A large-scale current example is the development of nanotechnology.

³³ See e.g. *Re Workers' Compensation Act and O'Donnell #2*, 2007 YKSC 7, 155 A.C.W.S. (3d) 739 at para. 106.

e) Explanations of the Demand for “Scientific Proof”

The demands for a presumption of the negative when there is no “scientific proof” of the affirmative are used to prevent or rebut claims for damages or compensation for disability or death as a result of employment exposures, air or water pollution, the consumption of toxic food or drinks, military service, or other causes. A demand for “scientific proof” of harm has also been used repeatedly to justify government decisions to allow, and to subsidize, the continuing rise in pollution and global warming. At least in BC, this demand is also used to make cuts in the coverage of the health care system.

Paradoxically, the demand of some interest groups, some physicians and some administrators for “scientific proof” in legal decision-making, and in other contexts, does not accord with normal medical practice. When there is uncertainty on questions, such as diagnosis, etiology or prognosis, it is normal routine for a physician to advise a patient of possibilities and probabilities. The basis for any opinion given to a patient depends on the circumstances, the question being addressed, and the expected use of the opinion. Sometimes an opinion might be based on scientific proof, but sometimes it might be based solely on unrecorded experience, anecdotal evidence, the common knowledge of the profession, or special knowledge from remembered or forgotten sources. Also, although physicians may not express themselves in these terms, it is routine for physicians to advise patients according to varying standards of proof (degrees of probability). For example, if a patient’s problem might be one for which the appropriate treatment would be a harmless exercise, the physician may think it appropriate to assume the diagnosis on a low degree of probability, and recommend the treatment. But if the appropriate treatment would be a high-risk operation, the physician may well seek scientific proof (or other proof close to a certainty) of diagnosis and prognosis, and perhaps make other checks, before affirming the diagnosis and recommending the treatment.

There are several explanations why a requirement is sometimes asserted in social insurance and social security systems that for an affirmative medical opinion to be admissible, it must be “objective,” or based on “scientific proof,” even though no such requirement is assumed for a negative opinion. One explanation is that decisions are commonly made without the involvement of anyone qualified or trained to identify the legally relevant medical questions. For example, this problem has plagued workers’ compensation since our present systems began in Ontario in 1914, following the seminal *Meredith Report*. That report led to a great improvement for employers, workers, and taxpayers; but unfortunately, the

report did not recommend exactly how decisions should be made within the Board. The structure and practice that emerged seemed to assume that workers' compensation decisions would only involve the determination of simple facts, medical opinions, and arithmetic.

Regardless of whether that is a correct explanation, the only professionals appointed to the claims departments of the boards were the board doctors. In at least Ontario and BC, the boards established legal departments, but the lawyers there generally dealt with such matters as subrogation claims and the collection of assessments. They would only occasionally become involved in a compensation claim. Because board doctors were the only professionals in the claims departments, adjudicators (usually promoted from clerical staff) would refer to them any question of difficulty or uncertainty. A board doctor, who was supposed to be a medical adviser, then became the *de facto* decision-maker on all questions, including non-medical facts and law, as well as medicine. In particular, board doctors decided, if only subconsciously, what was the legally relevant medical question, without even recognizing that this was a question of law. The problem was aggravated when, as commonly happened, the opinion of a board doctor, who had never examined the patient, became entrenched as the position of the board. Starting in the 1970s, the problem was solved or mitigated in some jurisdictions. The extent to which it still prevails seems to vary with jurisdiction, time, level of decision-making, and other factors.

In systems in which the "medical adviser" is the *de facto* decision-maker on the general issue of entitlement, a decision may reflect restrictive assumptions about the burden and standard of proof that accord with some notion of science, or with budgeting, but not with the law of the system being administered.

The problem can be aggravated, and sometimes created, by the dependency of "independent medical experts." The title "independent" is usually adopted by, or attributed to, people who depend for most of their incomes on being selected and continuously retained by a small number of insurance companies, workers' compensation boards (since the late 1980s), large business corporations, or some combination of these. "Independent medical experts" commonly see a patient only once or twice, often without having received a statement of the non-medical facts. Treating specialists, on the other hand, usually depend for their incomes on being selected by a large and ever-changing number of people, and they commonly see a patient several times over a longer period. It is at least arguable that they are more genuinely independent, though they never seem to use that word in relation to themselves.

In the adversary system, the reports of “independent medical experts” usually seem at least responsive to the legally correct medical questions, but that is commonly not so in the inquisitorial system. Unless instructed otherwise, “independent medical experts” often report conclusions on the general issue that involve erroneous assumptions of law, such as a presumption of the negative, which they assume follows from the absence of “scientific proof” of the affirmative.

Another explanation of the demand for “scientific proof” is that when a statute is passed to benefit a dissipated public interest, it is common to find that subsequent administration of the statute is under continuous pressure or control from concentrated private interests.³⁴ This can be augmented by sociological phenomena, such as elite accommodation. In the context of this article, it is concentrated private interests that benefit from the demand for “scientific proof.”

There are also more benign explanations of the demands for “scientific proof.” If a physician has not been properly instructed on the role of an expert witness, there may be a misunderstanding about the expectations of the adjudicating body. This can easily result from the diverse meanings of “proof” and “proved.” Even in the same profession, these words are not used with a consistent meaning. For example, during a trial a judge may ask counsel whether something will be proved. The question usually means “Will some evidence be adduced in support of that?” If, however, a judge concludes in a judgment that a fact has been proved, this may mean “I find the evidence in support of that fact more persuasive than the evidence against it.” In the medical profession, to describe something as “proved” might sometimes mean that it has been proved scientifically. That is not a requirement in law, but a physician who has not been otherwise informed might assume that it is.

f) The Aversion to “Don’t Know”

There seems to be a widespread and perhaps universal belief in the medical profession that a medico-legal report should never conclude that “I don’t know,” though if the author of the report does not know the answer to the relevant question, that would seem the only correct conclusion to state. I have read literally hundreds of “medical” reports, mostly in workers’ compensation cases, and mostly on questions of diagnosis or etiology, in which a specialist clearly stated in an early paragraph of the report that he or she does not know the answer - but I have never read a single report in which any specialist or other physician ever concluded at the end of the report that “I don’t know.” When a medical specialist consulted by the

³⁴ This is part of the phenomenon known in the US as “regulatory capture.”

adjudicating body has stated early in the report that he or she does not know the answer, a common practice is to presume the negative, and conclude that the disability or death did not result from employment.

For courts or other tribunals using the adversary system, the practice of concluding a medico-legal report with an answer one way or the other is understandable. The lawyer for each party will only seek, or only put in evidence, the report of a physician whose opinion favours that party. It is another matter when an adjudicating body operates on an inquisitorial model, and the reporting physician is employed or retained by the adjudicating body. In those reports, there should be no aversion to concluding that “I don’t know” if that would be the correct answer. It is in exactly this context, however, that I have read hundreds of medical reports saying “I don’t know” in the opening paragraphs, while none concludes with that statement. It is also rare for the intervening paragraphs of these reports to show any logical reason for the movement from “don’t know” to a conclusion one way.

It can help if a report includes any thoughts on possibilities and probabilities, but concluding with a presumption instead of “I don’t know” simply distracts the adjudicator from reaching a legally correct conclusion. It can also help if, as well as concluding that “I don’t know,” the reporting specialist can say whether an answer is likely to be obtainable from another source, or the question lies outside the scope of medical science to answer.

Sometimes, the aversion to concluding that “I don’t know” may explain the use statistics of unknown validity, or why a medical report ends with a presumption of the negative for no reason except the absence of “scientific proof” of the affirmative.

g) The Legal Significance of “Scientific Proof”

Unless the statute law of a system provides otherwise, there is no requirement of any particular type of proof of causation. When an affirmative medical opinion has been rejected because it lacks “scientific proof” or “objective medical evidence,” this usually means that the consequential decision was wrong in law.

It is also noteworthy that the inquisitorial system is the same as the adversary system with regard to the *standard* of proof, but it differs with regard to the *burden* of proof. If the evidence for and against a claim is adjudged to be evenly balanced, the adversary system then applies a *legal* presumption of the negative, because the burden of proof lies on the plaintiff. In the inquisitorial system, the parties are usually required to

provide all relevant information available to them; but for resolving any remaining uncertainties, the burden lies on the adjudicating body to initiate and conduct further enquiries. Advocacy, including the provision of further evidence and argument, is a supplementary option. If, after making such further enquiries as the adjudicating body deems appropriate, the evidence for and against a claim is judged to be about evenly balanced, some systems provide that the claimant be given the benefit of the doubt. This is specified in some workers’ compensation statutes. Some others provide that “all reasonable inferences” be drawn in favour of the worker, and this phrase is commonly interpreted to mean that the worker (or dependants) be given the benefit of the doubt. A similar phrase appears in the legislation of some other systems, such as military pensions, and it might be argued that it is open to the same interpretation.

A related distinction is that under the adversary system, the issues decided are usually drawn from among those raised by the parties. Under the inquisitorial system, the adjudicating body commonly initiates as well decides the issues, the more so when there is only one participating party.

The legal position is that when etiology is unknown, the court or other adjudicating body must reach a conclusion as best it can on the balance of probabilities (the best available hypothesis).³⁵ Often, however, that has not been explained in advance to the advising physician. A workers’ compensation case within my own experience involved a claim by the widow of a former miner who had died of a respiratory disease. The issue was whether his death had resulted from twenty-five years of exposure to mining dusts. The Board had retained a panel of three specialists in lung diseases to provide an opinion. Because the panellists had been instructed by a Board doctor, their instructions did not identify the legally relevant questions.³⁶ In an early paragraph, the unanimous report of the panel stated the diagnosis as “chronic obstructive lung disease,” which they said could have been caused by the twenty-five years of exposure to mining dusts. At

³⁵ The phrase “best available hypothesis” was suggested to me by the Dean of Medicine at UBC in 1975 as a synonym for the balance of probabilities, and one that might be more understandable in the medical profession.

³⁶ One way of putting those questions might be:

- a) Is it possible that the exposure of the worker over 25 years to mining dusts was a significant contributing cause of the disease that led to his death?
- b) If the answer to a) is affirmative, can you identify any other exposure or circumstance that might have been a significant contributing cause?
- c) If the answers to a) and b) are both affirmative, is it likely or unlikely that the exposure of the worker to the mining dusts was one of the significant contributing causes of the disease that led to the death; or are the probabilities of this being so about evenly balanced?

the end, the report concluded: “There is no evidence that the death was caused by employment.” Whatever the panel understood by “evidence,” the conclusion left the Board to determine etiology as best it could. The specialists had reported that employment causation was a credible hypothesis. No evidence could be found to identify any non-employment exposure that might have been causative. Therefore the claim was allowed.

Keeping medical experts focussed on the legally relevant medical questions is less of a problem in courts than in other adjudicating bodies because the courts have traditionally held oral hearings in primary adjudication, though nowadays a medical report might be admitted at trial without the presence of the physician, at least if there is no objection. Often, the medical expert has also discussed the opinion with the lawyer for at least one of the parties. Many other adjudicating bodies never hold oral enquires, at least not in primary adjudication. Some are also reluctant to hold an oral enquiry at any level of appeal, or if they hold one are reluctant to have the medical expert present whose opinion was relied upon in primary adjudication. On a complex medical issue, however, it can be hard to formulate in writing the legally relevant medical questions, and to ensure that the questions were understood by the reader to have the meaning intended by the writer. That problem can usually be avoided if final communications with the medical specialist are oral and interactive. The demeanour of the witness and the answers given can help to ensure that the questions were properly understood, as well as helping to weigh the evidence. Oral interaction also allows a specialist to ask for clarification of a question. It allows follow-up questions to be asked, and any cross-examination.³⁷ Oral hearings are only needed in a very small proportion of social insurance or social security cases, but when they are needed, the need does not arise for the first time at some stage of appeal. The need is at its greatest in primary adjudication.

Where a statutory presumption of the affirmative applies, any “medical” report based on nothing but a presumption of the negative is even more objectionable, and even more clearly inadmissible. For example, many workers’ compensation statutes include a schedule of occupational diseases. The schedule is in two columns, one a list of

³⁷ In *Melanson v. New Brunswick (Workers’ Compensation Board)* (1994), 146 N.B.R. (2d) 294 at 306-08, 114 DLR (4th) 75 (N.B.C.A.), the Court decided that if a written medical report of an outside specialist engaged by the board or the appellate body, or of a board doctor, was to be considered on appeal, the author of the report must be produced as a witness for cross-examination by a party. It is arguable, however, that at least in workers’ compensation proceedings, cross-examination should only be allowed if it is conducted in a manner, tone and language that shows respect for the witness, with the avoidance of scorn, smirking, or language that is aggressive or insulting.

diseases, and the other a list of industries or exposures. Each entry in the first column is opposite an entry in the second column. A section of the statute provides that where a worker sustained a disease mentioned in the first column, and had been employed in the circumstances mentioned opposite that disease in the second column, the disease is presumed to have resulted from the employment, unless the contrary is proved. Yet in at least three jurisdictions, it has been known for a claim to be denied because the contrary has been “proved” by a medical opinion that rested on nothing but a presumption of the negative in the absence of “scientific proof” of the affirmative. By adopting such a “medical” opinion, the board in these cases applied a presumption of the negative when the statute expressly required a presumption of the affirmative.

In an inquisitorial system, where there is no burden of proof on a party, a conclusion must be reached regardless of whether there is a firm basis for a conclusion either way. In some cases, it may only be possible to reach a conclusion by intelligent guesswork, usually described as drawing reasonable inferences from the circumstances. Even in civil actions in the courts, where there is a burden of proof on the plaintiff, it is still recognized that if the parties have adduced all the available evidence, and there is no firm basis for a conclusion, a decision should be reached by drawing a reasonable inference from the circumstances.

Whatever the historical explanation for reaching conclusions in this way, it is clearly justified by the injustice that would flow from applying a presumption of the negative in the absence of “scientific proof” of the affirmative. If an erroneous negative decision is made, a human being suffers financially, and bears the cost of industrial, military or motor-vehicle activity. Commonly, the individual will also suffer in health, family relations, and other consequences of poverty. If an affirmative decision is erroneous, the loss is usually born by an aggregated fund, such as tax revenue, an insurer, or a major corporation, and no adverse consequences are suffered in health or family relations. The traditional legal theory was that insurance or another source of funding to pay a claim is irrelevant, but that has never been the position in practice,³⁸ and even the theory is eroding.³⁹

Even with no presumption of the negative in the absence of “scientific proof,” the scales of justice already weigh heavily in favour of those who

³⁸ Insurance coverage is, for example, one explanation why it is much easier for a pedestrian to succeed in an action against a motor-vehicle driver than it is for a driver to succeed in an action against a pedestrian.

³⁹ See e.g. *Bazley v. Curry*, [1999] 2 SCR 534, at 554, 174 D.L.R. (4th) 45.

would benefit from such a presumption. For several reasons, many and probably most valid claims are never pursued, particularly if pursuing a claim would involve the cost,⁴⁰ stress, long delays and uncertainties of the adversary system. Applying a presumption of the negative would tip the scales of justice even further. This is even more so in cases of disability or death from disease. It is very likely that with regard to claims for damages, workers' compensation, and military pensions, the claims pursued in disease cases are only a tiny portion of the claims that would succeed if the research on etiology had been done. There is no standard routine for a patient with a disease to be asked for an exposure history to produce data on possible causes, and a patient might never even think about whether the evidence to support a claim could be available. With regard to cancer, for example, there is no standard admission form at places of treatment seeking data on any broad range of exposures that might have been causative, though a question on smoking history is common.

The available statistics relating to cancer also illustrate the point. Over the years, there have been enough epidemiological studies to estimate that occupational exposures cause, or at least are a significant contributing cause, of somewhere in the range of 20 percent to 50 percent of all cancers. Yet the number of workers' compensation claims for cancer is tiny. A similar impression appears with regard to environmental exposures. There are surely a substantial number of cancers from environmental exposures and for which the offending industry could be identified. Yet a claim for damages for nuisance or negligence in such circumstances is unusual. These examples illustrate that to require "scientific proof" of the affirmative before a claim is allowed would add to what is already a negative tip in the scales of injustice.

Another public policy objection to any requirement of "scientific proof" is that it would further impair the efficiency of a market economy, including fair competition and the optimum allocation of resources. In traditional economic theory, the benefits of a market economy can only be achieved if the externalization of costs is controlled, and every product bears the cost of its own production. This provides an assurance, or at least a hope, that the choices made by consumers will generally represent the public interest. Thus when our present workers' compensation systems began in Ontario in 1914, one of the goals was to internalize the costs of industrial activity, and prevent those costs from being passed on to taxpayers through welfare or in other ways.⁴¹ With regard to actions for damages, they are not an efficient way of

⁴⁰ In most jurisdictions nowadays, lawyers are allowed to act for contingent percentage fees, but they will only do so in a limited range of cases.

⁴¹ See *Meredith Report*, *supra* note 29 at 4, 16; Commissioner Meredith (then Chief

internalizing costs; but when it is feasible for plaintiffs to discharge the burden of proof, such actions can help.

There are some situations, however, in which a lack of “scientific proof” can be relevant in adjudication. One is when there are two admissible medical opinions, one supported by “scientific proof” and a contrary opinion that is not. “Scientific proof” is then a consideration in deciding which opinion is the more cogent.

It can also be relevant whether “objective medical evidence” or “scientific proof” is normally available on the particular issue, and in the circumstances of the case. If it is, and the case is being decided on the adversary system, a failure to adduce such evidence could warrant some questions. When no such evidence is normally available, to deny a claim because no such evidence was adduced in the particular case would displace the obligation to decide according to the balance of probabilities (the best available hypothesis) on the best evidence available, and replace it with a presumption of the negative for no reason except the absence of “scientific proof.”

Problems of “scientific proof” are confused and compounded if the only “scientific proof” available, for the affirmative or the negative, relies on statistics that are not statistically significant in the broader meaning of that term.

When a medical opinion refers to a research project, it is sometimes argued in court that the research report should be weighed by considering peer reviews. Of course, peer review can be a useful form of quality control; but it can also have its limitations. One is that the standard of proof used by a reviewer in judging an article or report may be different from the standard of proof that is relevant in adjudication. Peer reviews can also be a way of suppressing or downgrading independent articles that do not accord with the dominant ideology of the time. There can also be some peer discomfort if an article breaks new ground, disturbing what had been common assumptions in the profession. Conflicts of interest can also be an influence. For example, if an independent research project shows that previously unknown adverse affects are caused by a drug, or by industrial pollution, critical reviews might be expected from some of those who depend financially on the affected industry. Where research for an article

Justice of Ontario) referred to preventing the cost of occupational disabilities and deaths from falling onto “the community.” This public policy objective is also reflected in the some of the workers’ compensation legislation in provisions to reimburse the welfare department out of the compensation payable for any welfare payments that a worker has received since the injury.

was funded, the source of that funding might sometimes be considered more significant than peer reviews. For these reasons, peer reviews should be read cautiously when weighing the output of any research, particularly when high profits are involved.

h) The Position of the Courts

The courts have commonly reacted with common sense to any assertion or assumption that an affirmative conclusion requires “scientific proof” or “objective medical evidence.” There are some basic requirements for any opinion evidence to be admissible. The witness must be qualified to express the opinion. The opinion must be relevant to an issue in the proceeding. The facts on which the opinion is based must generally be within the first-hand knowledge of the witness, or within the expertise of the witness to determine, or be proved by the evidence of another witness who has first-hand knowledge of those facts. For example, if a medical opinion rests, in part, on symptoms described by the patient to the medical witness, and which the witness cannot otherwise verify, the symptoms must generally be proved by the evidence of the patient, or another witness having first-hand knowledge of the symptoms.

As long as the basic requirements for admissibility have been met, any medical opinion is acceptable as expert evidence, regardless of whether it is “objective” or based on “scientific proof.” The quality or strength of an opinion goes to its weight, not to its admissibility. The conclusions of a medical opinion will also be found by the court to have been proved, regardless of “scientific proof,” unless the judge regards those conclusions as lacking any credibility, or they are contradicted by other medical opinion that is judged to have greater weight.

As early as 1774, Lord Mansfield stated that “... all evidence is to be weighed according to the proof which it was in the power of one side to have produced, and in the power of the other to have contradicted.”⁴² That statement was cited with approval in the unanimous decision of the Supreme Court of Canada in *Farrell v. Snell* in 1990.⁴³ The Court also quoted with approval from earlier judgments of other courts. In *Wilsher v. Essex Area Health Authority*,⁴⁴ the earlier House of Lords decision in

⁴² *Blatch v. Archer* (1774), 1 Cowp. 63 at 65, 98 E.R. 969 at 970.

⁴³ [1990] 2 S.C.R. 311 at 328, 72 D.L.R. (4th) 289 [*Farrell* cited to S.C.R.].

⁴⁴ [1988] 2 W.L.R. 557 (H.L.), rev’g [1987] 2 W.L.R. 425 (C.A.) [*Wilsher*] cited in *ibid.*

*McGhee v. National Coal Board*⁴⁵ was explained as “promoting a robust and pragmatic approach to the facts to enable an inference of negligence to be drawn even though medical or scientific expertise cannot arrive at a definitive conclusion.” The Supreme Court in *Farrell* noted that “... although the doctors cannot identify the process of causation scientifically, there seems to be nothing irrational in drawing the inference, as a matter of common sense, that the consecutive periods when brick dust remained on the body contributed cumulatively to the causation of the dermatitis.”⁴⁶

The Court also reaffirmed in *Farrell* that “[c]ausation need not be determined by scientific precision”⁴⁷ and that “[t]he legal or ultimate burden remains with the plaintiff, but in the absence of evidence to the contrary adduced by the defendant, an inference of causation may be drawn although positive or scientific proof of causation has not been adduced.”⁴⁸ Even if no medical opinion at all is in evidence, an inference of causation may be drawn. With respect to the lower court decision in *Farrell*, the Court concluded that “...[the trial judge] failed to appreciate that it is not essential to have a positive medical opinion to support a finding of causation. Furthermore, it is not speculation but the application of common sense to draw such an inference where, as here, the circumstances, other than positive medical opinion, permit.”⁴⁹

These principles evolved in the common law courts for claims decided on the adversary system, with a burden of proof on the plaintiff. *A fortiori*, a medical opinion is not required to be “objective,” or supported by “scientific proof,” to be admissible in a system established to be inquisitorial,⁵⁰ and thereby to relieve a disabled person or dependant of any burden of proof. It would be particularly objectionable to introduce such a requirement in a system, such as workers’ compensation, where one rationale for our present system was to make the admissibility of evidence less restrictive (not more restrictive) than in the courts.

⁴⁵ [1973] 1 W.L.R. 1 (H.L.) [*McGhee*] cited in *ibid.*

⁴⁶ *Supra* note 43 at 325 (citing the passage in *Wilsher* explaining *McGhee*).

⁴⁷ *Ibid.* at 328.

⁴⁸ *Ibid.* at 330.

⁴⁹ *Ibid.* at 336.

⁵⁰ The standard provision in workers’ compensation legislation that the Board shall “enquire into” a claim, as well as “hear and determine” has always been interpreted to mean that the system is inquisitorial. The worker and the employer have statutory duties to report to the Board facts within their knowledge, and the attending physician has a statutory duty to report facts and opinion. Standard forms are used for these purposes. But when these reports are not enough to reach a conclusion, the boards undertake enquiries to obtain such further evidence as may be required. Arguments on law are also raised by staff or members of a board, though they may also be received from the parties.

There have also been court decisions confirming that these principles apply to social security and social insurance systems as well as actions for damages. The courts have taken this view whether the case comes to court by appeal (where there is a statutory right of appeal) or on judicial review. For example, with regard to pensions for disability or death from military service, there have been many tribunal decisions denying claims on the ground that affirmative medical evidence was not supported by “scientific proof”; and those decisions have been set aside by the courts. In *Thériault v. Canada (A.G.)*,⁵¹ for example, the Veterans Review and Appeal Board had rejected an affirmative medical opinion “...primarily because the Board had no knowledge of a higher rate of vascular illness or ‘popliteal entrapment’ among young members of the military than in the general population. The Board also added that the record should have contained studies or statistics to establish such a rate.”⁵²

In other words, the Board had decided that the lack of any relevant epidemiological research warranted a presumption of the negative. Understandably, the Federal Court set aside that decision because “[t]he Board appeared to require a much higher standard of proof than that of the balance of probabilities.”⁵³

Contemporary reports⁵⁴ and case files show that the practice of presuming the negative in the absence of “scientific proof” of the affirmative continues, notwithstanding clarification of its illegality by the courts, and by some of the boards and tribunals.⁵⁵

Similar problems can arise in the medical care coverage of workers’ compensation systems, provincial health care plans, and other government programs. If the coverage of diagnostic testing or treatment is made to depend on “scientific proof” that the test or the treatment is beneficial, there will be an increasing lack of coverage for beneficial tests and treatments.

⁵¹ 2006 FC 1070, 299 F.T.R. 246, 156 A.C.W.S. (3d) 352 (F.C.).

⁵² *Ibid.* at para. 50.

⁵³ *Ibid.* at para. 51.

⁵⁴ See e.g. Northwest Territories, Legislative Assembly, *Minutes of the Standing Committee on Accountability and Oversight*, 15th Leg. 5th sess. (29 June 2006) at 63 (evidence of Colin Baile).

⁵⁵ See e.g. Manitoba, Workers Compensation Board, *The Workers Compensation Act: Legislative Overview 2006*, (WCB Backgrounder) (Winnipeg: Program Development and Review, 2006) at 14, online: The Workers Compensation Board of Manitoba <http://www.wcb.mb.ca/download/about_wcb/WCABackgrounder2006.pdf>.

4. *Wanting to Decide the General Issue*

This heading further explains why a presumption of the negative is commonly adopted in the absence of “scientific proof.” It also explains why adjudicative decisions often involve other illegalities. Medical experts who frequently provide opinions to courts usually understand that their role is to express an opinion on medical questions, and nothing else. Many other medical specialists dislike confining their roles to *medical* advice. They commonly want to decide the general issue, including questions of law, and moral or political questions, as well as medical questions. There are several possible explanations.

a) Medical Education

The phenomenon might begin with the scope of medical education. In legal education, a course on Jurisprudence usually includes a discourse on the nature of law. Other courses, such as Evidence, involve distinguishing questions of law from questions of fact, and which among the facts can usually be determined best with the help of an expert opinion. The corresponding distinctions do not seem to be a part of medical education. Obviously a focus on medical science is in the public interest; but that focus can also limit the perspective. The breadth of a physician’s role, and any preference between advisory or decision-making functions, are more likely to result from individual personality than from medical education.

b) Career Experience

The educational differences are reinforced by subsequent career experience. It is routine for practising lawyers to distinguish questions of law from questions of fact; and among the latter, to distinguish issues that can benefit from expert advice (known as “opinion evidence”). In medical practice, some patients want a medical opinion so that they can make a better informed decision about what to do; but physicians are constantly dealing with people who do not want an exclusive focus on medical advice. Many, perhaps most, patients simply want to be told “what I should do.” Even if a rational decision would require a compromise of medical advice with economic, social or other goals, many patients still want a physician to decide for them what to do. There are also the emergency situations involving an unconscious patient, and no-one else available who is authorized to consent to treatment. Necessity may sometimes require a surgeon or other physician to be the decision-maker, even if there are treatment options, and even if the choice among them may have economic and social consequences.

c) *Absence of Lawyers*

Many adjudicating bodies do not employ lawyers in primary adjudication, and some do not even employ lawyers for appeals; but they may have physicians on staff who play an active role in primary adjudication, as well as on appeals. If the adjudicator is a person with no professional status, and particularly if the adjudicator has been promoted by seniority from clerical staff, the physician may be the only professional person readily to hand. A file may be reviewed by the staff physician because it includes a difficult question, not necessarily a medical question, and the adjudicator may feel bound to defer to the physician. The staff physician then becomes the *de facto* decision-maker on the general issue of entitlement, including questions of law, non-medical fact, and any moral or political questions.

When this happens, the assumptions of law are commonly wrong. For example, some staff physicians reach a negative conclusion for no reason except that the medical evidence of the affirmative is not “objective” or not supported by “scientific proof.” Staff physicians (and “independent medical experts”) also sometimes assume or assert that the eligible cause must be the exclusive cause of the disability or death, not recognising that the law requires only that the eligible cause be a significant – more than *de minimis* – contributing cause of the disability or death for which entitlement is claimed.⁵⁶

This propensity among staff physicians of adjudicating bodies to want to decide the general issue sometimes spills over to external specialists retained to advise in a particular case. They sometimes also want to decide the general issue. A vivid example within my own experience was a

⁵⁶ See e.g. *Athey v. Leonati*, [1996] 3 SCR 458 at 466, 140 D.L.R. (4th) 235 which reaffirms this principle in the context of actions for damages. A unanimous Supreme Court of Canada said that “...a defendant is liable for any injuries caused *or contributed to* by his or her negligence... the presence of other non-tortious contributing causes does not reduce the extent of the defendant’s liability. Loss cannot be apportioned according to the degree of causation where it is created by tortious and non-tortious causes” [emphasis added in published headnote]. See also *Decision No. 1508/04* (2005), 74 W.S.I.A.T.R. 101 at 113-14 (the Workers’ Compensation Appeals Tribunal reaffirmed this principle in the context of workers’ compensation); *Fernyhough v. Nova Scotia (Workers’ Compensation Appeals Tribunal)*, 2000 NSCA 121, 189 N.S.R. (2d) 76 at 81-82 (the Court reaffirmed that the compensable accident need only be a significant contributing cause of the disability or death for which benefits are claimed. It does not need to be a substantial contributing cause. The Court also reaffirmed that “significant” means only more than *de minimis*); see also *Saskatchewan Government Insurance v. Steinhauer*, 2006 SKCA 1, 275 Sask. R. 59 (the same principle applied to accident benefits under motor vehicle insurance).

workers' compensation case in which the worker had a compensable accident causing a violent shake of her head. A few weeks later, she was diagnosed with a detached retina. At the final level of appeal, the Board retained an ophthalmologist to meet with the Commissioners. At the meeting, the facts of the case were stated orally to the ophthalmologist, and several questions asked. The final question was what the ophthalmologist thought were the probabilities that the accident was a significant contributing cause of the retinal detachment that became noticeable a few weeks later. He answered that he thought the probabilities of this being so, or not so, were about even. The ophthalmologist was then thanked for his opinion and shown to the door, but he was reluctant to leave; as if he felt that he had not completed his role. After the door was closed behind him, he reopened it enough to put his head around and said "I would pay her fifty per cent."

5. Conclusion

In the course of a long career, I have read literally hundreds of medical opinions that were provided in the context of controversy or uncertainty about legal entitlement. Almost by definition, the controversial medical questions are those for which no "scientific proof" is available. The most superficial and the most commonly irrelevant "medical" opinions that I have read have been those that rely on statistics of unknown validity, or on the lack of "scientific proof." The most thoughtful and deeply analytical medical opinions that I have read, the most cogent, and commonly the only ones that are legally relevant, are the opinions that made little or no mention of "scientific proof," or of statistics. This article might help to explain why that would be so.