

1-1-1992

The Efficacy of the Tort System and Its Alternatives: A Review of Empirical Evidence

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Citation Information

Dewees, Don and Trebilcock, Michael J.. "The Efficacy of the Tort System and Its Alternatives: A Review of Empirical Evidence." *Osgoode Hall Law Journal* 30.1 (1992) : 57-138.
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Abstract

This paper reviews the existing empirical evidence on the efficacy of the tort system and alternatives to it. The evidence is evaluated against three normative goals: deterrence, corrective justice, and distributive justice. Empirical evidence relating to five major categories of accidents is reviewed: automobile accidents, medical malpractice, product related accidents, environmental injuries, and workplace injuries. In each case, the paper proceeds by reviewing empirical evidence on the deterrence and compensatory properties of the tort system, and then reviews parallel bodies of evidence on regulatory or penal alternatives and on compensatory alternatives to the tort system. The paper concludes that the deterrent properties of the tort system seem strongest with respect to auto accidents and weakest with respect to environmentally related accidents. The incentive effects of the system are mixed in the case of medical malpractice and product related accidents, making net welfare judgments problematic. In the case of workplace accidents, workers' compensation levies appear to have stronger deterrent effects than the tort system did have or might have if resurrected in this context. With respect to an expansive distributive justice perspective, the tort system appears to fail badly in all five areas, with the failure being most severe with respect to environmentally related injuries, product related injuries, and medically induced injuries. With respect to a corrective justice perspective, the tort system appears to perform reasonably well in the automobile accident context, but much less well with respect to medically induced injuries and environmentally related injuries. With respect to product related accidents, its performance is unclear. As to the alternatives to the tort system, regulatory achievements with respect to workplace safety, product related accidents, and medical malpractice appear to have been modest. In environmentally related accidents and, more qualifiedly, traffic related accidents, regulatory policies appear to have registered notable successes, although in some cases generating costs disproportionate to the benefits. As to compensatory alternatives to the tort system, these have so far played a marginal role with respect to medical, product, and environmentally related personal injuries. In the case of traffic related accidents, the empirical evidence suggests that various kinds of no-fault compensation systems can deliver compensatory benefits, at least for pecuniary losses, at lower administrative costs and with greater speed than the tort system. Even with substantial risk rating of premiums or contributions to such schemes, there is still a debate whether a significant loss in deterrence arises from curtailment or abolition of the tort system. With respect to workplace injuries or disabilities, workers' compensation schemes appear to deliver relatively complete compensation for pecuniary losses (except for long term disability) at relatively low administrative costs and more expeditiously than the tort system, as well as achieving significant safety gains. In the case of medically related injuries, experience with programmes in New Zealand and Sweden suggests that no-fault compensation systems are viable alternatives to the tort system. Although they suffer from weak internalization of accident costs to wrongdoers, these no-fault systems hold out the promise of compensating a wider range of victims more expeditiously and at lower administrative cost than the tort system. In the case of product and environmentally related injuries, no general compensatory alternatives to the tort system for personal injuries readily suggest themselves. The paper expresses doubt as to whether a general social insurance alternative to the tort system, covering both injuries and disabilities, with non-risk rated financial contributions and high levels of income coverage, is a feasible alternative to tort law for personal injuries and disabilities at large.

Keywords

Torts

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THE EFFICACY OF THE TORT SYSTEM AND ITS ALTERNATIVES: A REVIEW OF EMPIRICAL EVIDENCE[©]

BY DON DEWEES* AND MICHAEL TREBILCOCK**

This paper reviews the existing empirical evidence on the efficacy of the tort system and alternatives to it. The evidence is evaluated against three normative goals: deterrence, corrective justice, and distributive justice. Empirical evidence relating to five major categories of accidents is reviewed: automobile accidents, medical malpractice, product related accidents, environmental injuries, and workplace injuries. In each case, the paper proceeds by reviewing empirical evidence on the deterrence and compensatory properties of the tort system, and then reviews parallel bodies of evidence on regulatory or penal alternatives and on compensatory alternatives to the tort system.

The paper concludes that the deterrent properties of the tort system seem strongest with respect to auto accidents and weakest with respect to environmentally related accidents. The incentive effects of the system are mixed in the case of medical malpractice and product related accidents, making net welfare judgments problematic. In the case of workplace accidents, workers' compensation levies appear to have stronger deterrent effects than the tort system did have or might have if resurrected in this context. With respect to an expansive distributive justice perspective, the tort system appears to fail badly in all five areas, with the failure being most severe with respect to environmentally related injuries, product related injuries, and medically induced injuries. With respect to a corrective justice perspective, the tort system appears to perform reasonably well in the automobile accident

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** Professor of Law and Director of the Law and Economics Programme, University of Toronto. This paper draws heavily on a much larger study entitled *The Efficacy of the Tort System and its Alternatives: A Review of the Empirical Evidence*, undertaken by the two authors (with David Duff) for the American Law Institute [forthcoming]. Additional funding has been provided by the Social Sciences and Humanities Research Council of Canada. We gratefully acknowledge the research assistance of David Duff, Robert Howse, Paul Collins, Andrew Green, Carolyn Naiman, Susan Burke, Jamie MacArthur, John Ferber, Jamie Hansen, and George Georgopoulos on the larger study.

context, but much less well with respect to medically induced injuries and environmentally related injuries. With respect to product related accidents, its performance is unclear.

As to the alternatives to the tort system, regulatory achievements with respect to workplace safety, product related accidents, and medical malpractice appear to have been modest. In environmentally related accidents and, more qualifiedly, traffic related accidents, regulatory policies appear to have registered notable successes, although in some cases generating costs disproportionate to the benefits.

As to compensatory alternatives to the tort system, these have so far played a marginal role with respect to medical, product, and environmentally related personal injuries. In the case of traffic related accidents, the empirical evidence suggests that various kinds of no-fault compensation systems can deliver compensatory benefits, at least for pecuniary losses, at lower administrative costs and with greater speed than the tort system. Even with substantial risk rating of premiums or contributions to such schemes, there is still a debate whether a significant loss in deterrence arises from curtailment or abolition of the tort system.

With respect to workplace injuries or disabilities, workers' compensation schemes appear to deliver relatively complete compensation for pecuniary losses (except for long term disability) at relatively low administrative costs and more expeditiously than the tort system, as well as achieving significant safety gains.

In the case of medically related injuries, experience with programmes in New Zealand and Sweden suggests that no-fault compensation systems are viable alternatives to the tort system. Although they suffer from weak internalization of accident costs to wrongdoers, these no-fault systems hold out the promise of compensating a wider range of victims more expeditiously and at lower administrative cost than the tort system.

In the case of product and environmentally related injuries, no general compensatory alternatives to the tort system for personal injuries readily suggest themselves. The paper expresses doubt as to whether a general social insurance alternative to the tort system, covering both injuries and disabilities, with non-risk rated financial contributions and high levels of income coverage, is a feasible alternative to tort law for personal injuries and disabilities at large.

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I. THE EVALUATIVE FRAMEWORK

In evaluating the efficacy of the present tort system with respect to personal injuries and alternatives to it, it is obviously necessary to be clear at the outset about the criteria against which they are to be evaluated. Unfortunately, controversy begins with this threshold question. First, there is fundamental disagreement as to the goals that the tort system is designed or can be designed to serve.¹ Second, even where there is agreement on objectives, there is profound uncertainty about what the empirical evidence proves as to how well the tort system

¹ See, for example, M.J. Trebilcock, "The Future of Tort Law: Mapping the Contours of the Debate" (1989) 15 Can. Bus. L.J. 471.

achieves those objectives, or how much better or worse alternative systems are likely to do in promoting those same objectives.

Law and economics scholars, drawing on concepts of economic efficiency, tend to stress the deterrent objectives of the tort system. They evaluate existing legal doctrine or proposed reforms in terms of whether appropriate incentives are created for the various causal contributors to a given personal injury to minimize the sum of accident and avoidance costs by taking cost justified precautions which will reduce the likelihood and severity of that outcome.²

Scholars who adopt a less individualistic, more communitarian perspective on tort law (such as many Critical Legal Studies scholars) view most accidents as the inevitable by-product of the activities (for example, motoring and manufacturing) that an industrialized, interdependent society has collectively decided to embrace. They are sceptical that economic incentives, such as legal internalization of accident costs to least-cost accident avoiders of them, are likely to have a significant impact on risky behaviour. Drawing instead on notions of distributive justice, these scholars stress that accident costs should be borne collectively, not individually, and that the tort system should be evaluated in terms of its capacity to spread risk and provide meaningful, expeditious, and low-cost compensation or insurance to the victims of these activities.³

More classical tort scholars, drawing on Aristotelian and Kantian theories of corrective justice, stress notions of individual responsibility, as do law and economics scholars. However, they view the purpose of tort law, not as deterrence of prospective wrongdoers, but rather as obliging a person whose morally culpable behaviour has violated

² See, for example, S. Shavell, *Economic Analysis of Accident Law* (Cambridge, Mass.: Harvard University Press, 1987); A.M. Polinsky, *An Introduction to Law and Economics*, 2d ed. (Boston: Little, Brown, 1989); R. Cooter & T. Ulen, *Law and Economics* (Glenview, Ill.: Scott, Foresman, 1988) c. 8; and W.M. Landes & R.A. Posner, *The Economic Structure of Tort Law* (Cambridge, Mass.: Harvard University Press, 1987).

³ See, for example, S.D. Sugarman, "Doing Away with Tort Law" (1985) 73 Calif. L. Rev. 558; S.D. Sugarman, *Doing Away with Personal Injury Law* (New York: Quorum Books, 1989); H.J. Glasbeek & R.A. Hasson, "Fault—the Great Hoax" in L. Klar, ed., *Studies in Canadian Tort Law* (Toronto: Butterworths, 1977) 395; T.G. Ison, *The Forensic Lottery* (London: Staples, 1967); R.L. Abel, "The Real Tort Crisis—Too Few Claims" (1987) 68 Ohio St. L.J. 443; A.C. Hutchinson, "Beyond No-Fault" (1985) 73 Calif. L. Rev. 755; and Royal Commission of Inquiry, *Compensation for Personal Injury in New Zealand* (Wellington: A.R. Shearer, Government Printer, December 1967) (Chair: The Honourable Justice A.O. Woodhouse) [hereinafter *Woodhouse Report*].

another's autonomy to restore the latter as nearly as possible to his or her pre-injury status.⁴ In contrast, economists generally regard issues of interpersonal equity as being outside their disciplinary domain.

This summary description of the three major normative perspectives on tort law obscures important differences of viewpoint among scholars and judges who espouse one or the other of these general perspectives, and thus risks misstating the precise implications of each perspective. However, the summary suggests the general lines of empirical enquiry that must be pursued. It is obviously difficult to formulate a coherent tort law reform agenda without resolving these fundamental differences in philosophical perspectives on the tort system. To the extent that these differences rest in part on different empirical assumptions about the actual operation of the present tort system and its alternatives, the following assessment of the existing empirical evidence on the efficacy of the tort system and its alternatives may help bridge the differences.

For all three major goals of the tort system, the performance of the system can be evaluated by examining both inputs and outputs. Our analysis of inputs assumes that, if a particular set of theoretical assumptions is empirically satisfied, then the tort system is likely to realize its stated goal. We focus, then, on whether the assumptions are satisfied by legal doctrines or empirical facts. The analysis of outputs examines performance itself, first identifying what changes the tort system has in fact induced, then judging whether these changes are of a kind or scale that satisfy the stated normative goal.

A. Deterrence

Assuming that one goal of the tort system is to discourage socially undesirable conduct or activities, our analysis proceeds in both of the following ways.

⁴ See, for example, E.J. Weinrib, "Toward a Moral Theory of Negligence Law" (1983) 2 *Law & Phil.* 37; "Liberty, Community, and Corrective Justice" (1988) 1 *Can. J. L. & Jurisprudence* 3; and "Understanding Tort Law" (1989) 23 *Val. U.L. Rev.* 485.

1. Input Evaluation

The deterrence goal is likely to be well served if empirical evidence suggests that most victims of wrongdoing have ready access to the legal system without excessive barriers to suit; that legal standards are certain and well understood by the parties subject to them; and that damage principles confront the defendant with the full social costs of wrongdoing without abandoning incentives.

2. Output Evaluation

To measure deterrence outputs, we look for behavioural changes in care or activity levels among violators and then the effects of such behavioural changes on the injury rates among victims. Obviously, if no significant effects are observable, one can hardly argue that the tort system is an effective instrument of deterrence. The more difficult case is the one in which observed behavioural effects can reasonably be attributed to the tort system; but there are serious questions as to whether they reflect full attainment of optimal deterrence, or perhaps reflect a net reduction in social welfare through excessive deterrence (such as the alleged curtailment of obstetrical services as a response to medical malpractice litigation). Making empirical judgments about how close the real world is to the social optimum, and what contributions the tort system has made to whatever state of optimality or suboptimality is observed, is a highly perilous endeavour. Our judgments on this critically important issue will necessarily be somewhat tentative. This concern is mitigated somewhat when one adds to the ledger our empirical evaluation of the input measures of performance.

B. *Corrective Justice*

1. Input Evaluation

An input evaluation of this goal focuses on many of the same kinds of factors that are relevant to an input evaluation of the deterrence goal: whether victims have ready access to the legal system, whether costs of enforcing rights are excessive, whether legal standards are

certain and well understood by the parties subject to them, and whether damage rules ensure full redress to victims for all consequences of wrongdoing.

2. Output Evaluation

We assess progress towards the corrective justice goal by trying to answer the following questions: (i) What fraction of wrongfully injured accident victims actually receives compensation?; (ii) How frequently are damages awarded to those not wrongfully injured, or against those not wrongfully causing the injury?; and (iii) Is the measure of compensation actually received adequate or excessive?

C. Distributive Justice

1. Input Evaluation

To serve the goals of distributive justice, the desired inputs include: victims with ready access to the legal system; no excessive costs of bringing suit; victims who are well informed as to their rights and the facts giving rise to risks of injury (these factors being common to input evaluations of deterrence and corrective justice); legal standards that impose liability on efficient risk-spreaders, such as large corporate enterprises with "deep pockets"; and damage rules that provide optimal "insurance" or compensation.

2. Output Evaluation

Realization of the goal of distributive justice might be measured through the following questions: (i) What fraction of injured accident victims receives compensation from the tort system?; (ii) Is the measure of compensation actually received adequate or excessive?; and (iii) What administrative costs and delays are entailed in providing compensation to victims?

We believe that the success of the tort system in achieving any of the goals discussed above is likely to differ significantly among substantive areas of law. Among the relevant factors are the certainty of liability

standards, the complexity of causation and scientific issues, the availability and pricing of first and third party insurance coverage (public and private), the sophistication of plaintiffs, the size of defendants and the competitiveness of their economic environment, and the concentrated or dispersed nature of harms.

Regulatory and compensatory alternatives to the tort system will also be evaluated within the same framework that we have applied to the tort system.

In this paper, we examine separately five substantive areas of tort law: traffic accidents, medical malpractice, product related accidents, workplace accidents, and environmental injuries. Each of these areas represents a major source of personal injury claims. Collectively, they cover a wide variety of the conditions that are likely to affect the success of tort law in attaining its goals. For each of the five substantive areas, drawing on a much larger study commissioned by the American Law Institute,⁵ we summarize and interpret the available empirical literature using the input and output modes of analysis described above. We first evaluate the tort system and then regulatory and compensatory alternatives to it, applying a common evaluative framework as outlined above.

II. AUTOMOBILE ACCIDENTS

A. *Deterrence*

With respect to input analysis, economic analysis suggests that the Learned Hand test of liability for negligence can, in theory, induce efficient levels of driving care. On the other hand, since it is virtually impossible to consider driving frequency as a component of the standard of care, a negligence regime does not discourage socially excessive driving activity: each driver's decision on how much to drive need not account for the risk of non-negligent accidents whose costs fall on others.

⁵ D.N. Dewees & M.J. Trebilcock (with D. Duff), *The Efficacy of the Tort System and its Alternatives: A Review of the Empirical Evidence* (Philadelphia: American Law Institute) [forthcoming].

If the tort system is to encourage efficient precautions to avoid automobile accidents, drivers must face the full social cost of all accidents attributable to their failure to exercise adequate care. However, three features of the contemporary law of damages contradict this theoretical ideal and imply that there will be underdeterrence of automobile accidents through the civil liability system: (a) judicially or legislatively imposed caps on pain and suffering damages; (b) collateral source offsets in many jurisdictions; and (c) substantial undercompensation for wrongful death.⁶ With respect to claims initiation, Canadian evidence suggests that a very high percentage of persons injured in motor vehicle accidents who have a valid tort claim make such a claim.⁷ British evidence suggests that a somewhat lower percentage of victims with valid tort claims make such claims—perhaps as few as 75 per cent.⁸ As to claims resolution, it appears that both the settlement and adjudicative system are able to resolve relatively accurately most claims of fault. In one U.S. study of 352 insurance claims, more than 90 per cent of cases involved uncontroversial evidence of fault.⁹ As to the impact of third party liability insurance on safety incentives, insurers in many jurisdictions employ co-payment mechanisms (coverage restrictions, co-insurance percentages, and/or explicit deductibles) and premium rating schemes to ensure rough congruity between expected costs and individual premiums. While any deviation from perfect risk rating is bound to affect the precision of the tort system's deterrent signal, compared to other areas of civil liability, automobile insurance employs features that retain much of tort law's deterrence incentives. Finally, as to driver responsiveness to the incentive effects of the tort system, at least some driving patterns that are significantly correlated with accidents, such as speeding or drunk driving, are likely to be responsive to

⁶ W.K. Viscusi, "Alternative Approaches to Valuing the Health Impacts of Accidents: Liability Law and Prospective Evaluations" (1983) 46:4 *Law & Contemp. Probs.* 49 at 67-68.

⁷ S.A. Rea, "Compensation for Automobile Accident Victims in Ontario: A Simulation" in Ontario, Ministry of the Attorney General and the Ministry of Financial Institutions, *Report of Inquiry into Motor Vehicle Accident Compensation in Ontario*, vol. 2 (Toronto: Queen's Printer, 1988) (Commissioner: Coulter A. Osborne) 336 at 392-93 [hereinafter *Osborne Report*, vol. 2] and Dewees & Trebilcock, *supra*, note 5 at 7.

⁸ D. Harris *et al.*, *Compensation and Support for Illness and Injury* (Oxford: Clarendon Press, 1984) at 72.

⁹ C.J. Bruce, "The Deterrent Effects of Automobile Insurance and Tort Law: A Survey of the Empirical Literature" (1984) 6 *Law & Pol'y* 67 at 69.

the tort system's incentives. This is less clear, though, with respect to momentary acts of inadvertence, where possible tendencies of some individuals to discount low-probability risks may reduce driver responsiveness to the tort system's deterrence signals, at least relative to various penal or regulatory alternatives.

With respect to output analysis of the deterrence effects of the tort system, most of the empirical evidence focuses on the safety effects of moving from a third party tort liability insurance system to some form of first party no-fault compensation system. The U.S. evidence in this context is hopelessly ambiguous: some studies find significant erosion of safety incentives in moving from tort to no-fault,¹⁰ while other studies find no significant relationship between no-fault automobile legislation and the rate of fatal accidents.¹¹ It should be borne in mind, though, that almost all U.S. no-fault programmes retain substantial elements of fault liability, whether the programmes take the form of add-on or threshold no-fault. In contrast, Quebec adopted in 1978 a pure no-fault system, one which precludes all rights of tort action for personal injuries arising out of automobile accidents and which provides a flat-priced schedule of benefits under a state administered compensation scheme. The evidence about this policy move is much less ambiguous.

Two studies have examined the effect of introducing this no-fault scheme on Quebec's rate of motor vehicle accidents. Gaudry found a 7 per cent increase in automobile fatalities (on the order of 100 additional fatalities a year),¹² while Devlin found an even larger increase in fatal accidents (on the order of 150 a year).¹³ Gaudry attributes the bulk of this increase to two factors: the flat rate premium structure adopted under the Quebec scheme, which reduces the cost of motoring for certain high-risk drivers (such as young male drivers), who were previous-

¹⁰ M.H. Medoff & J.P. Magaddino, "An Empirical Analysis of No-Fault Insurance" (1982) 6 *Evaluation Rev.* 373 and E. Landes, "Insurance Liability and Accidents: A Theoretical and Empirical Investigation of the Effect of No-Fault Accidents" (1982) 25 *J.L. & Econ.* 49.

¹¹ P. Zador & A. Lund, "Re-analysis of the Effects of No-Fault Auto Insurance on Fatal Crashes" (1986) 53 *J. Risk & Ins.* 226 and P.S. Kochanowski & M.V. Young, "Deterrent Aspects of No-Fault Automobile Insurance: Some Empirical Findings" (1985) 52 *J. Risk & Ins.* 269.

¹² M. Gaudry, "The Effects on Road Safety of the Compulsory Insurance, Flat Premium Rating and No-Fault Features of the 1978 Quebec Automobile Act" in *Osborne Report*, vol. 2, *supra*, note 7 at 1.

¹³ R.A. Devlin, *Liability Versus No-Fault Automobile Insurance Regimes: An Analysis of the Experience in Quebec* (Ph.D. Thesis, University of Toronto, 1988) [unpublished].

ly priced off the Quebec highways under third party tort liability insurance, and to more stringent enforcement of compulsory insurance requirements, which induced previously uninsured drivers to reduce care levels. Devlin, on the other hand, attributes a substantial part of the increase in fatalities to a reduction in average driving care. Gaudry's research suggests that proper risk rating of first party insurance premiums would take care of the activity level effect to which he largely attributes the increase in fatalities. In Devlin's analysis, even with full risk rating, significant erosion of driving safety incentives would still occur. Australian evidence is broadly consonant with the Quebec experience. McEwen finds that the adoption of comprehensive no-fault schemes was responsible for a 16 per cent annual increase in automobile fatalities.¹⁴

B. *Compensation*

With respect to input analysis, how available is first party insurance for automobile accidents, and what proportion of drivers voluntarily purchase such insurance? Both u.s. and Canadian data suggest that most drivers in both tort and no-fault jurisdictions carry substantial amounts of first party health insurance, but that only a minority of individuals are protected against the risk of income loss from long term disability.¹⁵ Whether this coverage is optimal depends on the likelihood of market failure. For example, on the demand side, is there evidence that drivers have insufficient information about the risks in driving and therefore purchase less than optimal coverage against them? Even if this information is available, do drivers systematically undervalue certain risks, such as low-probability events entailing serious injury if they occur? The psychological evidence suggests that there may be problems of both underestimation and overestimation of such risks.¹⁶

¹⁴ I. McEwen, "No-Fault and Road Accidents: Some Australasian Evidence" (1989) 9 Int'l Rev. L. & Econ. 13.

¹⁵ R. Houchens, *Automobile Accident Compensation, Volume III: Payments from All Sources* (Santa Monica: Institute for Civil Justice, Rand, 1985) at 25 and D. Hensler et al., *Accidents and Injuries in the U.S.: Costs, Compensation, and Claiming Behavior* (Santa Monica: Rand, 1990) at 17.

¹⁶ See D. Kahneman & A. Tversky, "Judgment Under Uncertainty: Heuristics and Biases" (1974) 185 Science 1124. Compare W.K. Viscusi, *Tort Liability and Regulation: The Economic Basis for Assigning Institutional Roles* (Philadelphia: American Law Institute, 1987).

Also, to the extent that accident victims can externalize the cost of their own injuries to others (for example, public health or welfare systems), does this lead to the purchase of socially suboptimal amounts of first party insurance (and attendant moral hazard problems)? Although, strictly speaking, it is not a form of market failure, having limited financial resources may prevent the purchase of voluntary first party insurance by some drivers. It is not clear, however, how this concern is met by compulsory first party insurance. On the supply side, one would need to investigate whether under a voluntary first party insurance system adverse selection problems may inhibit the supply of private voluntary first party insurance to some or all classes of drivers. So far as we know, there is no systematic evidence available on these issues.

Where inadequate coverage is provided through voluntary first party insurance, tort law can be viewed from a distributive justice perspective as a form of mandatory insurance system. From this perspective, one would first need to inquire whether eligibility criteria and benefit levels provided through the tort system reflect sound insurance principles. The notion of *ex ante* moral hazard may be able to justify restricted or reduced compensation under rules of contributory or comparative negligence. However, an expansive distributive justice perspective cannot sustain current tort principles that compensate only those automobile injuries that are attributable to the negligence of a third party with sufficient assets or liability insurance to reimburse the losses caused. Nor can it excuse the traditional "guest passenger" rule, still existing in some U.S. states, that bars guest passengers (either completely or unless gross negligence is established) from recovering from host drivers.¹⁷

On the other hand, fault-based liability is broadly consistent with the corrective justice principle that only wrongfully injured victims should be entitled to recovery from wrongdoers through the tort system. However, from a corrective justice perspective, a distinct judicial expansion of the negligence concept in the automobile context and legislative provisions reversing the onus of proof in automobile accident claims and making owners of insured vehicles vicariously liable for the negligence of anyone driving with their permission indicate a pervasive tendency of compensatory goals to steer negligence doctrine away from traditional

¹⁷ J.K. Hammitt, *Automobile Accident Compensation, Volume II: Payments by Auto Insurers* (Santa Monica: Institute for Civil Justice, Rand, 1985) at 7.

notions of fault. Conversely, the incidence of uninsured and underinsured drivers, particularly in U.S. states in which liability insurance is either optional or compulsory at relatively low minimum policy limits, implies that, despite the expanded reach of liability rules, many wrongly inflicted injuries will remain "uncorrected" or "undercorrected" through the tort system.

Turning to the issue of benefit levels, the tort system contradicts sound insurance principles in three respects. First, even though transaction costs suggest that rational individuals would self-insure against small losses and purchase first party insurance against relatively large losses, tort law pays damages for all losses regardless of how trivial they may be. Second, to the extent that the tort system provides recovery for non-economic losses, the law and economics literature raises serious questions as to whether parties would rationally buy coverage for these forms of losses.¹⁸ Finally, whereas optimal insurance requires the rationalization of all sources of coverage to minimize premium costs and thus prevent unnecessary overinsurance, the collateral source rule frustrates this result by prohibiting the deduction from tort awards of indemnity payments otherwise receivable.

The tort process of claims disposition is even more problematic on compensatory grounds. Insurance principles would emphasize the importance of prompt remuneration to address immediate medical needs, to respond to sudden disruptions to employment income and household services, and to initiate immediate steps toward physical and vocational rehabilitation. However, the tort method of lump sum payments by parties who are adverse in interest to the victim implies considerable delay in initiating a flow of compensation to meet pecuniary losses as they accrue. Furthermore, this result is also inconsistent with insurance principles to the extent that inadequate liability coverage and the process of claims settlement frequently result in payments that are considerably less than full economic losses, especially the larger, more serious losses. Finally, from an insurance perspective one needs to know whether the third party tort liability insurance system entails administrative costs that exceed the overhead in public or private first

¹⁸ See, for example, S.A. Rea, "Non-Pecuniary Loss and Breach of Contract" (1982) 11 J. Legal Stud. 35 and G.L. Priest, "The Current Insurance Crisis and Modern Tort Law" (1987) 95 Yale L.J. 1421 at 1546-47.

party regimes. As we note below, significant administrative cost savings seem to be realizable under no-fault first party compensation systems.

With respect to output analysis of the compensation effects of the tort system, a series of U.S. and Canadian studies conducted in the 1960s found that fewer than 50 per cent of individuals injured in traffic accidents, including those seriously injured on the road, received any compensation at all from the tort system.¹⁹ Even though doctrinal and insurance reform during the intervening decades have made the fault system "more compensatory" in orientation,²⁰ recent U.S. evidence suggests that between a third and a half of claimants under first party no-fault systems would not qualify under a third party tort insurance system, either because there was no other negligent driver or because their own negligence barred recovery.²¹ When compensation from all sources is considered, the compensation gap between no-fault and third party tort insurance regimes significantly narrows, but does not disappear.²² Of the remaining 50 to 70 per cent of injured victims with valid tort claims, a further percentage is undoubtedly unable to recover fully from judgment-proof defendants. Although we have found no systematic evidence on the extent of this phenomenon, it has been reported that between 8 and 11 per cent of U.S. motorists are uninsured,²³ and this rate reportedly rises to more than 20 per cent in several states,²⁴ and to almost 70 per cent in urban areas like Detroit and Los Angeles.²⁵ Output analysis of benefits paid through the tort system reveals the operation of liability and quantum rules, as well as the effects

¹⁹ Ontario Law Reform Commission, *Report on Motor Vehicle Accident Compensation* (Toronto: Ministry of the Attorney General, 1973) at 51 (Table 5) and U.S. Department of Transportation, *Compensating Auto Accident Victims: A Follow-up Report on No-Fault Auto Insurance Experiences* (Washington: Office of the Secretary of Transportation, 1985) at 73-74.

²⁰ U.S. Department of Transportation, *ibid.* at 74 n. 11.

²¹ J. Rolph, *Automobile Accident Compensation, Volume I: Who Pays How Much How Soon?* (Santa Monica: Institute for Civil Justice, Rand, 1985) at 17 and Hammitt, *supra*, note 17 at 48.

²² Houchens, *supra*, note 15.

²³ U.S. Department of Transportation, *supra*, note 19 at 76.

²⁴ Hammitt, *supra*, note 17 at 19.

²⁵ Ontario, Ministry of the Attorney General and the Ministry of Financial Institutions, *Report of Inquiry into Motor Vehicle Accident Compensation in Ontario*, vol. 1 (Toronto: Queen's Printer, 1988) (Commissioner: Coulter A. Osborne) at 480 [hereinafter *Osborne Report*, vol. 1] and G.T. Schwartz, "A Proposal for Tort Reform: Reformulating Uninsured Motorist Plans" (1987) 48 Ohio St. L.J. 419 at 424.

of the claims settlement process and inadequate liability coverage. A recent U.S. study concludes that between 2 and 10 per cent of negligent paid claimants receive incomplete compensation for economic losses on account of their own negligence.²⁶ Although no more than 30 per cent of negligent paid claimants in any state surveyed received special damages less than their economic loss, there is a marked relationship between comparative negligence and both a reduced likelihood of, and a lower quantum of, general damages.²⁷ This suggests that total settlements are regularly reduced on account of claimant fault, even if this fact is not explicitly reflected in listed amounts for special damages.

Consistent with the tort principle of full recovery for all losses, paid claims surveys also reveal the extent to which tort suits are dominated by relatively minor injuries with small economic losses, and by payments for non-pecuniary losses. According to a recent survey in Ontario, the vast majority of paid claims involved nominal injuries (victim "shaken up") or injury to soft tissue.²⁸ Of the mere 50 per cent of those claimants who suffered measurable work time loss, almost 45 per cent lost four weeks or less, and only 19 per cent experienced time loss of more than six months.²⁹ In total, 46 per cent of all liability payments were for non-pecuniary damages and a further 5 per cent for family law actions for loss of care, guidance, and companionship.³⁰ Recent U.S. data confirm this pattern, indicating that over 60 per cent of automobile liability payments relate to non-pecuniary damages.³¹

Canadian and U.S. data also confirm the extent to which the collateral source rule promotes wasteful overinsurance and double recovery. According to a recent Ontario study, when all sources of compensation were considered, the roughly 30 per cent of claimants with collateral benefits in addition to compulsory no-fault benefits (deducted from tort awards) received compensation for loss of employment income equal to almost 136 per cent of their gross lost wages.³² In the United

²⁶ Hammitt, *supra*, note 17 at 29.

²⁷ *Ibid.* at 30 and 39-40.

²⁸ *Osborne Report*, vol. 2, *supra*, note 7 at 548-49 (Question 24).

²⁹ *Ibid.* at 551 (Question 28).

³⁰ *Osborne Report*, vol. 1, *supra*, note 25 at 258 (Figure 7.7).

³¹ Hammitt, *supra*, note 17 at 32.

³² *Osborne Report*, vol. 1, *supra*, note 25 at 430-31.

States, nearly 20 per cent of motor vehicle victims surveyed reported recovery from more than one source; many of these individuals were paid twice their economic loss or more.³³ Almost half of those with private health insurance failed to submit claims, mainly because they had already been compensated from another source.³⁴

Notwithstanding overcompensation of some claimants, when all sources are taken into account, empirical evidence also reveals a consistent tendency of the tort system to undercompensate victims with large economic losses.³⁵ Insufficient liability coverage appears to be a significant factor here. Although recent U.S. data concludes that policy limits prevent no more than 0.5 per cent of claimants from recovering their full economic losses, this figure rises to 5 per cent in a low-minimum policy limit state like Massachusetts.³⁶ Moreover, those whose damages are limited in this manner are disproportionately the small minority of accident victims suffering severe or catastrophic injuries. On average, these claimants have economic losses of almost \$18,000 and obtain payments \$10,000 smaller than their losses.³⁷

As to the timeliness of compensation, U.S. and Canadian studies disclose considerable delays in the payment of third party benefits, particularly to claimants with serious injuries involving higher pecuniary losses and a greater likelihood of litigation and attorney involvement.³⁸ In contrast, first party insurance plans display a marked ability to initiate a stream of payments to accident victims much more quickly than the third party tort liability insurance system.³⁹ The experience in Quebec, where a pure no-fault scheme was introduced in 1978, is summarized in Table 1.

³³ Houchens, *supra*, note 15 at 5 and 31-32.

³⁴ *Ibid.* at 27.

³⁵ See, for example, R.L. Bombaugh, "The Department of Transportation's Auto Insurance Study and Auto Accident Compensation Reform" (1971) 71 Colum. L. Rev. 207 at 213; Ontario Law Reform Commission, *supra*, note 19 at 51 (Table 4); and S. Carroll *et al.*, *No-Fault Approaches to Compensating People Injured in Automobile Accidents* (Santa Monica: Rand, 1991).

³⁶ Hammitt, *supra*, note 17 at 29-30.

³⁷ *Ibid.* at 29.

³⁸ Ontario Law Reform Commission, *supra*, note 19 at 56-63; U.S. Department of Transportation, *supra*, note 19 at 70; and Hammitt, *supra*, note 17 at 54.

³⁹ *Osborne Report*, vol. 2, *supra*, note 7 at 546 (Questions 18C and 22) and 569 (Question 18); U.S. Department of Transportation, *ibid.* at 79; and Carroll *et al.*, *supra*, note 35.

Table 1
Percentage of Victims Compensated by Month (Quebec)⁴⁰

<i>Duration</i>	<i>Tort System</i>	<i>No-Fault</i>
Less Than One Month	5%	32%
Less Than Two Months	12%	70%
Less Than Three Months	18%	84%
Less Than Six Months	35%	96%
More Than Six Months	65%	4%

No-fault schemes also exhibit a comparative advantage over the tort system with respect to administrative costs. Comparing an average net payout ratio of 50.2 cents on the dollar in threshold no-fault states to the figure of 43.2 cents in traditional tort states, the U.S. Department of Transportation concludes that "a no-fault system is 16.2 per cent more efficient than a traditional system, with respect to returning money paid as premiums to victims in the form of benefits or damages."⁴¹ Studies of the Quebec pure no-fault system suggest that there may be cost savings in the range of 10 to 24 per cent of earned premiums in such a system,⁴² although other estimates put the savings at a much lower figure (5 per cent).⁴³

⁴⁰ Devlin, *supra*, note 13 at 74. Since tort delay is based on the duration between the accident and settlement, and no-fault delay measures the time between claim filing and first payment, this comparison exaggerates the difference between the two systems. Nevertheless, since only about 10 per cent of tort claimants obtain advance payments before final settlement and there is little reason to delay filing claims under the Quebec scheme, any exaggeration is probably slight.

⁴¹ U.S. Department of Transportation, *supra*, note 19 at 83.

⁴² Devlin, *supra*, note 13 at 249-57.

⁴³ *Osborne Report*, vol. 1, *supra*, note 25 at 528. For U.S. evidence, see Carroll *et al.*, *supra*, note 35.

C. Penal and Regulatory Alternatives to the Tort System⁴⁴

Almost 50,000 Americans and over 4000 Canadians die in traffic related accidents every year. Many times that number sustain personal injuries and property damage. The private and social costs of traffic accidents are enormous. While aggregate traffic fatalities rose fairly consistently over time in most industrialized countries since the introduction of the automobile, they peaked in the U.S. and Canada in the mid-1970s and have since been consistently declining. Moreover, fatality rates, measured in terms of distances driven, have consistently and dramatically declined over time in the U.S. and other industrialized countries.

Most of the effort to control traffic accidents historically has been concentrated on changing driver behaviour. Police surveillance and prosecution have dominated control strategies. However, beginning in the late 1950s, attention has no longer focused exclusively on drivers' care levels and prevention of crashes. Traffic safety experts and eventually policy makers began to realize that the damage sustained in crashes could be reduced by other forms of regulation that focused on the external environment, such as motor vehicle and highway design.⁴⁵

This epidemiological perspective has, in turn, been challenged by "risk compensation" theorists,⁴⁶ who argue that regulatory reductions in expected accident costs may induce adaptive behaviour by drivers who will consume safety gains as performance benefits by increasing risks on unconstrained margins.

While a vast amount of public resources and court time continue to be directed to the prosecution of traffic offenses, there is surprisingly little firm evidence as to the effects of criminal sanctions on the traffic accident rate. Several studies that have examined the effects of police

⁴⁴ The following review is largely derived from M.L. Friedland, M.J. Trebilcock & K. Roach, *Regulating Traffic Safety* (Toronto: University of Toronto Press, 1990). See also L. Evans, *Traffic Safety and the Driver* (New York: Van Nostrand Reinhold, 1991).

⁴⁵ See W. Haddon, "A Logical Framework for Categorizing Safety Phenomenon and Activity" (1971) 12 *J. Trauma* 193 and W. Haddon & S. Baker, "Injury Control" in D. Clark & B. MacMahon, eds, *Preventive and Community Medicine*, 2d ed. (Boston: Little, Brown, 1981).

⁴⁶ See, for example, S. Peltzman, "The Effects of Automobile Safety Regulation" (1975) 83 *J. Pol. Econ.* 677 and J.G.U. Adams, *Risk and Freedom: The Record of Road Safety Regulation* (London: Transport Publicity Projects, 1985).

slow-downs as a result of labour disputes, or differential enforcement levels from one location to another, have tended to find no immediate measurable impact on the frequency or severity of traffic accidents.⁴⁷ More systematic evidence on the long term effects of changes in sanctions or enforcement policy has tended to focus on seat-belt use, speeding, and drunk driving.

With respect to seat-belt legislation, mandatory seat-belt laws, even with low levels of enforcement and relatively trivial penalties, appear to increase use rates dramatically. Moreover, increased seat-belt usage appears to reduce significantly the injury rate, and the safety gains do not appear to be offset by adaptive driver responses.⁴⁸ The experience with respect to the enforcement of speed limits is somewhat more mixed than with respect to the enforcement of seat-belt laws. The effects of police surveillance appear to be quickly dissipated once it is withdrawn.⁴⁹ Moreover, police surveillance efforts are often, because of ease of enforcement, directed at "fishing holes" where violators are easily apprehended, but where speeds in excess of legal limits often do not pose serious safety hazards. The empirical evidence suggests that variance in speed is more important than absolute speed in causing accidents. A number of studies have found that the greater the absolute deviation from mean traffic speed, the higher the accident rate.⁵⁰ This suggests that speed limits should not be set so low as to encourage massive violations and higher variance in speed, and that enforcement activity and severity of sanctions should be targeted at drivers who are guilty of substantial deviations from mean traffic speeds, even though this may pose greater enforcement difficulty. With respect to drunk

⁴⁷ See, for example, A.F. Carr, J.F. Schnelle & R.E. Kirchner, "Police Crackdowns and Slowdowns: A Naturalistic Evaluation of Changes in Police Traffic Enforcement" (1980) 2 Behavioral Assessment 33; and J.A. Gardiner, *Traffic and the Police: Variations in Law Enforcement Policy* (Cambridge, Mass.: Harvard University Press, 1969).

⁴⁸ B.A. Jonah & J.J. Lawson, "The Effectiveness of the Canadian Mandatory Seat Belt Use Laws" (1984) 16 Accident Analysis & Prevention 433 and Organization for Economic Co-operation and Development, *Road Safety Research: A Synthesis* (Paris: O.E.C.D., 1986).

⁴⁹ U.S. National Research Council, Committee for the Study of the Benefits and Costs of the 55 m.p.h. National Maximum Speed Limit, 55: *A Decade of Experience* (Washington, D.C.: U.S. Transportation Research Board, 1984) (Chair: A. Altshuler).

⁵⁰ U.S. Department of Transportation, *Synthesis of Safety Research Related to Traffic Control and Roadway Elements* (Washington, D.C.: Office of the Secretary of Transportation, 1982) at 17-2 and 17-6.

driving, the evidence of the efficacy of criminal sanctions is also somewhat mixed. Spot-check programmes of the kind that have become prevalent in many jurisdictions appear to have a largely transitory effect on driver behaviour.⁵¹ However, year-round massive breath testing of the driving population accompanied by extensive publicity campaigns designed to emphasize the certainty and severity of punishment (as has been introduced in the Australian state of New South Wales)⁵² does appear to have a significant impact on both the incidence of drunk driving and the underlying accident rate.

Licensing regimes have now become a major adjunct to criminal sanctions in controlling drivers' care and activity levels. The empirical evidence tends to show that raising the driving⁵³ and drinking⁵⁴ age has a significant effect on accident rates, as do graduated licensing regimes,⁵⁵ especially for young drivers, who are heavily overrepresented in the accident statistics.

With respect to motor vehicle safety design, early evidence was controversial and contested. It now appears to be clear that, on balance, safety design standards have substantially reduced fatality and injury

⁵¹ H.L. Ross, *Detering the Drinking Driver: Legal Policy and Social Control* (Toronto: Lexington Books, 1984).

⁵² I. Kearns *et al.*, "An Overview of the Random Breath Testing Trial in New South Wales" in P. Noordzij & R. Roszbach, eds, *Alcohol, Drugs and Traffic Safety—T86* (Amsterdam: Excerpta Medica, 1987) 429.

⁵³ A. Williams *et al.*, "Variations in Minimum Licensing Age and Fatal Motor Vehicle Crashes" (1983) 73 *Am. J. Pub. Health* 1401.

⁵⁴ M. DuMouchel *et al.*, "Raising the Alcohol Purchase Age: Its Effects on Fatal Motor Vehicle Crashes in Twenty-Six States" (1987) 16 *J. Legal Stud.* 249 and H. Saffer & M. Grossman, "Beer Taxes, the Legal Drinking Age and Youth Motor Vehicle Fatalities" (1987) 16 *J. Legal Stud.* 351. Compare M. Males, "The Minimum Purchase Age for Alcohol and Young Driver Fatal Crashes: A Long Term View" (1986) 15 *J. Legal Stud.* 181.

⁵⁵ Conditions may be attached to the exercise of the license over the first several years of licensing, for example, night-time and weekend curfews, driving only with adults and without teenagers, license suspensions may be triggered by lower blood-alcohol levels than apply to adults or by the commission of other moving violations that might not trigger license suspensions in other cases. See D.R. Mayhew & H.M. Simpson, *Graduated Licensing: State of Knowledge and Current Practices* (Ottawa: Traffic Injury Research Foundation, 1984).

rates with benefits exceeding costs, except on the most pessimistic estimates of costs and benefits.⁵⁶

With respect to highway safety design improvements, there seems to be considerable potential for safety gains from such improvements, but identification of problem locations and choice of design countermeasure to date has typically been quite unsystematic, and little is confidently known about relative cost-benefit payoffs from alternative highway design measures.⁵⁷

With respect to post-accident injury care, the empirical evidence seems to suggest significant potential health gains from improved trauma systems⁵⁸ and improved long term rehabilitation programmes.⁵⁹ However, in the nature of things, such programmes can only ameliorate the status of a very small subset of traffic injury victims.

Because of the resources devoted both to directly reducing the toll on the highways and to researching its causes, one might have assumed that the effects of these various interventions are well understood. In fact, there is little consensus on what works and what does not work. In particular, we do not have robust empirical findings that suggest where the greatest payoff lies on the marginal dollar devoted to traffic safety. This is the central policy issue that traffic safety research has barely begun to confront. Without a more robust empirical consensus on this issue, it is not possible at this time to dismiss the effects of the tort system as irrelevant to the traffic safety calculus.

D. *Compensatory Alternatives to the Tort System*

Although automobile no-fault compensation schemes differ significantly from one jurisdiction to the next, first party no-fault insurance for automobile injuries typically compensates the pecuniary

⁵⁶ R.W. Crandall *et al.*, *Regulating the Automobile* (Washington D.C.: Brookings Institute, 1986); J.D. Graham, *Auto Safety: Assessing America's Performance* (Dover, Mass.: Auburn House, 1989); and J.L. Mashaw & D.L. Harfst, *The Struggle for Auto Safety* (Cambridge, Mass.: Belknap Press, 1990).

⁵⁷ See J.F. Carney, ed., *Effectiveness of Highway Improvements* (New York: American Society of Civil Engineering, 1986).

⁵⁸ D.D. Trunkey, "Trauma" (1983) 249 *Scientific American* 28.

⁵⁹ U.S. Department of Transportation, *supra*, note 19 at 107-12.

losses of more traffic victims more promptly and at lower administrative cost than tort/third party liability arrangements.

Compared to other no-fault plans, add-on schemes that provide first party no-fault benefits in addition to tort entitlements return a relatively high proportion of the automobile injury premium dollar to traffic victims, but entail considerably higher coverage costs. Consequently, add-on no-fault benefits are typically quite modest and fail to diminish significantly primary reliance on tort compensation for automobile injuries.⁶⁰ In turn, add-on schemes tend to manifest the same compensatory deficiencies found in the tort system. On the other hand, except where no-fault payments are deducted from tort awards, they preserve whatever deterrence and corrective justice qualities are associated with tort actions for automobile injuries.

Threshold schemes that eliminate tort claims below some loss or injury severity threshold are more diverse in the level of no-fault benefits available and in the extent to which they reduce tort actions for automobile injuries. However, they seem best able to provide generous benefits at acceptable administrative and premium costs where high verbal or monetary thresholds exclude a substantial percentage of no-fault claimants from pursuing a tort claim. Most problematic is why, except for purely political reasons,⁶¹ these schemes allow tort actions where damages exceed stipulated thresholds. Although it is arguable that non-pecuniary compensation is warranted for permanently and seriously disabled or disfigured accident victims who suffer a large loss of enjoyment of life,⁶² it is not clear why these benefits should be channelled through the tort system and made contingent upon fault, instead of included as part of the no-fault package, as in Quebec. Further, it is questionable whether serious injuries *per se* especially engage deterrence or corrective justice rationales for tort liability, since such injuries may be caused by minor inadvertence on the part of the injurer rather than egregious misconduct.⁶³

⁶⁰ Ontario Law Reform Commission, *supra*, note 19 and D. Caldwell, "No-Fault Automobile Insurance: An Evaluative Survey" (1977) 30 Rutgers L. Rev. 909.

⁶¹ *Osborne Report*, vol. I, *supra*, note 25 at 326.

⁶² *Ibid.* at 468.

⁶³ M.J. Trebilcock, "Incentive Issues in the Design of 'No-Fault' Compensation Systems" (1989) 39 U.T.L.J. 19 at 47.

Pure no-fault schemes appear to score highest with respect to the speed and adequacy of no-fault payments (at least for pecuniary losses), reduced administrative costs, and low overall automobile injury insurance costs; but they are least impressive in terms of corrective justice and deterrence considerations. Finally, although elective schemes have the virtue of permitting motorists to choose the compensation regime in which they will participate,⁶⁴ they risk severe adverse selection problems which, over time, are likely to turn them into *de facto* pure no-fault schemes.⁶⁵

III. MEDICAL MALPRACTICE

A. Deterrence

Let us consider first the key input factors. Liability in the medical malpractice context is determined by reference to standards of customary practice rather than a direct cost-benefit calculus. Whether the customary practice standard is socially optimal is debatable. On the one hand, information asymmetries and provider self-interest suggest that customary standards might well fall beneath the optimal level. On the other hand, extensive health insurance coverage implies that customary practice may lead to unduly high levels of medical care, since patients may externalize to health insurers some or all of the costs of additional precautions employed. As to damage rules, just as was true of automobile accidents, there are three reasons for supposing that the amount of awards may lead to underdeterrence: (a) caps on non-pecuniary damages; (b) collateral benefit offsets in a number of jurisdictions; and (c) undercompensation for wrongful death. As to claims initiation, the U.S. evidence is that the ratio of malpractice claims to negligent medical injuries is still only one to eight (one to sixteen for paid claims), and a substantial proportion of the claims are brought by

⁶⁴ J. O'Connell & R.H. Joost, "Giving Motorists a Choice Between Fault and No-Fault Insurance" (1986) 72 Va. L. Rev. 61.

⁶⁵ J.L. Carr, "Giving Motorists a Choice Between Fault and No-Fault Insurance: An Economic Critique" (1989) 26 San Diego L. Rev. 1087.

patients who were *not* negligently injured.⁶⁶ As to the incentive effects of liability insurance, unlike automobile liability insurance, explicit co-payment mechanisms and/or experience rating are virtually non-existent in the medical liability insurance context, as opposed to rating by region and specialty category.

Turning now to output analysis, it is useful to consider first the impact of civil liability on patterns of medical practice and then the likely relationship between these intermediate responses and the ultimate medical injury rate. As to the impact of the liability system on care levels of individuals, two econometric studies in the U.S. have found statistically significant correlations between increases in malpractice premium levels (using this as a proxy for the risk of malpractice suit) and the frequency of physician use of specific diagnostic procedures.⁶⁷ Second, several U.S. and Canadian surveys of physicians have recorded changes in practice patterns that respondent physicians ascribed to the threat of malpractice liability.⁶⁸ In addition to increased record keeping and communication with patients and other health care professionals, a substantial percentage of doctors attribute increased diagnostic testing (such as amniocentesis and electronic fetal monitoring) and specific treatment procedures (such as caesarian sections) to the liability threat. However, these surveys also reveal that practice patterns are strongly shaped by patient demand and professional considerations. Third, three empirical studies have attempted to trace how a significant change in a

⁶⁶ Report of the Harvard Medical Practice Study to the State of New York, *Patients, Doctors, and Lawyers: Medical Injury, Malpractice Litigation, and Patient Compensation in New York* (Cambridge, Mass: Harvard University, 1990) c. 7 [mimeo] [hereinafter *Harvard Study*].

⁶⁷ B. Greenwald & M. Mueller, "Medical Malpractice and Medical Costs" in S. Rottenberg, ed., *The Economics of Medical Malpractice* (Washington, D.C.: American Enterprise Institute for Public Policy Research, 1978) 65 and R.A. Reynolds, J.A. Rizzo & M.L. Gonzalez, "The Cost of Medical Professional Liability" (1987) 257 *J.A.M.A.* 2776.

⁶⁸ See, for example, *Liability and Compensation in Health Care* (App. B: vol. 2) (Toronto: University of Toronto Press, 1990) (Chair: J.R.S. Prichard), especially the following submissions in c. 4: F. Sellers, "Report on the Survey of the Impact of Medical/Legal Liability on Patterns of Practice"; W. Hannah et al., "Submission of Working Group on Obstetrics and Gynaecology"; C.A. Woodward & W. Rosser, "The Impact of Medical/Legal Liability on Patterns of General and Family Practice in Canada"; and M.M. Cohen, J. Wade & P.G. Duncan, "The Effect of Liability on the Provision of Anesthetic Care." See also *Professional Liability and Effects* (Washington, D.C.: American College of Obstetricians and Gynaecologists, 1988); *Harvard Study, supra*, note 66, c. 9; and B. Dickens, "The Effects of Legal Liability on Physicians' Services" (1991) 41 *U.T.L.J.* 168.

particular rule has affected physician behaviour.⁶⁹ At least two of the studies—one expanding the scope of informed consent in Canada⁷⁰ and the other expanding the obligations of mental health care professionals regarding potentially violent psychiatric patients⁷¹—found a significant impact on subsequent physician practice.

With respect to the impact of civil liability on the activity levels of physicians, liability concerns may cause practitioners to curtail or discontinue high risk practice areas. A number of U.S. and Canadian physician surveys report this result, particularly among obstetricians, gynaecologists, certified nurse-midwives, and among general practitioners and family physicians who previously performed obstetrical and prenatal care, anesthesiology, or emergency room services.⁷² As with changes in practice patterns, though, other factors such as lifestyle and family considerations are reported as major reasons for changes in practice scope. It is difficult, then, to isolate the marginal impact of malpractice liability alone. Concerns about suit may also encourage physicians to move from highly litigious regions to areas with lower claims frequency and lower malpractice premiums. However, recent empirical studies have found little relationship between the malpractice environment and physicians' location decisions.⁷³ Third, the choice of new entrants into the profession might be affected by liability considerations. According to one recent U.S. survey, for example, the percentage of fourth year medical students selecting obstetrical residen-

⁶⁹ J. Wiley, "The Impact of Judicial Decisions on Professional Conduct: An Empirical Study" (1981) 55 S. Cal. L. Rev. 345; G.B. Robertson, "Informed Consent in Canada: An Empirical Study" (1984) 22 Osgoode Hall L.J. 139; D.J. Givelber, W.J. Bowers & C.L. Blitch, "Tarasoff, Myth & Reality: An Empirical Study of Private Law in Action" (1984) Wis. L. Rev. 443; and G. Robertson, "Informed Consent Ten Years Later: The Impact of *Reibl v. Hughes*" (1991) 70 Can. Bar Rev. 423.

⁷⁰ Robertson, *ibid.*

⁷¹ Givelber, Bowers & Blitch, *supra*, note 69.

⁷² See, for example, S.C. Charles, C.E. Pyskoty & A. Nelson, "Physicians on Trial—Self-Reported Reactions to Malpractice Trials" (1988) 148 West J. Med. 358; D. Lewis-Idema, "Medical Professional Liability and Access to Obstetrical Care: Is There a Crisis?" in Institute of Medicine, Committee to Study Medical Professional Liability and Delivery of Obstetrical Care, Division of Health Promotion and Disease Prevention, *Medical Professional Liability and the Delivery of Obstetrical Care*, vol. II (Washington, D.C.: National Academy Press, 1989) (Chair: R.J. Bulger) 78 [hereinafter *Medical Professional Liability*]; Hannah *et al.*, *supra*, note 68; Woodward & Rosser, *supra*, note 68; and Cohen, Wade & Duncan, *supra*, note 68.

⁷³ G. Burghardt, "Medical Malpractice and the Supply of Physicians" in *The Economics of Medical Malpractice*, *supra*, note 67, 103 at 119 and Greenwald & Mueller, *supra*, note 67 at 73.

cy fell from nine in 1984 to seven in 1987.⁷⁴ However, these data are not particularly refined or robust.

The evidence concerning the impact of practice changes on the ultimate medical injury rate is quite fragmentary and inconclusive. Although commentators suggest that increased record keeping leads to better medical care, no studies strongly support this view. It is also questionable whether fuller communication to patients of treatment risks and alternatives has any ultimate impact on the medical injury rate, although patient demand for such disclosure indicates that many patients find this a benefit in its own right. The marginal gains from liability induced diagnostic and treatment procedures are also uncertain. Recent evidence casts doubt on the utility of electronic fetal monitoring, amniocentesis, caesarian sections, and certain other technologically sophisticated procedures, suggesting even that these are sometimes harmful to patients.⁷⁵ To the extent, then, that tort liability has induced more use of these procedures, it is not at all clear that doing so has reduced the injury rate. The relationship between liability induced activity changes and the trends in medical injuries is even harder to assess. To the extent that liability fears cause some physicians to curtail or discontinue high-risk practice settings, some commentators welcome more litigation on the grounds that it may discourage excessive use of expensive and invasive procedures.⁷⁶ Similarly, to the extent that quality of care is inversely related to physician age and directly related to physician training and specialization, early retirement or restrictions on the scope of general family practice may reduce the injury rate. On the other hand, some reported activity level responses to the threat of liability may reduce patient access to care, especially in rural areas or among the poor. In that event, a difficult social calculus must be faced: deciding whether patients are really better off with less ready access to more specialized practitioners, as compared to readier access to physicians with a somewhat more disparate range of expertise.

Notwithstanding these ambiguities in the evidence on the deterrent effects of the medical malpractice system, a recent

⁷⁴ Cited in B.P. Sachs, "Is the Rising Rate Cesarean Sections a Result of More Defensive Medicine?" in *Medical Professional Liability*, *supra*, note 72, 27 at 36-37.

⁷⁵ *Ibid.* at 75-82.

⁷⁶ See, for example, R.H. Brook, R.L. Brutoco & K.N. Williams, "The Relationship Between Medical Malpractice and Quality of Care" [1975] *Duke L.J.* 1197 at 1211.

econometric analysis undertaken by the Harvard Medical Practice Study Group, focusing on widely varying rates of claims per negligent adverse event across the New York State hospital system, yielded this estimate: the elasticity of negligent injuries to tort litigation implies that for every 10 per cent increase in malpractice claims, there will be a 4 per cent reduction in negligent injuries.⁷⁷ Set against this result is the fact that Canadian doctors are one-fifth as likely to be sued for malpractice as are U.S. doctors, and Canadian malpractice premiums are one-tenth those in the U.S.; yet there appears to be no evidence that Canadian physicians are more careless than their U.S. counterparts.⁷⁸

These somewhat speculative gains from malpractice liability in reducing the medical injury rate must, of course, be compared to the costs of such liability. The best U.S. estimates of the total cost of specifically liability related practices yield an estimate of nearly \$11 billion annually.⁷⁹ Moreover, this estimate does not include the transaction costs of the tort system, the foregone income and the emotional trauma sustained by physicians involved in malpractice claims, and the public cost of providing the court system. Danzon has estimated that for the costs of the tort system to be justified, as a first approximation, there would have to be one medical accident (of equal severity) avoided for every one compensated by the tort system—a ratio which the Harvard data fall well below.⁸⁰

B. *Compensation*

Just as was true of first party voluntary automobile insurance, there is some reason to suppose that patients, left to their own devices, may purchase less than optimal insurance. Limited economic resources may induce poorer patients to prefer the risk of uncertain future losses

⁷⁷ P.C. Weiler & T.A. Brennan, *Medical Injuries and Malpractice Litigation: Findings of the Harvard Medical Practice Study*, (September, 1990) at 103 [mimeo] [unpublished].

⁷⁸ D.N. Dewees, M.J. Trebilcock & P.C. Coyte, "The Medical Malpractice Crisis: A Comparative Empirical Perspective" (1991) 54:1 *Law & Contemp. Probs.* 217.

⁷⁹ Reynolds, Rizzo & Gonzalez, *supra*, note 67 at 2778. This estimate is in 1984 dollars and includes direct premium costs and the additional expenditures on liability induced physician procedures.

⁸⁰ P.M. Danzon, "Medical Malpractice Liability" in R.E. Litan & C. Winston, eds, *Liability Perspectives and Policy* (Washington, D.C.: Brookings Institute, 1988) 101 at 117-18.

to the certain cost of present premiums. Because individuals do not always bear the full cost of the accidents they experience, they may decline to purchase the socially optimal level of private insurance. To the extent that patients have inadequate information about the risks of medical treatment or undervalue low-probability risks of serious injury, inadequate insurance may also be purchased. Finally, to the extent that insurers find it difficult to segregate risk pools, incomplete insurance coverage may arise from imperfect information on the supply side of the market.⁸¹ Given these factors, civil liability is viewed by many as a means of ensuring some protection for those who would otherwise be without compensation in the event of a disabling medical injury.

Examination of the existing medical malpractice system, however, casts doubt on this system's efficacy as a scheme of compulsory insurance, let alone as a source of any hoped for wealth redistribution. Three features of the contemporary law of damages suggest that the existing malpractice system pays considerably higher benefits than those suggested by optimal insurance analysis. First, although the problem of moral hazard typically requires benefits at somewhat less than full recovery, the general principle of tort damages requires full recovery. Second, although economic analysis challenges the wisdom of insuring against non-pecuniary losses, current damages law provides for recovery for pain and suffering. Third, whereas optimal insurance would avoid wasteful duplication by compensating only losses not already covered by other sources, traditional tort law prohibits deducting from the award benefits received from collateral sources. Viewed from a more expansive distributive justice perspective, the eligibility criteria of the malpractice system leave it woefully inadequate as a compulsory insurance scheme, with only a tiny fraction of iatrogenic injuries—injuries attributable to medical care—leading to tort recovery of any amount.⁸²

Turning to an analysis of outputs, of all negligently injured patients, only about 13 per cent are estimated to initiate a claim for medical malpractice; of those who do seek tort compensation, only about 50 per cent are successful. Considering the empirical evidence that only 27 per cent of all medical injuries involve provider negligence,

⁸¹ For example, one estimate suggests that only 20 per cent of the employed U.S. labour force is privately insured against the risk of general long term disability. See P.M. Danzon, "Tort Reform and the Role of Government in Private Insurance Markets" (1984) 13 *J. Legal Stud.* 517 at 523.

⁸² See *Harvard Study*, *supra*, note 66.

these figures suggest that less than 2 per cent of injured patients receive compensation through the tort system.⁸³

Moreover, the procedural arrangements for malpractice compensation have two further consequences that undermine the insurance function of the tort system. First, tort compensation is notoriously slow compared to administrative compensation. While benefits are usually forthcoming two weeks after a legitimate unemployment payment is filed, three weeks after an uncontested workers' compensation claim, and four months in the case of a contested workers' compensation claim, recent U.S. data on the disposition of medical malpractice claims reveal an average duration between injury and claims disposition of roughly three years.⁸⁴ In the case of claims involving serious permanent disability and the largest dollar amounts, four year delays are common.

Second, the combined effects of delayed compensation, difficulties of proof, litigation costs, and the often pressing needs of injured plaintiffs produce settlements of claims at sums significantly less than the amount that in principle should have been payable for the injury. In one study of malpractice claims, for example, Danzon reports that settlements averaged 74 per cent of the amount that would likely have been awarded at trial.⁸⁵ According to a more recent U.S. survey of over 18,000 paid malpractice claims, aggregate indemnity payments totalled only 33 per cent of the aggregate economic losses associated with the claims.⁸⁶ As is true of automobile accident claims, shortfalls in compensation of economic losses increase markedly with the size and severity of the claim. The reason is that the settlement process operates in a regressive manner by placing the greatest pressure to settle on those with the fewest resources and the most severe injuries.

As to administrative costs, Weiler estimates that the existing U.S. malpractice system spends roughly 55 to 60 cents to deliver between 40

⁸³ *Ibid.*

⁸⁴ U.S. General Accounting Office, *Medical Malpractice: Characteristics of Claims Closed in 1984* (Washington, D.C.: General Accounting Office, April 1987) at 32-35 [hereinafter *GAO Claims Study*].

⁸⁵ P.M. Danzon & L.A. Lillard, "Settlement-Out-Of-Court: The Disposition of Medical Malpractice Claims" (1983) 12 *J. Legal Stud.* 345 at 346.

⁸⁶ Calculated from the *GAO Claims Study*, *supra*, note 84 at 44-45. Of course, some of this shortfall may reflect weakness in the merits of the plaintiff's case.

and 45 cents into the hands of injured patients.⁸⁷ In contrast, benefits paid account for roughly 95 per cent of federal social security costs. And to the extent that the costs of the civil liability/malpractice insurance system are passed on to patients through medical fees, all patients pay the same implicit insurance premium regardless of their income, although benefits depend in major part on income related pecuniary losses. The result is that low-income patients are required to subsidize the protection given to high-income patients.

Finally, though the formal features of the medical malpractice law comport better with corrective than with distributive justice, the fact remains that only a very small percentage of negligently injured patients even initiate claims, let alone obtain compensation.

C. *Regulatory Alternatives to the Tort System*

Over 80 per cent of all u.s. medical malpractice claims closed in 1984 involved an injury arising in a hospital setting.⁸⁸ Recent Canadian data confirm the centrality of the hospital setting with respect to malpractice claims, finding that over 90 per cent of all large claims (accounting for over half of total payouts) arose out of incidents in hospital settings.⁸⁹ Two large scale and independent studies of hospital records—one undertaken in California in the mid-1970s⁹⁰ and the recent Harvard Medical Practice Study of New York hospitals⁹¹—yield closely similar findings, indicating that approximately 4 per cent of all hospitalizations result in adverse events from medical treatment (iatrogenic injuries) and one quarter of these incidents involve substandard care. The Harvard Study extrapolates New York's adverse event related death total to the u.s. population as a whole and estimates

⁸⁷ P.C. Weiler, *Medical Malpractice on Trial* (Cambridge, Mass.: Harvard University Press, 1991) at 139.

⁸⁸ *GAO Claims Study*, *supra*, note 84 at 24-25.

⁸⁹ D.N. Dewees, P.C. Coyte & M.J. Trebilcock, "Canadian Medical Malpractice Liability: An Empirical Analysis of Recent Trends" in *Liability and Compensation in Health Care* (App. B: vol. 1) (Toronto: University of Toronto, 1990) (Chair: J.R.S. Prichard) c. 3.

⁹⁰ D.H. Mills, "Medical Insurance Feasibility Study—A Technical Summary" (1978) 128 *West J. Med.* 360.

⁹¹ *Harvard Study*, *supra*, note 66.

that there may be 150,000 iatrogenic fatalities annually, over half of these deaths being due to negligence. Medical injury thus exceeds the mortality rate associated with motor vehicle accidents (about 50,000 per death) and occupationally related mishaps (6,000 per year).⁹² As data cited above indicate, the tort system in practice addresses only a tiny fraction of the iatrogenic injury phenomenon and a very small fraction of negligently caused medically adverse events. Do other quality control regimes more effectively address this phenomenon?

With respect to individual physicians, the principal quality control mechanism traditionally has been licensing regimes and correlative disciplinary sanctions operated by state medical boards. However, in terms of input analysis, there are reasons for *a priori* scepticism as to how well licensing and discipline regimes are likely to operate as quality control mechanisms.⁹³ First of all, there is little incentive for patients to report cases of negligence or incompetence to such boards. Indeed, a 1976 New York survey asking people where they would file a complaint against a physician found that not one respondent mentioned the Medical Licensing Board.⁹⁴ The linkage between malpractice claims (even paid claims) and the licensing discipline regimes is virtually non-existent, and collegial norms seem strongly to discourage reporting by fellow physicians of cases of negligence or incompetence by other physicians. Despite various estimates that between 2 per cent and 10 per cent of all U.S. physicians are unscrupulous, unethical, delinquent, or incompetent,⁹⁵ a 1971 U.S. Department of Health, Education and Welfare report commented that "disciplinary action by Medical Boards is almost insignificant in terms of the universe of practising physicians," adding that "data indicate a tendency towards leniency even in the relatively few cases that result in

⁹² Weiler & Brennan, *supra*, note 77 at 28.

⁹³ See M.J. Trebilcock, "Regulating Service Quality in Professional Markets" in D.N. Dewees, ed., *The Regulation of Quality: Products, Services, Workplaces, and the Environment* (Toronto: Butterworths, 1983) 92 [hereinafter *The Regulation of Quality*] and A. Donabedian, "Evaluating the Quality of Medical Care" (1966) 44:3 *Milbank Mem. Fund Q.* 166.

⁹⁴ S. Law & S. Polan, *Pain and Profit: The Politics of Malpractice* (New York: Harper & Row, 1978) at 44-45.

⁹⁵ R. C. Derbyshire, "How Effective is Medical Self-Regulation?" (1983) 7 *Law & Hum. Behav.* 193 at 195; D.B. Hogan, "The Effectiveness of Licensing: History, Evidence, and Recommendations" (1983) 7 *Law & Hum. Behav.* 117 at 124; and P. Williams, "Abandoning Medical Malpractice" (1984) 5 *J. Legal Med.* 549 at 573.

formal board sanction."⁹⁶ In the ten years between 1969 and 1978, only 3,623 actions were launched by American state medical boards, an average of only 362 each year.⁹⁷ While this number had increased to 569 by 1981, this still represented only 0.14 per cent of all licensed physicians in the United States. Furthermore, in 1981, state medical boards took no action in 15 states comprising a total physician population of 34,300.⁹⁸ Although the Federation of State Medical Boards reported a 37 per cent increase (from 1,540 to 2,108) in disciplinary actions against physicians between 1984 and 1985, the latter figure still represented only 0.38 per cent of the nation's 552,716 licensed physicians at the time.⁹⁹ Moreover, disciplinary action is not generally related to competence, but to other aspects of professional ethics. Most disciplinary actions involve drug related offenses, criminal charges, sexual impropriety, or abetting unlicensed persons to practice medicine.¹⁰⁰ Between 1970 and 1975, only eight physicians in the U.S. were disciplined for incompetence.¹⁰¹ Of disciplinary actions taken in 1985, roughly half were related to improper prescription of drugs, and a physician's personal drug or alcohol abuse accounted for roughly 25 per cent of the total.¹⁰²

Moreover, according to Gaumer,¹⁰³ initial licensure criteria are heavily based on considerations other than practice performance, namely on a test of student performance; that is, the standard of competence is the assimilation of the concepts and scientific content of the educational programme. Performance in the treatment of clients is not part of the screening protocol. In the medical context, considerable research suggests that academic grades are useful only for predicting

⁹⁶ U.S. Department of Health, Education and Welfare, *Report on Licensure and Related Health Personnel Credentialing* (Washington, D.C.: U.S. Government Printing Office, 1971), cited in Hogan, *ibid.* at 124.

⁹⁷ Derbyshire, *supra*, note 95 at 197.

⁹⁸ *Ibid.*

⁹⁹ U.S. General Accounting Office, *Medical Malpractice: A Framework for Action* (Washington, D.C.: General Accounting Office, 1987) at 13 [hereinafter *Medical Malpractice*].

¹⁰⁰ Law & Polan, *supra*, note 94 at 33.

¹⁰¹ *Ibid.* at 34.

¹⁰² W. Gellhorn, "Medical Malpractice Litigation (U.S.)—Medical Mishap Compensation (N.Z.)" (1988) 73 Cornell L. Rev. 170 at 181.

¹⁰³ G.L. Gaumer, "Regulating Health Professionals: A Review of the Empirical Literature" (1984) 62 Milbank Mem. Fund Q. 380 at 397.

future grades or results on tests similar to those used in establishing the grades. One study comparing the practices of a group of 500 physicians to performance in formal education disclosed a relationship of almost complete independence.¹⁰⁴ Roughly a quarter of all medical boards do not believe that they adequately screen out inept practitioners.¹⁰⁵ In addition, licensure requirements may often have adverse effects on both the cost and quality of health care. Often licensure requirements impose explicit limits on numbers of aides and prohibit the performance of certain tasks by non-licensees. Sox, for example, reports that nurse practitioners and other mid-level personnel can competently perform many services currently restricted to physicians.¹⁰⁶ Lave and Lave estimate that 80 per cent of pediatric practice could be carried out by personnel with considerably less training than specialized physicians.¹⁰⁷ Indeed, by increasing health care costs and encouraging malutilization of hospital personnel, particularly para-professionals, some licensing requirements may actually decrease the overall health status of the population.¹⁰⁸

Given rapid advances in medical knowledge and techniques, mandatory continuing medical education (CME) in recent years has often been imposed as a condition of license retention. However, a number of studies of the efficacy of CME find little or no effect on practice conduct or on quality of patient care.¹⁰⁹ Gaumer concludes that "the only demonstrably reliable way to monitor continued competence and remedy deficiencies is through the use of 'output monitoring' and corresponding deficiency-oriented training."¹¹⁰ To this end, the emergence of Quality Assurance Programmes, often promoted by third

¹⁰⁴ P.B. Price *et al.*, "Measurement of Physician Performance" (1964) 39 J. Med. Ed. 203.

¹⁰⁵ W.H. Dornette, "Role of the Healing Arts Licensing Board in the Current Medical Malpractice Crisis" (1976) 4 J. Legal Med. 9.

¹⁰⁶ H.C. Sox, Jr., "Quality of Patient Care by Nurse Practitioners and Physician's Assistants: A Ten-Year Perspective" (1979) 91 Annals Internal Med. 459.

¹⁰⁷ J.R. Lave & L.B. Lave, "Medical Care and its Delivery: An Economic Appraisal" (1970) 35 Law & Contemp. Probs. 252.

¹⁰⁸ Gaumer, *supra*, note 103 at 384.

¹⁰⁹ See *ibid.* at 399; C. Brown & H. Uhl, "Mandatory Continuing Education—Sense or Nonsense?" (1970) 312 J.A.M.A. 1660; and J. Williamson, M. Alexander & G. Miller, "Continuing Education and Patient Care Research" (1976) 201 J.A.M.A. 118.

¹¹⁰ Gaumer, *supra*, note 103 at 407.

party insurers, which focus on regulation of specific practices to ensure individual compliance with predetermined standards seem more effective in reducing substandard care.¹¹¹ Identification of physicians falling below acceptable minimum standards requires reliance on systems of peer review, practice audits, utilization reviews, tissue and death reviews, and incident reports; remedial measures involve education targeted to specifically identified problems.¹¹²

Hospital accreditation programmes that accord hospital privileges to individual physicians provide another potential check on quality of care, although little is known about how rigorously accreditation procedures are applied. Given the centrality of hospital-based incidents in the medical malpractice data, there is reason for scepticism as to how well accreditation regimes operate as a screening device. More recently, partly in response to the expansion of civil liability and partly in response to regulatory requirements enacted by state legislatures to this effect, many hospitals have adopted extensive risk management programmes. These programmes integrate systems for the identification of unexpected outcomes and risks, centralize data on all such identified risks, and result in communication of this information to other clinical and administrative departments and to quality assurance and credentials committees. They also involve the organization of educational programmes to minimize the risk of harm to patients; the development of specific programmes tailored to particular institutions to address high risk clinical areas; and the review of remedial action by a facilities risk manager charged with the task of implementing, co-ordinating, and effectuating the risk management programme.¹¹³ Along similar lines, a number of jurisdictions now require accreditation of hospitals themselves (in addition to individual practitioners with hospital privileges). Alternatively, institutional accreditation is required as a condition of participation in Medicare and Medicaid programmes. Institutional accreditation requires satisfaction of pre-established physical, technical, and personnel standards. The enactment of the U.S.

¹¹¹ Donabedian, *supra*, note 93.

¹¹² M.R. Chassin & S.M. McCue, "A Randomized Trial of Medical Quality Assurance: Improving Physicians' Use of Pelvimetry" (1986) 256 J.A.M.A. 1012.

¹¹³ *Medical Malpractice*, *supra*, note 99 at 17.

Health Care Quality Improvement Act of 1986,¹¹⁴ which *inter alia* creates a national data bank to house information acquired through mandatory reporting by insurance companies and by hospitals, state licensing boards, peer review organizations, and other bodies granting privileges or imposing duties on physicians holds out some promise for more systematic quality review both at the individual physician and institutional levels.

D. *Compensatory Alternatives to the Tort System*

In the past decade, two fault-based alternatives to the current tort system have been proposed as means of compensating more victims of medical injuries more rapidly, more efficiently, and more equitably: neo-no-fault, first outlined in a number of articles by tort scholar Jeffrey O'Connell,¹¹⁵ and administrative fault, most recently proposed by a joint project of the American Medical Association and over thirty U.S. medical specialty societies.¹¹⁶

Established either contractually or by statute, a neo-no-fault scheme for medical injuries would empower health care providers to compel or encourage injured patients to settle their claims at an amount equal to their net economic losses (including attorneys' fees), provided that this sum is offered to the victim within 180 days of the patient's discharge from a medical facility or from the occurrence of the event giving rise to a possible malpractice claim. If no such offer is tendered, the victim retains the right to bring a civil action under existing rules of malpractice liability. As inducements to make such offers, O'Connell suggests a ceiling on compensation for wage loss and a right for defendants who make such offers to name third parties who may be liable as participating tortfeasors. As penalties to discourage providers from failing to offer neo-no-fault compensation, O'Connell proposes

¹¹⁴ 42 U.S.C.S. § 11101 *nt.* (Law. Co-op. 1989).

¹¹⁵ See, for example, W. Moore & J. O'Connell, "Foreclosing Medical Malpractice Claims by Prompt Tender of Economic Loss" (1984) 44 *Loy. L. Rev.* 1267 and J. O'Connell, "Neo-No-Fault Remedies for Medical Injuries: Co-ordinated Statutory and Contractual Alternatives" (1986) 49:2 *Law & Contemp. Probs.* 125 [hereinafter "Neo-No-Fault Remedies"].

¹¹⁶ American Medical Association/Specialty Society Medical Liability Project, *A Proposed Alternative to the Civil Justice System for Resolving Medical Liability Disputes: A Fault-Based Administrative System* (Washington, D.C.: American Medical Association, 1988).

that defendants who fail to make such an offer would lose any defence based on the patient's contributory fault, face a reverse onus of proof once the claimant establishes a *prima facie* case for liability, and be liable for successful claimants' court and counsel costs.

The recent American Medical Association/Specialty Society proposal envisages amendments to the medical malpractice system in the areas of eligibility for compensation, benefits paid, and most importantly claims disposition. With respect to eligibility, administrative fault proposes minor revisions to tort doctrines regarding the standard of care required of a health provider and proof of a causal connection between the defendant's negligence and the patient's injuries. It would also eliminate the tort rule of joint and several liability, limiting defendants' liability solely to the extent of their responsibility. With respect to benefits, administrative fault would cap or eliminate recovery for non-pecuniary losses and provide generous compensation for net economic losses, deducting any payments from collateral sources. Administrative fault would also replace civil litigation by a process of expedited claims disposition conducted by experienced and expert adjudicators employed by specialized medical boards.

By discouraging extensive litigation over compensation for medical injuries, both neo-no-fault and administrative fault schemes hold out the promise of reducing the enormous delays and administrative costs associated with tort compensation for medical injuries. However, fault concepts remain central to both schemes, and neither scheme increases eligibility for compensation much beyond the 17 to 27 per cent of medical injuries estimated to be caused by provider negligence.

In addition to fault-based approaches to compensation of medical injuries, the past two decades have also witnessed the emergence of several schemes of no-fault compensation for patients injured in the course of medical treatment. Comprehensive no-fault plans, covering virtually all medical injuries, have been proposed in a number of academic and legislative forums and were enacted in New Zealand in 1974, Sweden in 1975, and Finland in 1987. Designated Compensable Event (DCE) schemes compensate only specifically listed medical injuries, optimally defined in terms of time and space rather than medical causation *per se*. Although most proposals contemplate a relatively extensive schedule of such events, existing DCE schemes are highly context specific, compensating victims of vaccine and drug related

injuries or infants suffering so-called birth related neurological injury (BRNI). Finally, elective no-fault schemes, involving either a comprehensive definition or a detailed specification of compensable injuries, enable providers and/or patients to select a tort or no-fault option for injury compensation.

The central challenge confronting no-fault schemes is the definition of a compensable event. Unlike fault-based regimes which limit compensation to medical injuries caused by substandard care, comprehensive no-fault expands eligibility to all iatrogenic injuries. Thus, with no-fault workers' compensation plans, the central test would appear to be whether the injury in question arose out of and in the course of medical treatment. However, as both theoretical analysis¹¹⁷ and practical experience in New Zealand, Sweden, and Finland make clear, the concept of iatrogenicity is by no means straightforward. First, it is not sufficient that the patient's disability be caused by medical intervention. In addition, it must be the unintended or unexpected result of such treatment. Since many procedures entail adverse consequences as a means of treating the patient's underlying condition, no-fault compensation for purely *medical* injuries must exclude these cases in order not to become a general insurance scheme for disability, however caused. Second, iatrogenicity need not involve active medical intervention, but may also occur where a disability is caused or aggravated by a *failure* to prevent or minimize the patient's condition at a stage when it was medically possible to do so. On the other hand, if diagnosis is medically impossible until the condition is virtually untreatable, the outcome is properly attributable to the underlying condition rather than medical cause. Finally, because medical science is often probabilistic in nature, and since iatrogenicity is typically only one element in a complex causal chain leading to the patient's disability, both the definition and proof of a compensable event involve difficult issues of probabilistic and proportional causation. As a result, many proposals for comprehensive no-fault patient compensation plans specifically limit eligibility to cases where medical care is both a probable cause of the adverse outcome and a significant or material cause of the resulting disability.

The New Zealand, Swedish, and Finnish no-fault plans attempt to address these problems of causation and attribution in different ways,

¹¹⁷ See Weiler, *supra*, note 87 at 139-44 and *Harvard Study*, *supra*, note 66 at 2-14—2-15 and 5-9—5-16.

although each scheme holds out the promise of increasing significantly the number of injured patients eligible for compensation beyond the 17 to 27 per cent of all medical injuries compensable under purely fault-based criteria. Indeed, the empirical experience under the New Zealand¹¹⁸ and Swedish¹¹⁹ plans is that there has been a significant increase in the number of successful claimants relative to the previous tort system, although the evidence discloses that only about 60 to 65 per cent of claimants under both plans actually succeed in establishing entitlements. This evidence is consistent with the Harvard Medical Study's findings that issues of causation, while sometimes difficult, present fewer difficulties than judgments over fault.¹²⁰

In order to help finance the expansion of eligibility to virtually all medical injuries, comprehensive no-fault schemes typically limit or eliminate benefits for non-pecuniary losses, restrict compensation for income losses to a fixed percentage of pre-disability earnings up to a stated maximum, confine payments to relatively large losses by means of a medical expense or time loss deductible, and preclude double recovery either by compensating only losses not already covered by collateral sources or by establishing a right of subrogation or reimbursement by collateral insurers for benefits paid. Both the New Zealand and Swedish schemes appear to involve much more modest financing costs than the U.S. medical malpractice system, as well as dramatically lower administrative costs.

Designated Compensable Event schemes, depending upon how ambitious they are, raise many of the same conceptual issues as comprehensive no-fault schemes. Elective no-fault schemes entail either contractual agreement between patients and health care providers as to the compensation regime, a statutory provider election scheme that binds patients to the options elected by the health care provider, or patient election schemes which allow the patient to select the preferred system of compensation either before receiving treatment or after the

¹¹⁸ See Gellhorn, *supra*, note 102 and O. Woodhouse, "The New Zealand Experience" in M. Halley *et al.*, eds, *Medical Malpractice Solutions: Systems and Proposals for Injury Compensation* (Springfield, Ill.: Charles C. Thomas, 1989) 171.

¹¹⁹ C. Oldertz, "The Swedish Patient Insurance System—Eight Years of Experience" (1984) 52 *Med. Legal. J.* 43; C. Oldertz, "Security Insurance, Patient Insurance, and Pharmaceutical Insurance in Sweden" (1986) 34 *Am. J. Comp. L.* 635; and J. Hellner, "Compensation for Personal Injury: The Swedish Alternative" (1986) 34 *Am. J. Comp. L.* 613.

¹²⁰ Weiler & Brennan, *supra*, note 77 at 40-43.

occurrence of an injury. Elective schemes are typically favoured on the ground that they facilitate individual choice in the selection of compensation regimes under which one will be governed.¹²¹ However, in the medical context especially, this choice raises some serious difficulties. First, since the market for medical services entails serious information asymmetries between patients and health care providers, the former may be seriously disadvantaged in efforts to obtain a fair and efficient no-fault alternative by private contract. Second, wherever individuals are given the option of selecting a liability regime to which they will be subject, the possibility of adverse selection poses serious risks as to the long term viability of the elective arrangement.

In the U.S. context, the Harvard Medical Study estimates that a comprehensive no-fault patient compensation scheme that compensates only net economic losses (after deducting available benefits from collateral sources) and with a six month deductible, would entail patient payouts in the state of New York of 894 million dollars in 1984. This compares favourably to the roughly one billion dollars in malpractice premiums paid in the state in 1988.¹²² Thus, solely in terms of costs, some form of comprehensive no-fault compensation scheme seems a viable alternative in the U.S. However, on the compensation side, it would raise serious controversies as to the appropriateness of abolition of claims for non-pecuniary losses, and, on the deterrence side, it would raise serious controversies as to what might be lost in terms of deterrent effects with respect to suboptimal care from the curtailment or abrogation of the tort system.

IV. PRODUCT RELATED ACCIDENTS

A. *Deterrence*

With respect to deterrence, input evaluation suggests that the choice of liability rule does not matter if one assumes perfect information and zero transaction costs.¹²³ However, in circumstances in

¹²¹ See "Neo-No-Fault Remedies," *supra*, note 115; Weiler & Brennan, *ibid.* at 108; and Sellers, *supra*, note 68 at 28-31.

¹²² *Harvard Study*, *supra*, note 66 at 11-5—11-8.

¹²³ See, for example, Shavell, *supra*, note 2.

which consumers underestimate product related accident risks, strict liability enjoys an advantage over a negligence regime: the price of the product will incorporate the costs of non-negligently caused accidents, thereby producing a socially efficient demand and supply of the product. On the other hand, strict liability exerts less control over intensity of consumer use of a product than does a negligence regime. Thus, to the extent that non-negligently caused accidents are a function of intensity of use, negligence enjoys this advantage over strict liability.¹²⁴

In choosing between the two regimes, much turns on the extent to which, empirically, consumers systematically underestimate product risks. On this question, Schwartz and Wilde argue that, if errors as to risk are random and unbiased, producers will treat each consumer as if he or she correctly perceives the risk. They argue that, if there is a bias in risk misperception, it more likely reflects excessive consumer pessimism about the risks of using a product, although there is some evidence of systematic undervaluation by consumers of low-probability serious injuries.¹²⁵ Beyond these psychological generalizations, much depends on the particular product context.

Input analysis also requires that suppliers who are held liable under the operative liability regime confront the full social costs of product defects, including non-pecuniary losses. To the extent that some jurisdictions have adopted reforms that constrain awards for non-pecuniary losses or require collateral source offsets and given general undercompensation for fatal accidents, underdeterrence is likely.

Apart from the choice of appropriate liability and quantum rules, input analysis also focuses on the effect of insurance on injury avoidance measures. Traditionally, product liability insurance premiums took little account of individual risk-creating characteristics. However, there has been considerable movement in the last decade away from market insurance and toward self-insurance, and within market insurance toward higher deductibles, higher co-insurance, and more extensive coverage exclusions. This trend suggests that existing liability insurance

¹²⁴ *Ibid.*

¹²⁵ See A. Schwartz & L.L. Wilde, "Imperfect Information in Markets for Contract Terms: The Examples of Warranties and Security Interests" (1983) 69 Va. L. Rev. 1387 and A. Schwartz, "Proposals for Products Liability Reform: A Theoretical Synthesis" (1988) 97 Yale L.J. 353.

arrangements may not seriously mute the incentive effects of the tort system.

Finally, input analysis is concerned with the likelihood of enforcement of a valid claim. Efficient deterrence requires that all meritorious claims be brought. Evidence on this question is again fragmentary. For example, the U.S. Consumer Product Safety Commission found that of 6.7 million consumers injured while using products, fewer than 3 per cent filed claims.¹²⁶ It is impossible to tell from this statistic, though, how many meritorious claims (that is, claims with respect to "defective" products) were not initiated.

With respect to output analysis of deterrence, it has been argued that the emergence of modern strict product liability in the U.S., with associated increases in insurance costs and reductions in insurance availability, has resulted in a decrease in the level of socially beneficial innovations, a reduction in availability of socially beneficial products and services, and consumer substitution towards more dangerous products.¹²⁷ This argument rests primarily on anecdotal evidence.

Huber, for example, cites instances of less innovation in several industries. He notes that research expenditures on contraceptives peaked in 1973, then fell by 90 per cent over the next decade.¹²⁸ Also, he notes, the clinical tests for a new contraceptive (Norplant) were stalled for over a year because of a lack of liability insurance, although the product was already available in five other countries. He claims, as well, that the number of vaccine manufacturers fell by half between 1965 and 1985, and that by 1986 only two companies were undertaking major research into vaccines.¹²⁹ These and other disaggregated statistics are the only empirical data on which Huber bases his thesis that strict product liability has led to less innovation.

¹²⁶ See J.G. Fleming, *The Law of Torts*, 5th ed. (Sydney: Law Book, 1977) at 212.

¹²⁷ P.W. Huber, *Liability: The Legal Revolution and Its Consequences* (New York: Basic Books, 1988).

¹²⁸ See also L. Mastroianni, P. Donaldson & T. Kane, eds, *Developing New Contraceptives: Obstacles and Opportunities* (Washington, D.C.: National Academy Press, 1990).

¹²⁹ See also U.S. Institute of Medicine, Committee on Public-Private Sector Relations in Vaccine Innovation, *Vaccine Supply and Innovation* (Washington D.C.: National Academy Press, 1985) (Chair: J.P. Sanford) at 118-119.

Estimates by Viscusi and Moore link product liability costs with various measures of innovation.¹³⁰ With firms with significant product patents, the average ratio of product liability insurance premiums to firm sales is 5 per cent greater than with firms without such patents. In the case of process patents, however, the reverse is true, as firms in industries without process patents have a 15 per cent higher product liability cost rate. Firms that introduce new products also have a higher product liability burden. Thus, the two aspects of innovation most directly related to product liability suits—product patents and new product introductions—both indicate somewhat higher product liability costs for innovators.

Huber also argues that the expansion of strict product liability has been responsible for preventing the introduction and causing the removal of socially beneficial products from the market. In support of his argument, Huber cites a number of examples, such as the swine flu vaccine, small airplane production, and Botulinum (a paralytic poison used to control eye twitching). In a number of these cases, however, it is not clear whether the withdrawal of a product was or was not socially desirable.

A complex mix of effects is also reflected in the results of a Conference Board survey in 1988 that found, for example, that liability costs led to the discontinuation of product lines (36 per cent of all respondents), decisions against introducing new products (30 per cent), and discontinuation of product research (21 per cent).¹³¹ Liability costs also led to improved safety of particular products (35 per cent) or the product line (33 per cent) and improved warnings (47 per cent).

More aggregated empirical analysis undertaken by Professor George Priest suggests that the dramatic increase in product liability claims has not led to any significant decrease in product related accidents, which have only modestly declined in some contexts and

¹³⁰ W.K. Viscusi & M.J. Moore, "Rationalizing the Relationship Between Product Liability and Innovation" in P. Schuck, ed., *Tort Law and the Public Interest* (New York: W.W. Norton, 1991) 105.

¹³¹ E.P. McGuire, *The Impact of Product Liability, U.S. Conference Board Report No. 908* (New York: The Conference Board, 1988). See also G. Eads & P. Reuter, *Designing Safer Products: Corporate Responses to Product Liability Law and Regulation* (Santa Monica: Rand, 1983) and the empirical studies collected in P. Huber & R. Litan, eds, *The Liability Maze: The Impact of Liability Laws on Safety and Innovation* (Washington D.C.: Brookings Institute, 1991).

modestly increased in others.¹³² However, product related accidents statistics (such as those from the Consumer Product Safety Commission) do not distinguish cases in which a product defect causes an accident from those in which a product was simply involved in an accident (falling down stairs, off stepladders, bicycles, or skateboards, or cutting oneself on a kitchen knife). Given that the latter type of product related accident swamps accidents involving product defects, it is not clear that anything useful can be deduced from these data about the impact of the tort system on product related accident rates involving defective products.

B. *Compensation*

With respect to compensation, there are advantages from a distributive justice perspective in a strict liability regime over a negligence regime: in the former, the costs of non-negligently caused accidents are borne by producers rather than by consumers. On the other hand, this kind of implicit insurance has regressive features: low-income consumers are forced to pay the same premiums as higher-income consumers for coverage of their smaller pecuniary losses. Moreover, from an insurance perspective, the case for awarding non-pecuniary damages is weak, although the case for subtracting collateral benefits in order to avoid double recoveries is stronger. From a corrective justice perspective, a negligence regime is preferable to a strict liability regime. However, in cases in which liability is found, corrective justice would require liability for all losses sustained by wrongfully injured victims, including non-pecuniary losses, and probably would not view collateral source offsets as justified.

In terms of output analysis, the evidence suggests that the vast majority of consumers suffering product related injuries do not take legal action. From an insurance or distributive justice perspective, this would suggest that the tort system is a highly inadequate source of compensation, although it is not clear how many of these consumers are able to claim compensation from other sources. From a corrective justice perspective, it is crucial to know how many of those victims who

¹³² G.L. Priest, "Products Liability Law and the Accident Rate" in *Liability Perspectives and Policy*, *supra*, note 80, 184.

do not initiate claims were wrongfully injured. There are no data available on this question. Data from U.S. asbestos claims show that the average total compensation per closed claim was \$60,000, and that after deducting plaintiffs' legal fees and other expenses, net compensation received by plaintiffs averaged \$35,000 or 37 per cent of total expenditures by defendants and their insurers.¹³³ Given the life threatening nature of the diseases at issue, this amount seems very low and likely reflects the tendency of undercompensation of fatal injuries noted above, the general undercompensation for economic losses in the case of serious injuries, and the many claims in which the plaintiff's evidence regarding causation may have been weak. For asbestos claims, the average time from filing a claim to closure was two years and eight months; about one-third of these claims closed in one year or less, while 11 per cent took six years or more.¹³⁴

Empirical evidence suggests that damages for pain and suffering for different categories of personal injury range from 30 per cent to 57 per cent of total damage awards for product liability claims in which bodily injury payments were received.¹³⁵ Given that consumers implicitly pay for this coverage in the price of products, tort law seems to be providing more than optimal insurance. U.S. data also suggest that in civil claims involving tort compensation for personal injuries, corporate defendants pay on average one-third higher damages awards than do individual defendants, holding all other factors constant.¹³⁶ The tort system is thereby being used as an insurance or risk-spreading device, arguably desirable from a distributive justice perspective, although not compatible with the corrective justice principle that tort law should focus on wrongdoing irrespective of who commits it.

¹³³ J.S. Kakalik & N.M. Pace, *Costs and Compensation Paid in Tort Litigation* (Santa Monica: Rand, 1986).

¹³⁴ J.S. Kakalik *et al.*, *Variations in Litigation Compensation and Expenses* (Santa Monica: Rand, 1984) at vii.

¹³⁵ W.K. Viscusi, "Liability for Occupational Accidents and Illnesses" in *Liability Perspectives and Policy*, *supra*, note 80, 155.

¹³⁶ A. Chin & M.A. Peterson, *Deep Pockets, Empty Pockets: Who Wins in Cook County Jury Trials* (Santa Monica: Rand, 1985).

C. Regulatory Alternatives to the Tort System

In the case of product safety regulation, recent research suggests grounds for caution in identifying targets for, and modes of, intervention. Empirical studies of safety standards adopted by the U.S. Consumer Product Safety Commission (CPSC) find trivial to non-existent safety benefits from regulations pertaining to such matters as child-resistant caps, mattress flammability standards, bicycle safety regulations, carpet and rug flammability regulations, and children's crib regulations.¹³⁷ Similar studies find that even where product safety standards do generate safety gains, often the safety benefits are outweighed by the costs, both direct and indirect, generated by the standards. This appears to be so, for example, with respect to urea formaldehyde foam standards, power lawnmower standards, matchbook standards, and architectural glazing standards.¹³⁸ Similarly, a study of FDA mandatory prescription drug regulations found little or no effect on poisoning mortalities,¹³⁹ and studies of more stringent pre-clearance requirements for new drugs find that they have significantly reduced the rate of new drug innovations.¹⁴⁰ In terms of aggregate safety effects of CPSC regulations, Viscusi finds that the impact of regulation on the home accident rate is not statistically significant,¹⁴¹ although Zick, Mayer, and Snow find that CPSC policies may have saved 18,000 lives over the first

¹³⁷ See W.K. Viscusi, *Regulating Consumer Product Safety* (Washington, D.C.: American Enterprise Institute For Public Policy Research, 1984); W.K. Viscusi, "Consumer Behaviour and the Safety Effects of Product Safety Regulation" (1985) 28 J. L. & Econ. 527; W.K. Viscusi, "The Lulling Effect: The Impact of Child Resistant Packaging on Aspirin and Analgesic Ingestion" (1984) 74 Am. Econ. Rev. Pa. & Proc. 324; P. Linneman, "The Effects of Consumer Safety Standards: The 1973 Mattress Flammability Standard" (1980) 23 J. L. & Econ. 461; H.G. Grabowski & J.M. Vernon, "Consumer Product Safety Regulation" (1978) 68:2 Am. Econ. Rev. 284; R. Hirschorn, "Regulating Quality in Product Markets" in *The Regulation of Quality*, *supra*, note 93, 55; and P. Asch, *Consumer Safety Regulation* (New York: Oxford University Press, 1988).

¹³⁸ *Regulating Consumer Product Safety*, *ibid.*

¹³⁹ S. Peltzman, "The Health Effects of Mandatory Prescriptions" (1987) 30 J. L. & Econ. 207.

¹⁴⁰ S. Peltzman, "An Evaluation of Consumer Protection Legislation: The 1962 Drug Amendments" (1973) 81 J. Pol. Econ. 1049 and H.G. Grabowski, J.M. Vernon & L. Thomas, "Estimating the Effects of Regulation on Innovation: An International Comparative Analysis of the Pharmaceutical Industry" (1978) 22 J. L. & Econ. 133.

¹⁴¹ W.K. Viscusi, "Consumer Behaviour and the Safety Effect of Product Safety Regulation" (1985) 28 J. L. & Econ. 527.

decade of its existence (1972-1982).¹⁴² Since the early 1980s, the CPSC has been required to undertake an explicit balancing of costs and benefits of proposed safety standards. Since that time, however, it has also dramatically reduced its standard setting activities and relied increasingly frequently on mandatory product recalls and corrective actions.¹⁴³

Criticisms of the CPSC's performance variously stress: excessive reliance on emergency room accident data collected pursuant to the National Electronic Surveillance System (NEISS), which does not distinguish injuries caused by product defects or hazards from injuries where products were merely involved (giving undue prominence to products posing inherent but obvious risks such as ladders, stairs, bicycles); use of data that are not use weighted, making it impossible to tell whether there has been a change in the level of risk or merely a change in the utilization rate of a product; reliance on emergency room data which underemphasizes deaths, ignores health problems, and gives no consideration to property damage; failure to take account of substitution effects between products and other behavioural responses by consumers to more stringent safety standards, leading to over-estimation of the benefits of regulation; increased concentration and reduced competitiveness in some industries as a result of exit by smaller firms unable to meet regulatory compliance costs; failure to balance costs and benefits of proposed regulations; insufficient reliance on information-oriented policies; and weak monitoring and enforcement and inadequate penalties for violations, even where regulations are justified.

¹⁴² C. Zick, R. Mayer & L. Snow, "Does the U.S. Consumer Product Safety Commission Make a Difference? An Assessment of its First Decade" (1986) 6 J. Consumer Pol'y 25. For a similarly positive assessment of the effects of product safety regulation and detailed critiques of a number of foregoing studies, see also M. Kelman, "On Democracy-Bashing: A Sceptical Look at the Theoretical and 'Empirical' Practice of the Public Choice Movement" (1988) 74 Va. L. Rev. 199.

¹⁴³ T. Scanlon & R. Rogowsky, "Back-Door Rulemaking: A View from the CPSC" (1984) 8:4 Regulation 27.

On the other hand, despite early controversy,¹⁴⁴ the most recent (and exhaustive) study of U.S. motor vehicle safety standards finds that regulations may have reduced fatalities by as much as 40 per cent since the inception of NHTSA and may entail an annual reduction of fatalities of as many as 23,000. Moreover, the study finds that the safety benefits of these standards substantially exceed the costs, except on the most pessimistic estimates of benefits and costs.¹⁴⁵ However, like the CPSC, NHTSA has increasingly relied on mandatory recalls rather than standard setting, even though the safety gains from recalls, at least in the auto context, appear to be very modest.¹⁴⁶

The lessons to be learned from this research are that product safety regulatory regimes need to be much more systematic and rigorous than in the past, both with respect to identifying potential product hazards in a pro-active, but statistically rigorous, way and in responding appropriately to them. As a general proposition, hazard labeling and other mandatory safety information appear to be underutilized responses relative to minimum standards.¹⁴⁷ Where standards are used, more explicit and consistent balancing of costs and benefits is required.¹⁴⁸ In the absence of such an approach, data assembled by Morrall suggest that costs per life saved or injury avoided are likely to vary dramatically from one measure to another across the regulatory system, implying that major reallocations of resources could generate vastly better total payoffs from total investments in safety.¹⁴⁹ Morrall

¹⁴⁴ S. Peltzman, "The Effects of Automobile Safety Regulation" (1975) 83 J. Pol. Econ. 677; L. Robertson, "A Critical Analysis of Peltzman's 'The Effects of Automobile Safety Regulation'" (1977) 11 J. Econ. Issues 587; L. Orr, "The Effectiveness of Automobile Safety Regulations: Evidence from the FARS Data" (1984) 74 Am. J. Pub. Health 1384; and G. Blomquist, *The Regulation of Motor Vehicle and Traffic Safety* (Norwell, Mass.: Kluwer Academic Publications, 1988) c. 4.

¹⁴⁵ Crandall *et al.*, *supra*, note 56. More generally, see M.L. Friedland, M.J. Trebilcock & K. Roach, *Regulating Automobile Safety* (Toronto: University of Toronto Press, 1990) c. 7 and J. Mashaw & D. Harfst, *The Struggle for Auto Safety* (Cambridge, Mass.: Harvard University Press, 1990).

¹⁴⁶ Mashaw & Harfst, *ibid.*

¹⁴⁷ W.K. Viscusi, W. Magat & J. Huber, "Consumer Processing of Hazard Warning Information" (1988) 1 J. Risk & Uncertainty 201.

¹⁴⁸ See C. Sunstein, "Paradoxes of the Regulatory State" (1990) 57 U. Chi. L. Rev. 407.

¹⁴⁹ J. Morrall, "A Review of the Record" (1986) 10:2 Regulation 25. The data assembled by Morrall is summarized below, Table 2 at 106-107.

notes that at one extreme are several OSHA rules which address occupation risks of one or two in 1,000 of exposed population; at the other extreme are two FAA aircraft safety rules which address risks of two and seven in one hundred million of exposed population. The twenty-seven final rules reviewed by Morrall were estimated to save a total of 5,381 lives annually, which is the equivalent of about three-tenths of 1 per cent of annual U.S. deaths. The ten proposed rules (then in rule making) were projected to save a total of only 89 additional lives per year; the eight rejected rules were projected to save a total of only one life per year. A very large share of the regulatory benefits of the rules that were issued—4030 lives saved annually or 75 per cent of the benefits of all final rules—was due to just four regulations, all dealing with motor vehicle design (the subsequent Brookings study, noted above, yields substantially higher safety gains from motor vehicle design standards).¹⁵⁰ Even excluding all proposed rules and the least cost-effective final rule issued by the FDA, the range in terms of cost effectiveness is still three orders of magnitude: OSHA's arsenic standard cost nearly 1000 times as much per life saved as NHTSA's steering column standard. Sixteen studies estimating individual willingness to pay for risk reduction yield estimates that vary from about \$400,000 to about \$9.7 million per life saved, with a mean estimate of \$3.3 million and a median estimate of \$1.7 million. Even if one takes the highest estimate in this set of sixteen studies—approximately \$10 million per life saved—about half the standards on Morrall's list of 44 standards entail costs per lives saved substantially, and in many cases vastly, in excess of this figure. See Table 2, below.

¹⁵⁰ *Regulating the Automobile*, *supra*, note 56.

D. Compensatory Alternatives to the Tort System

Compensatory alternatives to the tort system that are specific to product related injuries have to date played a very limited role. In California, Denmark, Germany, France, Japan, Switzerland, and the United Kingdom, and more recently under the u.s. *National Childhood Vaccine Injury Act of 1986*,¹⁵¹ a number of jurisdictions have established, in effect, no-fault compensation schemes for individuals suffering adverse effects from immunization programmes. The rationale underlying the creation of these schemes appears to be that the state either requires or at least strongly encourages immunization in many contexts, and therefore should bear the responsibility for compensating individuals who suffer adverse effects from their participation in such programmes. Drug injury compensation schemes have been set up in Germany, Sweden, and Japan for similar reasons. In general, these various programmes have experienced a very low take-up rate, with the exception of the vaccine programme in the United Kingdom.¹⁵² Moreover, it is not at all clear that the experience under these vaccine and drug related injury schemes can be readily generalized to other product related accidents, where compensation on a no-fault basis would raise severe problems of attribution of causation and responsibility.¹⁵³

¹⁵¹ 42 U.S.C.S. §§ 300aa-1 *et seq.* (Law. Co-op. Supp. 1991).

¹⁵² W.K. Mariner, "Compensation Programs for Vaccine-Related Injury Abroad: A Comparative Analysis" (1987) 31 St. Louis U.L.J. 599; S.A. Sturges, "Vaccine-Related Injuries: Alternatives to the Tort Compensation System" (1987) 30 St. Louis U.L.J. 919; and J.G. Fleming, "Drug Injury Compensation Plans" (1982) 30 Am. J. Comp. L. 297.

¹⁵³ V.E. Schwartz & L. Mahshigian, "National Childhood Vaccine Injury Act of 1986: An Ad Hoc Remedy or a Window for the Future?" (1987) 48 Ohio St. L.J. 387.

Table 2
The Cost of Various Risk-Reducing Regulations per Life Saved

Regulation	Year	Agency	Status*	Initial Annual Risk**	Annual Lives Saved	Cost Per Life Saved (Thousands of 1984 \$)
Steering Column Protection	1967	NHTSA	F	7.7 in 10 ⁵	1,300,000	\$100
Unvented Space Heaters	1980	CPSC	F	2.7 in 10 ⁵	63,000	100
Oil & Gas Well Service	1983	OSHA-S	P	1.1 in 10 ³	50,000	100
Cabin Fire Protection	1985	FAA	F	6.5 in 10 ⁸	15,000	200
Passive Restraints /Belts	1984	NHTSA	F	9.1 in 10 ⁵	1,850,000	300
Fuel System Integrity	1975	NHTSA	F	4.9 in 10 ⁶	400,000	300
Trihalomethanes	1979	EPA	F	6.0 in 10 ⁶	322,000	300
Underground Construction	1983	OSHA-S	P	1.6 in 10 ³	8,100	300
Alcohol & Drug Control	1985	FRA	F	1.8 in 10 ⁶	4,200	500
Servicing Wheel Rims	1984	OSHA-S	F	1.4 in 10 ⁵	2,300	500
Seat Cushion Flammability	1984	FAA	F	1.6 in 10 ⁷	37,000	600
Floor Emergency Lighting	1984	FAA	F	2.2 in 10 ⁸	5,000	700
Crane Suspended Personnel Platform	1984	OSHA-S	P	1.8 in 10 ³	5,000	900
Children's Sleepware Flammability	1973	CPSC	F	2.4 in 10 ⁶	106,000	1,300
Side Doors	1970	NHTSA	F	3.6 in 10 ⁵	480,000	1,300
Concrete & Masonry Construction	1985	OSHA-S	P	1.4 in 10 ⁵	6,500	1,400
Hazard Communication	1983	OSHA-S	F	4.0 in 10 ⁵	200,000	1,800
Grain Dust	1984	OSHA-S	P	2.1 in 10 ⁴	4,000	2,800
Benzene / Fugitive Emissions	1984	EPA	F	2.1 in 10 ⁵	0.310	2,800
Radionuclides / Uranium Mines	1984	EPA	F	1.4 in 10 ⁴	1.100	6,900

Table 2 (CONTINUED)

Regulation	Year	Agency	Status*	Initial Annual Risk**	Annual Lives Saved	Cost Per Life Saved (Thousands of 1984 \$)
Asbestos	1972	OSHA-H	F	3.9 in 10 ⁴	396,000	7,400
Benzene	1985	OSHA-H	P	8.8 in 10 ⁴	3,800	17,100
Arsenic / Glass Plant	1986	EPA	F	8.0 in 10 ⁴	0.110	19,200
Ethylene Oxide	1984	OSHA-H	F	4.4 in 10 ⁵	2,800	25,600
Arsenic / Copper Smelter	1986	EPA	F	9.0 in 10 ⁴	0.060	26,500
Uranium Mill Tailings / Inactive	1983	EPA	F	4.3 in 10 ⁴	2,100	27,600
Acrylonitriles	1978	OSHA-H	F	9.4 in 10 ⁴	6,900	37,600
Uranium Mill Tailings / Active	1983	EPA	F	4.3 in 10 ⁴	2,100	53,000
Coke Ovens	1976	OSHA-H	F	1.6 in 10 ⁴	31,000	61,800
Asbestos	1986	OSHA-H	F	6.7 in 10 ⁵	74,700	89,300
Arsenic	1978	OSHA-H	F	1.8 in 10 ³	11,700	92,500
Asbestos	1986	EPA	P	2.9 in 10 ⁵	10,000	104,200
DES (Cattlefeed)	1979	FDA	F	3.1 in 10 ⁷	68,000	132,000
Arsenic / Glass Manufacturing	1986	EPA	R	3.8 in 10 ⁵	0.250	142,000
Benzene / Storage	1984	EPA	R	6.0 in 10 ⁷	0.043	202,000
Radionuclides / DOE Facilities	1984	EPA	R	4.3 in 10 ⁶	0.001	210,000
Radionuclides / Elemental Phosphorous	1984	EPA	R	1.4 in 10 ⁵	0.046	270,000
Acrylonitriles	1978	OSHA-H	R	9.4 in 10 ⁴	0.600	308,000
Benzene / Ethylbenzol Styrene	1984	EPA	R	2.0 in 10 ⁶	0.006	483,000
Arsenic / Low-Arsenic Copper	1986	EPA	R	2.6 in 10 ⁴	0.090	764,000
Benzene / Maleic Anhydride	1984	EPA	R	1.1 in 10 ⁶	0.029	820,000
Land Disposal	1986	EPA	P	2.3 in 10 ⁸	2,520	3,500,000
EDB	1983	OSHA-H	P	2.5 in 10 ⁴	0.002	15,600,000
Formaldehyde	1985	OSHA-H	P	6.8 in 10 ⁷	0.010	72,000,000

* Proposed, rejected or final rule

** Annual deaths per exposed population. An exposed population of 10³ is 1000. 10⁴ is 10,000 etc.

V. ENVIRONMENTAL INJURIES

Because environmental pollution discharge arises from production and consumption activities, it might be expected to increase as those activities increase in the absence of regulation. While the total discharge of a pollutant will depend on the level of activity in a specific sector of the economy and on the technology of that sector, the simplest assumption would be that discharge is proportional to population, to overall economic activity, or to the activity in a particular sector. Between 1970 and 1988, the U.S. population increased by 20 per cent, real (adjusted for inflation) gross national product (GNP) increased by 66 per cent, fossil fuel use increased by 12 per cent, coal use increased by 53 per cent, and motor vehicle miles travelled increased by over 60 per cent.¹⁵⁴ Furthermore, while ambient pollution concentrations may be proportional to emission rates for pollutants that are quickly removed from the environment, such as airborne lead, carbon monoxide or particulates, for persistent pollutants such as PCBs, dioxins, or heavy metals in soil or water ambient concentrations may continue to increase even if discharge rates decline, so long as there is any significant rate of emission. Thus, even substantial emission reductions will fail to prevent some types of continuing environmental degradation. The effect of tort and of the regulatory system must be evaluated with these facts in mind.

A. Deterrence

Evaluating inputs, we find that tort doctrine excludes recovery in many environmental cases. Private nuisance requires that the plaintiffs have an interest in real property. It excludes recovery where the harm to any individual is not substantial, where the harm is not unreasonable, where the pollution is consistent with the neighbourhood, where the victim is unreasonably sensitive, and where the plaintiff has come to the nuisance.¹⁵⁵ The doctrine of riparian rights applies only to injury to riparian property, while the doctrine of prior appropriation applied in the western United States limits the rights of junior appropriators,

¹⁵⁴ See below, Table 3 at 117.

¹⁵⁵ W.P. Keeton *et al.*, *Prosser and Keeton on the Law of Torts*, 5th ed. (St. Paul, Minn.: West Publishing Co., 1984) §§ 87, 88, 88A and 88B.

excluding many harms from tort protection.¹⁵⁶ Personal injury suits under these doctrines are rare. Where the harm is not associated with private property, individuals can rarely sue and governments rarely do, so injury to public lands and general ecosystem damage are poorly protected, as are the interests of travellers and visitors in public places. The public trust doctrine has expanded to protect environmental and recreational interests in navigable waters¹⁵⁷ but is not relevant to personal injuries.

Damage rules exclude recovery of pure economic loss or by especially sensitive plaintiffs, and courts have been reluctant to award damages for aesthetic or recreational loss or for the risk of future disease.¹⁵⁸ In the limited set of cases in which tort doctrine supports an action, proof of causation requires that the plaintiff establish four elements: that the plaintiff suffered actual damages, that the harm arose from a specific pollutant, that the pollutant was of a type discharged by the defendant, and that the defendant in fact discharged the pollutant that harmed the plaintiff.¹⁵⁹ This chain of causation is often impossible to prove, especially when there are multiple polluters or substances that cause a risk of future disease.¹⁶⁰ More recently, a variety of innovative means of dealing with these problems has been discussed, including the allocation of liability in proportion to emissions and applying general CERCLA liability principles (retroactive strict joint and several liability) to environmental torts not covered by CERCLA.¹⁶¹ However, the cost of litigation itself precludes lawsuits for pollutants causing small losses per victim, even when the aggregate damage may be quite large.

¹⁵⁶ F. Grad, *Environmental Law: Sources and Problems*, 3d ed. (New York: Matthew Bender, 1985) § 2.02.

¹⁵⁷ B. Austin, "The Public Trust Misapplied: *Phillips Petroleum v. Mississippi* and the Need to Rethink an Ancient Doctrine" (1989) 16 Ecology L.Q. 967.

¹⁵⁸ Keeton *et al.*, *supra*, note 155.

¹⁵⁹ "Developments in the Law: Toxic Waste Litigation" (1986) 99 Harv. L. Rev. 1458 at 1617-39 [hereinafter "Developments"].

¹⁶⁰ T.A. Brennan, "Causal Chains and Statistical Links: The Role of Scientific Uncertainty in Hazardous-Substance Litigation" (1988) 73 Cornell L. Rev. 469.

¹⁶¹ *Comprehensive Environmental Response, Compensation, and Liability Act*, 42 U.S.C.S. §§ 9601 *et seq.* (Law. Co-op. 1989). See K. Abraham, "Environmental Liability and the Limits of Insurance" (1988) 88 Colum. L. Rev. 942; and "Developments," *supra*, note 159 at 1630-42.

These input considerations suggest that tort will be useful primarily for local pollution problems involving a single polluter and very substantial damage.¹⁶² It will be of little significance for pollutants dispersed over a large area or discharged in a developed area with many other pollution sources, a category that includes most air and water pollution problems.

If we focus on toxic torts involving lawsuits for personal injury arising from environmental exposure to hazardous materials, tort law still appears to be of limited value. In the early 1980s, a study group mandated by CERCLA concluded that most plaintiffs face "substantial substantive and procedural barriers in a personal injury action for hazardous waste exposure, particularly where individual claims are relatively small."¹⁶³ The barriers include causation, the problem of joining many victims as plaintiffs in a single action, apportionment of damages, and statutes of limitation. The limitation problem has been significantly alleviated by the adoption of the discovery rule in a majority of states¹⁶⁴ and by the CERCLA provision that state statutes of limitation for personal injury arising from toxic waste disposal begin to run only when the victim discovers that an injury was caused by the hazardous substance in question.¹⁶⁵

During the 1980s, litigation over damage from hazardous waste expanded substantially,¹⁶⁶ although claims and recoveries for *personal injuries* from all environmental suits were surprisingly low.¹⁶⁷ Indeed, it appears that much of the expansion of environmental tort litigation in the last decade related to property damage cases, where it was relatively easy to prove that the presence of the toxic waste had reduced property

¹⁶² Many reported cases are of this type. See Grad, *supra*, note 156; T.A. Brennan, "Helping Courts with Toxic Torts" (1989) 51 U. Pitt. L. Rev. 1 at 57 (discussing the *Woburn* case) and Environmental Law Institute, *Six Case Studies of Compensation for Toxic Substances Pollution: Alabama, California, Michigan, Missouri, New Jersey, and Texas: A Report* (Washington, D.C.: U.S. Government Printing Office, 1980).

¹⁶³ Grad, *ibid.* at 718.

¹⁶⁴ "Developments," *supra*, note 159 at 1606.

¹⁶⁵ 42 U.S.C.S. § 9658 (Law. Co-op. 1989).

¹⁶⁶ P. Huber, "Environmental Hazards and Liability Law" in *Liability Perspectives and Policy*, *supra*, note 80, 128 at 134.

¹⁶⁷ T.A. Brennan, *Narrowing the Wide Open Spaces: The Role of Torts in Environmental Law* (Philadelphia: American Law Institute, 1990) at 150-56 [mimeo].

values or required costly remedial measures. Personal injury suits continue to be limited by the difficulty of proving causation when the pollutant is widely dispersed and when there is scientific or statistical uncertainty about whether an observed increase in disease more likely than not can be attributed to exposure to the pollutant. Most successful environmental toxic tort cases involve contaminated groundwater, which gives physical evidence of the exposure and which causes clusters of cases that may be found to be statistically significant.¹⁶⁸ Still, with respect to toxics, as with other environmental personal injuries, most pollution discharge will not attract litigation, most polluters will pay no compensation, and deterrence will be minimal.

Turning to outputs, an analysis of the experience with tort litigation confirms the limited effect of the common law for dealing with most environmental problems. Despite rapidly growing environmental concerns during the 1970s and 1980s, we do not find evidence that tort liability itself has significantly reduced air and water pollution discharge in any sector, although some large polluters have been forced to abate, and government regulations have clearly induced considerable abatement of some pollutants from some sources. After increasing up to 1975, U.S. expenditures on pollution control equipment were steady through the 1970s and 1980s, at less than 5 per cent of capital expenditures.¹⁶⁹ A recent review of the success of the environmental policies of the 1970s and 1980s mentions tort law but accords it a negligible role in such environmental improvement as has occurred.¹⁷⁰ Histories of major air and water pollution control efforts prior to the 1970s, such as pollution abatement in Pittsburgh after World War II, do not generally credit tort litigation with a major role.¹⁷¹ Most authors list the factors discussed in the preceding paragraph as barriers to the effective use of tort litigation for inducing pollution control.

¹⁶⁸ *Ibid.* at 187.

¹⁶⁹ G. Rutledge & N. Stergioulas, "Plant and Equipment Expenditures by Business for Pollution Abatement, 1987 and Planned 1988" (1988) 68 *Surv. Current Bus.* 26.

¹⁷⁰ P.R. Portney, "EPA and the Evolution of Federal Legislation" in P.R. Portney, ed., *Public Policies for Environmental Protection* (Washington, D.C.: Johns Hopkins Press, 1990) 7 at 12.

¹⁷¹ See, for example, T.O. Thackery, "Pittsburgh: How One City Did It" in M.I. Goldman, ed., *Ecology and Economics: Controlling Pollution in the 70s* (Englewood Cliffs, N.J.: Prentice Hall, 1967) 199 and R.D. Grinder, "The Battle for Clean Air: The Smoke Problem in Post-Civil War America" in M.V. Melosi, ed., *Pollution and Reform in American Cities, 1870-1930* (Austin: University of Texas Press, 1980) 83.

On the other hand, it appears that fear of liability in contract, by statute, or in tort for harm caused by toxic waste has induced businesses to be more careful in the purchase and sale of real estate and in handling such wastes.¹⁷² During the 1980s, there has been a steady expansion of lawsuits arising out of the discharge and disposal of toxic materials. As we noted above, almost all this growth involved suits relating to property damage rather than personal injuries. Causation is still difficult to establish except for local problems such as groundwater contamination. At best, one could say that the possibility of tort suits may deter some polluters from certain discharges that would likely lead to litigation. Furthermore, some tort suits may have provided the information and publicity necessary to give rise to legislative or regulatory action—for example, the Love Canal problem and associated lawsuits that contributed to the passage of CERCLA.¹⁷³ But the large expenditures in the last two decades for control of air and water pollution discharge are overwhelmingly a response to legislative and regulatory initiatives, not to tort suits for personal injury.

In contrast to this poor performance of the tort system for toxic waste spills and disposal, the potential liability created by CERCLA has caused many firms to evaluate their waste disposal strategies in order to minimize potential liability. This has led to waste reduction, more secure disposal of toxic waste, and legal arrangements to avoid liability. There is evidence that firms expend significant resources to limit the risk of spills of toxic substances and toxic waste property contamination that will require expensive cleanup efforts arising from CERCLA, tort claims, or claims based on contract. Still, CERCLA's retroactive strict joint and several liability is inconsistent with optimal deterrence, and actual collections have been modest to date. Brennan concludes that CERCLA has had little success in reducing the health hazards arising from hazardous waste sites during the 1980s.¹⁷⁴

¹⁷² P. Reuter, *The Economic Consequences of Expanded Corporate Liability: An Exploratory Study* (Santa Monica: Rand, 1988).

¹⁷³ "Developments," *supra*, note 159 at 1471.

¹⁷⁴ Brennan, *supra*, note 167.

B. *Compensation*

The serious input limitations faced by plaintiffs with respect to deterrence are equally disabling in pursuing the compensation goals of corrective and distributive justice. There have been recent moves to expand compensation, as some settlements have allowed damages for medical monitoring for future health effects, for emotional distress arising from fear of future disease, and for risk of future disease itself;¹⁷⁵ but these measures of damages are still in their infancy. Adequate compensatory performance for personal injuries is arguable only with respect to corrective justice, and even then only in the small subset of cases in which there is highly localized pollution that significantly increases the incidence of a disease, so that the victims can establish causation from a known polluter.

Turning to output measures, although some victims do recover from polluters, their numbers are small in comparison to the number of people affected by pollution, and their recoveries often fall short of full compensation.¹⁷⁶ Worse yet, tort plaintiffs generally retain as compensation only 46 per cent of all dollars spent on tort litigation and 37 per cent of all dollars spent on asbestos litigation,¹⁷⁷ with environmental litigation probably falling between these two—not an impressive level of administrative efficiency. Measured by deterrence, corrective justice, or distributive justice, tort law is a minor factor with respect to personal injuries arising from environmental pollution.¹⁷⁸

Recognition of the limitations of the tort system have led to reform proposals to deal with three of the limitations identified in the input analysis: proof of causation, standing to sue (the private property limitation), and thinly spread damage.

Proof of causation might be facilitated in situations where exposure to a contaminant increases the risk of contracting a disease by allowing probabalistic proof of causation, imposing proportional liability, and providing science panels to assist courts in dealing with complex

¹⁷⁵ Huber, *supra*, note 166 at 145 and Abraham, *supra*, note 161 at 972-73.

¹⁷⁶ Environmental Law Institute, *supra*, note 162. See also Brennan, *supra*, note 162.

¹⁷⁷ Kakalik & Pace, *supra*, note 133.

¹⁷⁸ This is reflected in the fact that a major casebook on environmental law, Grad, *supra*, note 156, devotes less than 8 per cent of its pages to tort law, the remainder dealing with statutory law.

medical evidence.¹⁷⁹ Unfortunately, reliable epidemiological data are available for very few pollutants, so there are likely to be few substances for which this set of proposals would yield reliably increased liability. Inviting U.S. courts to find *some* liability for diseases suffered by large numbers of injured people runs the risk of opening yet another giant legal lottery in which the uncertainties of fact finding leave little likelihood that justice or efficient deterrence will be done. The high cost of the legal system ensures that considerable resources would be consumed. In practice, the uncertainties created by these proposals would be considerable and the benefits modest.

Another type of reform would be to expand standing to sue by not requiring that the plaintiff have suffered actual damage in order to bring a claim for injunctive relief as is done by the *Michigan Environmental Protection Act*¹⁸⁰ and other similar statutes. While the proponents of such legislation correctly note that it has not unleashed a flood of litigation, significant environmental results are difficult to prove from the U.S. experience of the 1970s and 1980s.¹⁸¹

The wide dispersion of harm caused by many air and water pollution discharges might be less discouraging to tort litigants if class actions were facilitated. In the U.S., there are proposals to allow mandatory class actions, and in Canada to provide looser rules for bringing class actions.¹⁸² To the extent that these proposals consolidate actions that would otherwise be brought separately, they economize on judicial resources. To the extent that they encourage litigation that would not otherwise arise, and this is necessary if they are to increase deterrence, their value depends upon the courts' ability to adjudicate the issues fairly and at reasonable cost. The very limited data about the harmful effects of most pollutants will mean that such litigation is highly

¹⁷⁹ "Developments," *supra*, note 159 at 1619; Brennan, *supra*, note 162; and Shavell, *supra*, note 2.

¹⁸⁰ Mich. Comp. Laws §§ 691.1201 *et seq.* (1970).

¹⁸¹ D.P. Bryden, "Environmental Rights in Theory and Practice" (1978) 62 Minn. L. Rev. 163 and D.K. Slone, "The Michigan Environmental Protection Act: Bringing Citizen-Initiated Environmental Suits into the 1980's" (1985) 12 Ecology L.Q. 271.

¹⁸² D. Rosenberg, "Class Actions for Mass Torts: Doing Individual Justice by Collective Means" (1987) 62 Ind. L. J. 561 and S. Chester, "Class Actions to Protect the Environment: A Real Weapon or Another Lawyer's Word Game?" in J. Swaigen, ed., *Environmental Rights in Canada* (Toronto: Butterworths, 1981) 60.

uncertain in its outcome and again considerable resources will be consumed.

Whatever the overall merits of these reform proposals, we do not believe that their adoption would substantially alter the conclusion that many environmental discharges will not lead to tort litigation that imposes on polluters the social cost of their pollution.

C. Regulatory Alternatives to the Tort System

A review of regulatory inputs reveals the limitations under which the regulatory system labours. The Environmental Protection Agency (EPA) has regulated six traditional air pollutants and seven hazardous air pollutants,¹⁸³ although there are dozens of additional pollutants thought to be hazardous. It has also proceeded slowly with the promulgation of water effluent regulations, but has finally imposed regulations on the traditional pollutants for most point sources; again, the regulation of toxic pollutants is thought to be seriously incomplete.¹⁸⁴ The number of pollutants and sources is enormous, and monitoring and enforcement activity by the EPA and by the States affects only a very small proportion of all sources in any given year. While enforcement activities are often said to be inadequate, it is unlikely that budgets for these functions will be greatly increased in the near future. These resource constraints seriously limit both the pace at which regulations can be imposed and the degree to which they can be enforced. It seems likely that even an agency with the vast resources of the EPA will be able to act effectively against only a limited number of pollutants and types of sources in any given period of time.

Turning to outputs, the best measure of the effectiveness of environmental regulation would be evidence of the ultimate effect of regulation on human health and on the environment. If this is inconclusive, a secondary measure would be changes in the concentration of pollutants in the environment, while a tertiary measure would be changes in the rate of emission of those pollutants.

¹⁸³ P.R. Portney, "Air Pollution Policy" in *Public Policies for Environmental Protection*, *supra*, note 170, 27 at 40 and 80.

¹⁸⁴ A.M. Freeman, "Water Pollution Policy" in *Public Policies for Environmental Protection*, *supra*, note 170, 97 at 120.

If the ultimate goal of environmental regulation is the improvement of human health, it is difficult to document significant gains since 1970. While the killer smogs such as the 1948 Donora incident were eliminated by state and local pollution controls before 1970, concern has increased regarding chronic effects of urban air pollution and of the increasing number of toxic chemicals being found in the air and water. We have found no studies directly demonstrating that human health has improved generally since 1970 as a result of environmental regulation, nor that it has been prevented from deteriorating, although the latter is more likely true. This does not mean that there have been no health benefits, only that they cannot be discerned in overall health, morbidity, and mortality statistics given the variety of other factors influencing these statistics.

A secondary goal of environmental regulation is the reduction of ambient pollution concentrations, which may lead to better human health and to a more healthy ecosystem, even if those ultimate benefits are difficult to document. Here, the record is mixed but generally positive. Several measures of ambient air quality show improvements over the last two decades, with reductions in airborne concentrations of lead, carbon monoxide, and sulphur dioxide in the U.S. equal to, respectively, 90 per cent, 46 per cent, and 47 per cent between 1975 and 1988, despite considerable growth in economic activity.¹⁸⁵ Achievements with respect to surface water pollution have been more modest. Between 1972 and 1982, there were improvements in water quality in some streams and estuaries, but declines occurred in some lakes and reservoirs.¹⁸⁶ We cannot assess the extent of contaminated soil and groundwater, since little measurement of these factors was undertaken prior to about 1980. While many projects have been undertaken to clean up toxic waste sites, new contaminated sites are continually being discovered and perhaps being created.

Finally, we can look at the rate of pollution emissions. Substantial reductions in total annual emissions have occurred between 1970 and 1988 for all but one of the six criteria air pollutants, with

¹⁸⁵ U.S. Environmental Protection Agency, *National Air Quality and Emissions Trends Report 1988* (Washington D.C.: Environmental Protection Agency, 1990) [hereinafter *National Air Quality Report*].

¹⁸⁶ Freeman, *supra*, note 184 at 120.

reductions exceeding 50 per cent for lead and total suspended particulates.¹⁸⁷

Table 3
Air Pollution Emissions Trends
(Millions of Metric Tonnes per Year)

<i>Pollutant</i>	<i>1970</i>	<i>1975</i>	<i>1988</i>	<i>Percentage Reduction 1970-88</i>
Total Suspended Particles	18.1	10.2	7.0	62
Sulphur Oxide	28.2	26.0	21.1	25
Nitrogen Oxide	18.1	19.0	19.5	-8 (increase)
Volatile Organic Compounds	27.2	23.0	18.5	32
Carbon Monoxide	98.7	80.0	62.1	37
Lead ^a	203.8	148.0	13.2	94

<i>Economic Activity</i>				<i>Percentage Increase</i>
Population (10 ⁶) ^b	205	216	246	20
GNP (10 ¹² in 1982 dollars) ^c	2.42	2.69	4.02	66
Fossil Fuel Use ^d	63.6	65.3	71.2	12
Coal Use ^d	12.3	12.7	18.8	53

^aThousands of metric tonnes.

^bStatistical Abstract of the United States, 1990. U.S. Department of Commerce, Bureau of the Census, 110th ed., at 7.

^c*Ibid.* at 425.

^d*Ibid.*

Sources: EPA National Air Pollutant Emission Estimates 1940-85, and EPA National Air Quality and Emissions Trends Report 1988.

Similarly, there have been reductions in the emission of some water pollutants such as biochemical oxygen demand (BOD), suspended

¹⁸⁷ U.S. Environmental Protection Agency, *National Air Pollution Emissions Estimates 1940-1985* (Washington, D.C.: U.S. Environmental Protection Agency, 1986) and *National Air Quality Report, supra*, note 185.

solids, and phosphorous from some sources,¹⁸⁸ although data on the discharge of water pollutants is much less complete than for air pollutants. These achievements are reflected in the costs of pollution control, which have been estimated to have averaged over \$50 billion (in 1984 dollars) per year in the U.S. during the 1980s.¹⁸⁹ Considered in the light of the simultaneous considerable growth in population and economic activity, these absolute gains are impressive; emissions would likely have grown considerably in the absence of regulation. Pollution emission regulations usually apply to specific industries or products, so their effectiveness may be measured by looking at emissions related to individual industries or products. The regulation of motor vehicle emissions, which may have accounted for one-quarter of all pollution control costs during the last decade,¹⁹⁰ has reduced emissions per vehicle mile of four pollutants in the U.S. by amounts ranging from 26 per cent (nitrogen oxides) to 94 per cent (lead).¹⁹¹ After the effect of increased motoring is accounted for, total vehicular emissions have risen by 18 per cent for nitrogen oxides, and fallen by 35 per cent for carbon monoxide, 46 per cent for hydrocarbons, and 94 per cent for lead. Thus, the regulation of a small number of automobile manufacturers to control a pollution problem that is acknowledged to be severe in some parts of the country has been relatively successful, although costs appear to exceed the benefits by a substantial margin.¹⁹² There has been little regulation of emissions of nitrogen oxides, except for motor vehicle regulations, so it is not surprising that these emissions changed little between 1970 and

¹⁸⁸ Luken presents data indicating that the pulp and paper industry reduced its water pollution discharge (BOD and SS) by over 70 per cent between 1973 and 1984. R.A. Luken, *Efficiency in Environmental Regulation: A Benefit-Cost Analysis of Alternative Approaches* (Boston: Kluwer Academic, 1990) at 215. This is consistent with another study that found that, between 1978 and 1983, federal regulations had reduced pulp and paper discharges of BOD by 38 per cent and suspended solids by about 30 per cent. M. Freedman & B. Jaggi, "Impact of Government Regulations on Pollution Performance of Pulp and Paper Firms" (1988) 12 *Envtl. Mgmt.* 391 at 395.

¹⁸⁹ Council on Environmental Quality, *Eleventh Annual Report* (Washington, D.C.: Government Printing Office, 1980) at 394 and U.S. Environmental Protection Agency, *Final Report, the Cost of Clean Air and Water* (Washington, D.C.: U.S. Environmental Protection Agency, 1984) at 11, 12, 15, and 16.

¹⁹⁰ D.W. Jorgenson & P.J. Wilcoxon, "Environmental Regulation and U.S. Economic Growth" (1990) 21 *Rand J. Econ.* 314 at 338.

¹⁹¹ *National Air Pollution Emission Estimates 1940-1985*, *supra*, note 187.

¹⁹² Crandall *et al.*, *supra*, note 56 at 86.

1988.¹⁹³ The emission of particulates and sulphur oxides declined by 62 per cent and 25 per cent respectively between 1970 and 1988,¹⁹⁴ in significant part because of regulations directed at the electric utility industry. This has been achieved despite a 50 per cent increase in the use of coal during this period. The discharge of some water pollutants from point sources has declined significantly, but the failure to significantly regulate non-point sources, which contribute more than half of the total loading of many water pollutants, has led to very modest gains in overall water quality.¹⁹⁵ Furthermore, the costs of water pollution control appear to exceed the quantifiable benefits thereof by a significant amount.¹⁹⁶ There are other isolated success stories such as the greatly reduced mercury emissions from chlor-alkali plants, although regulation was only one of several causes of this reduction.¹⁹⁷

To some extent, regulation has succeeded where tort failed, as in the case of motor vehicle emission regulation. In other cases, both have failed, often for similar reasons. If we are uncertain of the harm caused by the pollution, and if it is difficult to trace the pollution from many sources to a receptor, then not only is it unlikely that a private lawsuit will succeed, but it is also difficult for the regulatory agency to impose an effective regulation, and it is costly to enforce that regulation. The slow progress in regulating toxic pollutants may be caused by many of the same factors that render tort suits for toxic pollution difficult to pursue in most cases. Furthermore, where a pollutant is emitted by many sources of different types and where emission limits are technology-based, the data requirements for standard setting are enormous, so appropriate regulations may be promulgated only slowly. The federal government has limited resources for the enforcement of the resulting regulations for thousands of sources across the country, so years may pass before significant compliance occurs. Finally, reliance on new

¹⁹³ *National Air Quality Report*, *supra*, note 185.

¹⁹⁴ *Ibid.*

¹⁹⁵ Freeman, *supra*, note 184 at 109.

¹⁹⁶ *Ibid.* at 144.

¹⁹⁷ D.N. Dewees, "The Effect of Environmental Regulation: Mercury and Sulphur Dioxide" in M.L. Friedland, ed., *Securing Compliance: Seven Case Studies* (Toronto: University of Toronto Press, 1990) 354 and J. Ashworth, I. Papps & D. Storey, "Assessing the Impact upon the British Chlor-Alkali Industry of the EEC Directive on Discharges of Mercury into Waterways" (1987) 63 *Land Econ.* 72.

source performance standards leaves existing sources untouched for years or decades and may result in very modest reductions in total emissions. All of these factors have contributed to a relatively slow pace of overall abatement for most pollutants.

Studies by economists of the costs and benefits of pollution regulation tend to show that the costs of U.S. federal water pollution regulations in the 1970s and 1980s exceeded the benefits of those regulations, while the reverse is true for air pollution.¹⁹⁸ There is substantial evidence that we have overregulated in many cases. However, it is also possible that in some cases, while costs have been estimated with some accuracy, those elements of benefits that are difficult to quantify have been omitted. Fully reflecting public concerns about the ecosystem damage, the ill health of urban forests, and other environmental harm could yield benefits that justify the costs. Another possibility is that some aspects of recent programmes can be justified on benefit-cost grounds, while others cannot, so that the problem is not simply that we have gone too far, but that we have gone too far in some parts of some regulations and not far enough in other cases. Finally, it is clear that many programmes have cost far more than necessary to achieve the environmental goal because of inefficiently designed policies, so that revision of the *form* of the regulation, rather than its goals, could yield benefits that justified the costs. We suspect that all of these explanations are true in part, so that no simple prescription, such as "regulate less," can be justified by the available data. We acknowledge, however, that high costs relative to the benefits afflict some of the U.S. federal environmental regulation of the 1970s and 1980s.

D. *Compensatory Alternatives to the Tort System*

There has been little legislation in the United States designed to compensate victims of environmental pollution for personal injuries. The Marshall Islanders Compensation Program, enacted in 1977, provides \$150 million in compensation for islanders harmed by atomic

¹⁹⁸ See, generally, the evidence reviewed in *Public Policies for Environmental Protection*, *supra*, note 170 and Freeman, *supra*, note 184.

testing during 1954.¹⁹⁹ The *Price-Anderson Act*²⁰⁰ governs liability for injuries arising from nuclear accidents at nuclear power plants. The *Act* relies on state law for liability doctrine, modifies that doctrine in certain circumstances, and governs insurance coverage and liability limits for nuclear power plants. The *Superfund* legislation²⁰¹ governs liability for damage arising from waste disposal sites, but is designed to cover costs of cleanup rather than personal injury, although the 1986 amendments may facilitate personal injury suits in the future.²⁰² There is no comprehensive legislation providing compensation for personal injuries arising from environmental pollution.

VI. WORKPLACE INJURIES

In general, no-fault workers' compensation regimes have replaced tort actions in North America as a means of compensating victims of workplace accidents, while occupational health and safety regulation has largely replaced the deterrence function of tort. The empirical evidence on the efficacy of the tort system is to be found largely in: (a) studies of the functioning of the tort system before workers' compensation was introduced; (b) studies of certain specific regimes in which tort survives, such as the legal regime covering railway workers in the United States; and (c) studies that focus on industrial disease and product liability claims which in the United States are not excluded by workers' compensation law. Conclusions drawn from such evidence must be qualified to the extent that they may reflect historical conditions no longer relevant, the specific nature of the sector that has adopted the tort system rather than workers' compensation, or the peculiar problems associated with industrial diseases.

¹⁹⁹ H. Ball, *Justice Downwind: America's Atomic Testing Program in the 1950s* (New York: Oxford University Press, 1986).

²⁰⁰ 42 U.S.C.S. § 2210 (Law. Co-op. 1978).

²⁰¹ *CERCLA and the Superfund Amendments and Reauthorization Act of 1986 (SARA)*, in 42 U.S.C.S. §§ 9601 *et seq.* (Law. Co-op. 1989).

²⁰² 42 U.S.C.S. §§ 9671-75 (Law. Co-op. 1989). See Brennan, *supra*, note 167 at 176-78.

A. *Deterrence*

At the time at which workers' compensation insurance was first introduced, the tort law applicable to workplace accidents was in a process of rapid evolution.²⁰³ The nineteenth century doctrines of voluntary assumption of risk, the fellow servant rule, and contributory negligence, which had barred tort recovery by many injured workers, were being transformed or discarded, and workers were succeeding in an increasing number of cases.²⁰⁴ Throughout this period of transition, negligence rather than strict liability defined the standard of care.²⁰⁵ However, causation was often difficult to prove, workers had some reservations about bringing a lawsuit or testifying in favour of a plaintiff for fear of impairing their relationship with the employer, and fatalities were undervalued by the standard tort award. Occupational diseases were largely ignored. Furthermore, low-income workers would have had difficulty financing a lawsuit that was not reasonably likely to succeed unless contingent fees were available. These input considerations suggest that, although early in the period tort law could have had a limited deterrent effect, by the end of the period of transition it could offer substantial, although less than optimal, deterrence. If tort were to replace workers' compensation today, the limitations regarding proof of causation, concern about the employment relationship, and undervaluing fatalities would remain. Indeed, one study of the choices available to an asbestos manufacturer whose workers suffered "an occupational health disaster" concluded that the expectation of *full* tort liability for *all* the disease that actually occurred would not have provided sufficient financial reason for the manufacturer to adopt fairly modest ventilation devices to reduce exposures below those that led to the disaster.²⁰⁶

²⁰³ L.M. Friedman & J. Ladinsky, "Social Change and the Law of Industrial Accidents" (1967) 67 Colum. L. Rev. 50.

²⁰⁴ G.T. Schwartz, "Tort Law and the Economy in Nineteenth-Century America: A Reinterpretation" (1981) 90 Yale L.J. 1717.

²⁰⁵ R. Epstein, "The Historical Origins and Economic Structure of Workers' Compensation Law" (1982) 16 Ga. L. Rev. 775.

²⁰⁶ D.N. Dewees, "Economic Incentives for Controlling Industrial Disease: The Asbestos Case" (1986) 15 J. Legal Stud. 289.

Turning to outputs, there has been very little empirical study of how care and activity levels have been affected by tort liability for occupational injury. Using statistics on deaths from non-motor vehicle machinery accidents in the early part of the century, Chelius found that, while both expanded tort liability and workers' compensation reduced accidents, the rate of reduction was much greater for workers' compensation than for expanded tort liability.²⁰⁷ Fishback's study of the effects of workers' compensation on coal mining accidents between 1903 and 1930 reaches the opposite conclusion. The shift from very restricted tort liability (that is, with the voluntary assumption of risk, fellow servant, and contributory negligence defenses operative) to either expanded tort liability or workers' compensation actually resulted in higher accident rates.²⁰⁸ The latter findings conflict with anecdotal evidence that employers in the coal industry actually responded to the introduction of workers' compensation with its risk-rated premiums by increasing safety precautions.²⁰⁹ Less formal evidence of the effects of tort liability on accident rates is found in the introduction of the federal *Employers' Liability Act*²¹⁰ in 1908, which allowed considerably expanded railroad liability, abolishing the contributory negligence defence in favour of comparative negligence, and also abolishing the voluntary assumption of risk defence.²¹¹ From the turn of the century until 1908, the number of railroad accidents that injured workers increased dramatically; however, the accident rate declined significantly thereafter.²¹²

Finally, we can compare the exposure of workers to asbestos since 1970 in the United States, where workers exposed to asbestos have brought an avalanche of product liability lawsuits against asbestos producers and suppliers, with exposures of similar workers in Ontario,

²⁰⁷ J.R. Chelius, "Liability for Industrial Accidents: A Comparison of Negligence and Strict Liability Systems" (1976) 5 J. Legal Stud. 293 at 305.

²⁰⁸ P.V. Fishback, "Liability Rules and Accident Prevention in the Workplace: Empirical Evidence from the Early Twentieth Century" (1987) 16 J. Legal Stud. 305 at 318.

²⁰⁹ W. Graebner, *Coal Mining Safety in the Progressive Period* (Lexington, Ken.: University of Kentucky Press, 1976).

²¹⁰ 45 U.S.C.S. §§ 51 *et seq.* (Law. Co-op. 1989).

²¹¹ V.E. Schwartz & L. Mahshagian, "The Federal Employers' Liability Act, a Bane for Workers, a Bust for Railroads, a Boon for Lawyers" (1986) 23 San Diego L. Rev. 1.

²¹² F.H. Hare, "Actions for Personal Injuries and Death of Railroad Workers" (1965) 17 Ala. L. Rev. 201.

where, because of differences in the workers' compensation legislation, there has been no such litigation.²¹³ There was no significant difference in supplier warnings about the hazards of the product, and no significant difference in worker exposure levels, but there was a greater reduction in asbestos use in the United States than in Canada.²¹⁴ The reduction in asbestos use may be a consequence of the litigation, but it may not have been efficient, given the low worker exposures prevailing at the time. Although this limited evidence is not conclusive, it does suggest that even massive tort litigation may not achieve ends substantially different from those achieved through collective bargaining, workers' compensation, and the regulatory system.

B. Compensation

The application of the corrective justice criterion to the workplace raises a conceptual question about the role of corrective justice in a contractual setting, where some have argued that the question is whether the harm suffered by the worker goes beyond that which was implicit or explicit in the bargain between the parties. On the assumption that some workplace injuries may have been subsumed in the bargain, then when combined with the bargain, the tort doctrines applicable at the end of the "transition" period, even though they fell short of optimal deterrence, would more closely satisfy the corrective justice objective. However, the practical impediments to suit, discussed above, also impede the achievement of corrective justice.

Turning to outputs, there is evidence of substantial and successful litigation by injured workers prior to the advent of workers' compensation.²¹⁵ However, it appears that the compensation awarded generally fell far short of full compensation for the injuries suffered, particularly in the case of fatally injured workers. In New York in 1910, survivors rarely recovered more than a few years' worth of the

²¹³ The *Ontario Workmens' Compensation Act*, R.S.O. 1980, c. 539, s. 8(9) prohibits an employee from suing, not just his own employer, but *any* employer in Schedule 1, which includes most private companies in the province, including Johns-Manville, the largest supplier of asbestos.

²¹⁴ D.N. Dewees & R. Daniels, "Prevention and Compensation of Industrial Disease" (1988) 8 *Int'l Rev. L. & Econ.* 51 at 63-66.

²¹⁵ Schwartz, *supra*, note 204 and J.L. Croyle, "Industrial Accident Liability Policy of the Early Twentieth Century" (1978) 7 *J. Legal Stud.* 279.

deceased's wages and retained only 40 per cent of this meagre amount after legal fees and costs were deducted.²¹⁶ In Pennsylvania in 1915, under expanded tort liability, the average settlement for the fatality of a coal miner was just over one year's wage.²¹⁷ Even today, it appears that compensation under product liability suits for risks to health and life falls far short of the value that *workers* place on these risks,²¹⁸ because the damages are designed only to compensate the *survivors*.²¹⁹

With respect to distributive justice concerns, the tort system that existed at the turn of the century was based on negligence, not strict liability; many injured workers could not recover from their employer because of the absence of negligence. This limitation is in addition to the limitations of doctrine and practicality outlined above in the discussion of deterrence. Furthermore, many of those who were compensated were undercompensated. We conclude that the compensation actually paid in fact fell far short of achieving distributive justice goals.

C. Regulatory Alternatives to Tort Law

The evaluation of inputs reveals a number of limitations on the deterrent capability of alternatives to the tort system. Consider first the command-and-control regulatory system. The determination of which problems to regulate is subject to little formal guidance for the U.S. federal Occupational and Safety Health Administration (OSHA), but there are some suspicions as to whether OSHA established the correct priorities.²²⁰ Once a problem is addressed, OSHA attempts to regulate highly diverse workplaces using regulations of general applicability, which imposes costs greater than could be achieved by a more flexible approach.²²¹ Worse, the legislation precludes explicit reference to costs

²¹⁶ Friedman & Ladinsky, *supra*, note 203.

²¹⁷ Fishback, *supra*, note 208.

²¹⁸ Viscusi, *supra*, note 135.

²¹⁹ W.G. Johnson & E. Heler, "Compensation for Death from Asbestos" (1984) 37 *Indus. & Lab. Rel. Rev.* 529.

²²⁰ W.K. Viscusi, "Reforming OSHA Regulation of Workplace Risks" in L. Weiss & M. Klass, eds, *Regulatory Reform: What Actually Happened* (Toronto: Brown, 1986) 234 at 246-52.

²²¹ *Ibid.* at 248.

in determining a standard, which has led to excessively strict standards in some cases, while other standards are insufficient.²²²

Studies have shown that only a fraction, between one-quarter and one-third, of workplace injuries are of a type that could be avoided through government regulation.²²³ Because the actual regulations that have been adopted do not cover all preventable injuries and because they are not ideal in form, the proportion of accidents that could be avoided by perfect enforcement of current regulations is lower still, perhaps one-fifth²²⁴ or one-tenth.²²⁵ While accident risks are imperfectly covered, health risks may be more seriously neglected, which is unfortunate since health risks are less likely than accident risks to be perceived and avoided by the workers themselves.²²⁶

Enforcement, of course, is not perfect. OSHA inspectors visit a workplace on average once every twenty years, and in a given year, workplaces employing only a few million workers are inspected.²²⁷ These inspections give rise to citations for violations of only about 15 per cent of all OSHA standards in any year, in part because inspectors cannot be familiar with all 4,000 standards.²²⁸ The penalties for violating OSHA regulations have been quite small. In 1983, the average was \$57 per violation and the total was \$6 million, both down substantially from a few years earlier.²²⁹ Considering the size of the penalty and the probability of being inspected and cited, the expected penalty is clearly too small to constitute a deterrent when compliance imposes any signif-

²²² W.K. Viscusi, *Risk by Choice: Regulating Health and Safety in the Workplace* (Cambridge, Mass.: Harvard University Press, 1983).

²²³ W.Y. Oi, "On the Economics of Industrial Safety" (1973) 38 *Law & Contemp. Probs.* 669 and R.S. Smith, *The Occupational Safety and Health Act: Its Goals and Achievements* (Washington, D.C.: American Enterprise Institute for Public Policy Research, 1976).

²²⁴ *Ibid.*

²²⁵ J. Mendeloff, *Regulating Safety: An Economic and Political Analysis of Occupational Safety and Health Policy* (Cambridge, Mass.: MIT Press, 1979) and A. Bartel & L. Thomas, "Direct and Indirect Effects of OSHA Regulation" (1985) 28 *J. L. & Econ.* 1 at 20.

²²⁶ Viscusi, *supra*, note 220 at 244.

²²⁷ *Ibid.*

²²⁸ R.S. Smith, "Protecting Workers' Safety and Health" in R.W.J. Poole, ed., *Instead of Regulation* (Toronto: Lexington Books, 1982) 311.

²²⁹ W.K. Viscusi, "The Structure and Enforcement of Job Safety Regulation" (1986) 49:4 *Law & Contemp. Probs.* 127 at 136 and 139.

ificant cost. While workers may use a conviction or citation in bargaining for improved safety in the workplace, the low frequency of citations leaves the overall deterrent effect at a low level.

With these disabilities, we do not expect to find that the establishment of OSHA would have had a substantial direct effect on worker health and safety. The interaction of workers and employers and changes in workplace culture regarding occupational health and safety seem likely to have a far greater effect. This is confirmed by the output data. Workplace accident rates have been declining at about 2 per cent per year for the last half century, and it is difficult to attribute this reduction to any particular regulatory initiative.²³⁰ Studies of aggregate data for the 1970s suggest that OSHA had little effect,²³¹ but studies of later data suggest that some accident reduction occurred, perhaps because OSHA had learned how to deploy its resources more effectively.²³² Case studies of individual regulations have indicated that some effect may result from regulations targeted on particular industries or hazards.²³³ When the costs and benefits of workplace regulations are evaluated, they are often found to be similar, indicating that the regulatory effort was justified, although marginally. However, in a number of individual regulations, the costs have been found to be quite high compared to any reasonable evaluation of the benefits.²³⁴

Workers' compensation is designed primarily to compensate workers, with deterrence of harmful behaviour as a distinctly secondary goal. Because many workers are covered by insurance that is not experience rated or only partially experience rated, we would not expect high levels of deterrence to arise from the workers' compensation system. In the case of occupational disease, the long time lags between worker exposure to hazardous substances and filing of claims for

²³⁰ Viscusi, *supra*, note 220 at 260.

²³¹ Smith, *supra*, note 223; W.K. Viscusi, "The Impact of Occupational Safety and Health Regulation" (1979) 10 *Bell J. Econ.* 117; Mendeloff, *supra*, note 225; and D.P. McCaffery, "An Assessment of OSHA's Recent Effects on Injury Rates" (1983) 18 *J. Hum. Resources* 131.

²³² Viscusi, *supra*, note 220 at 262 and J.T. Scholz & W.B. Gray, "OSHA Enforcement and Workplace Injuries: A Behavioral Approach to Risk Assessment" (1990) 3 *J. Risk & Uncertainty* 283.

²³³ Mendeloff, *supra*, note 225 and W.K. Viscusi, "Cotton Dust Regulation: An OSHA Success Story?" (1985) 4 *J. Pol'y Analysis & Mgmt.* 325.

²³⁴ Mendeloff, *ibid.*; Viscusi, *ibid.*; and Smith, *supra*, note 228.

industrial disease further reduce the deterrent effect. Loss management programmes by insurers probably restore only a small measure of deterrence. It is important to recognize, however, that workers' compensation premiums amount to tens of billions of dollars per year, thousands of times the level of OSHA fines, so even modest premium differentials will cost far more than the expected fine for violating regulatory standards. In fact, studies have found that experience-rated premiums can significantly reduce accident rates²³⁵ and that the level of benefits can also influence the accident rate.²³⁶ The most dramatic finding is the most recent: Moore and Viscusi conclude that the occupational fatality rate in U.S. would have been 20-27 per cent higher were it not for the deterrent effect of workers' compensation,²³⁷ implying that workers' compensation has been far more effective than OSHA, for which the effects on risk levels have been estimated at 2-4 per cent or less, in protecting workers' lives.

Criminal sanctions are not applied sufficiently frequently to give rise to a significant deterrent effect, and despite pleas from labour to jail corporate executives when workers are seriously or fatally injured, it seems unlikely that many cases will arise where the facts would justify using this sanction. Information policies that provide employers and employees information about job hazards, particularly the hazards posed by chemicals in the workplace, have been used in both Canada and the U.S. and are thought to have some effect, particularly for occupational health problems.²³⁸

²³⁵ J.W. Ruser, "Workers' Compensation Insurance, Experience Rating and Occupational Injuries" (1985) 16 *Rand J. Econ.* 487 and J.D. Worrall & R. Butler, "Benefits and Duration of Claims" in J.D. Worrall & D. Appel, eds, *Workers' Compensation Benefits: Adequacy, Equity, and Efficiency* (Ithaca, N.Y.: ILR Press, New York State School of Industrial and Labor Relations, Cornell University, 1985) 57 [hereinafter *Workers' Compensation Benefits*].

²³⁶ J.R. Chelius, "The Control of Industrial Accidents: Economic Theory and Empirical Evidence" (1974) 38 *Law & Contemp. Probs.* 700; McCaffrey, *supra*, note 231; and Ruser, *ibid.*

²³⁷ M.J. Moore & W.K. Viscusi, *Compensation Mechanisms for Job Risks* (Princeton, N.J.: Princeton University Press, 1990) c. 9 and W.K. Viscusi, "Product and Occupational Liability" (Presentation to the University of Toronto Law and Economics Workshop, 1990-91) at 12 [unpublished].

²³⁸ S.D. Carle, "A Hazardous Mix: Discretion to Disclose and Incentives to Suppress under OSHA's Hazard Communication Standard" (1988) 97 *Yale L.J.* 581 and J. Mendeloff, *The Dilemma of Toxic Substance Regulation* (Cambridge, Mass.: MIT Press, 1988).

Overall we conclude that occupational health and safety regulation at the federal, state, and local level has had a beneficial effect, but that the effect of the federal regulatory programme has not been large. Arguably, the provision of information, the evolution of general public attitudes toward worker health and safety, and workplace negotiations regarding health and safety issues have had considerably more impact. In the workplace, where workers have a direct interest in their own health and safety and where the employer shares a portion of that interest, the need for remote government intervention is modest. The workers' compensation system appears to fulfil an important role in promoting workplace safety, both by creating incentives for the employer and by implicitly providing information regarding workplace risks to both employer and employee. Still, standards set by government provide information about risks and prevention and may help to shape the environment within which the workplace bargaining takes place, so that the abolition of those standards might have a substantial adverse effect.

D. Compensatory Alternatives to the Tort System

Here we are principally concerned with workers' compensation regimes. A review of inputs to workers' compensation claims reveals several important barriers to successful recovery. It is difficult for many disease claimants to establish that their disease arises out of their workplace exposure.²³⁹ However, the problem here, equally serious in tort, is scientific uncertainty, not a defect in the workers' compensation system. It is not necessary to prove fault, simplifying the claimant's problems compared to tort. Many jurisdictions formerly required that a claim be filed soon after the last exposure, which effectively precluded most claims for diseases of long latency; but the predominant requirement today is that filing follow after discovery of the disease, not unlike the discovery rule for tort statutes of limitation.²⁴⁰ Finally, many victims of occupational disease may not be aware that their disease arose from

²³⁹ P.S. Barth & H.A. Hunt, *Workers' Compensation and Work-Related Illnesses and Diseases* (Cambridge, Mass.: MIT Press, 1980).

²⁴⁰ P.S. Barth, "On Efforts to Reform Workers' Compensation for Occupational Diseases" in J.R. Chelius, ed., *Current Issues in Workers' Compensation* (Kalamazoo, Mich.: W.E. Upjohn Institute for Employment Research, 1986) 327.

workplace exposure or that they have a right to compensation, a problem that is concentrated in workplaces that are small or non-unionized.²⁴¹ In tort, this problem might be alleviated by an aggressive plaintiffs' bar seeking out workplaces and victims.

The benefits offered by workers' compensation covers medical costs and a large proportion of net lost wages. There is no compensation for reduced performance off the job, lost enjoyment of life, or pain and suffering.²⁴² This reduction in compensation from that available under tort is offset by the much shorter wait for the receipt of benefits.

Most workers in the U.S. and Canada are covered by workers' compensation, and those that are not have recourse to tort. Surveys have found, however, that only 40 to 50 per cent of those hospitalized for injuries during working time have their medical costs paid by workers' compensation, in part because of waiting periods before benefits begin to accrue.²⁴³ Unfortunately, there is evidence that a much smaller fraction of those with occupationally related diseases apply for or receive compensation because of ignorance or because of strict disease eligibility guidelines.²⁴⁴ With respect to wage replacement, most of those who receive such benefits receive 90 per cent or more of their net lost wages. Low-income workers are likely to fully replace lost wages, while high-income workers may receive only two-thirds because of payment limits.²⁴⁵ In the past, limits on weekly payments and on the duration of payments led to serious undercompensation of the severely disabled, a situation that has improved to the extent that many believe that current benefit levels are, at last, adequate. One exception is the failure of most states to tie benefits to inflation, which may lead to the long term impoverishment of those with permanent disabilities. The general conclusion, therefore, is that workers' compensation appears to adequately compensate most injured workers, with a few specific areas, such as long term disability and occupational disease, still falling short.

²⁴¹ Barth & Hunt, *supra*, note 239 and P.C. Weiler, *Protecting the Worker from Disability: Challenges for the Eighties* (Toronto: Ministry of Labour, 1983).

²⁴² J.D. Worrall & D. Appel, "Some Benefit Issues in Workers' Compensation" in *Workers' Compensation Benefits*, *supra*, note 235, 1.

²⁴³ D. Hensler *et al.*, *supra*, note 15.

²⁴⁴ J.D. Worrall, "Nominal Costs, Nominal Prices, and Nominal Profits" in *Current Issues in Workers' Compensation*, *supra*, note 240, 251.

²⁴⁵ Worrall & Appel, *supra*, note 242.

There is substantial evidence that workers' compensation systems deliver their benefits more efficiently than the tort system. Administrative costs consume 10 to 20 per cent of workers' compensation premiums in the U.S.²⁴⁶ and 10 per cent in Ontario,²⁴⁷ compared to close to 50 per cent for the tort system, in addition to which workers' compensation handles many small claims that would not be brought under a tort system. Delays between injury and compensation are also much shorter under workers' compensation than under tort law.²⁴⁸

This relatively impressive performance of the workers' compensation system, and its considerable advantages and modest disadvantages relative to tort, may explain why criticism of workers' compensation over many decades has consistently led to reform and to adjustment rather than to abolition.

VII. CONCLUSIONS

Where does this review of the empirical evidence on the efficacy of the tort system lead us? With respect to deterrence, the evidence in each of the five categories of accidents reviewed is quite mixed: first, in terms of what impact the civil liability system has on behaviour, and second, in terms of whether such liability induced changes in behaviour as have occurred have moved us closer to the social optimum. The deterrent properties of the tort system seem strongest with respect to auto accidents and weakest with respect to environmentally related accidents. The incentive effects of the system are mixed in the case of medical malpractice and product related accidents, making net welfare judgments highly problematic. In the case of workplace accidents, workers' compensation levies appear to have stronger deterrent effects than the tort system did have or might have if resurrected in this context. With respect to an expansive distributive justice perspective, the tort system appears to fail badly in all five areas, the failure being most severe with respect to environmentally related injuries, product related

²⁴⁶ W.K. Viscusi, "Lessons from Workers' Compensation for Tort Liability Reform" (John R. Commons Lecture, University of Wisconsin, 1990) [unpublished] and Weiler, *supra*, note 87 at 139.

²⁴⁷ Weiler, *supra*, note 241.

²⁴⁸ R. Conley & J. Noble, *Workers' Compensation and Reform: Challenge for the 80's* (Interdepartmental Research Report) (1979) at 57 [unpublished].

injuries, and medically induced injuries. With respect to a corrective justice perspective, the tort system appears to perform reasonably well in the automobile accident context, but much less well with respect to medically induced injuries and environmentally related injuries. Its performance from this perspective with respect to product related accidents is unclear.

While this is a relatively bleak scorecard, it is crucial to ask: compared to what? This requires an evaluation of the existing empirical evidence on the alternative deterrent and compensatory instruments to the tort system, using similar measures of performance to those that we have applied to the tort system. With respect to deterrence, the empirical evidence on the efficacy of penal and regulatory alternatives to the tort system in the five accident contexts of concern to us is also decidedly mixed.

In the case of traffic safety, penal sanctions that focus on individual driver behaviour appear to be of limited efficacy in reducing the accident and injury rate, although recent mandatory seat-belt laws appear to yield significant safety gains. Also, despite early controversy, empirical evidence now suggests that significant safety gains have been realized from motor vehicle design standards. Exposure-limiting regulatory strategies, such as raising the drinking and driving age and graduated licensing regimes for young or inexperienced drivers, have also been effective.

With respect to medical malpractice, current licensing regimes and correlative disciplinary mechanisms, for the most part, do not focus on negligence or incompetence and appear to have little impact on the quality of post-entry medical care. Voluntary or mandatory continuing education programmes also appear to have only a marginal impact on the quality of medical care. Quality assurance and risk management programmes that are designed to uncover and redress specific practice deficiencies at either the individual practitioner or institutional level appear to be somewhat more effective, although the adoption of both kinds of programmes seems to have been driven, in significant part, by the escalating costs of the liability system. Thus, tort law can claim some credit for inducing these regulatory responses. However, the achievements of both the tort system and regulatory alternatives, or complements thereto, in reducing the incidence of substandard medical care have been modest indeed.

With respect to product related accidents, other than motor vehicle accidents, regulatory interventions appear to have had only a modest effect on the injury rate and have often entailed costs wholly disproportionate to the benefits.

Turning to environmentally related accidents, environmental regulation has registered some notable successes in reducing pollutant emissions that seem well beyond the reach of the tort system, although in some cases entailing costs disproportionate to the benefits. In other cases, potentially hazardous toxic substances have not attracted regulatory attention. Here, factors that have disabled the tort system as a deterrent instrument have also hampered the regulatory system—uncertain causation, scientifically controversial etiologies, multiple sources, and dispersed victims.

In the case of workplace safety, federal safety regulations have had a modest impact on workplace injury rates, again sometimes entailing costs wholly disproportionate to the benefits. Moreover, many occupational health hazards (as opposed to workplace injuries) have not been effectively addressed by regulatory policies. Indeed, the safety effects of workers' compensation levies appear to dwarf the safety effects realized by federal regulation.

With respect to compensation, alternative compensation regimes to the tort system have played a marginal role with respect to medical, product, and environmentally related personal injuries both in the U.S. and in most other jurisdictions. In the case of medically related injuries, experience with programmes in New Zealand and Sweden suggests that no-fault compensation systems are viable alternatives to the tort system. Although they suffer from weak internalization of accident costs to wrongdoers, no-fault systems hold out the promise of compensating a wider range of victims more expeditiously and at lower administrative cost. In the case of traffic related accidents, the empirical evidence suggests that various kinds of no-fault compensation systems can again deliver compensatory benefits, at least for pecuniary losses, at lower administrative cost and with greater speed than the tort system. Even with substantial risk rating of premiums or contributions to such schemes, there is still debate whether a significant loss in deterrence arises from curtailment or abrogation of the tort system. With respect to workplace injuries or disabilities, workers' compensation schemes appear to deliver relatively complete compensation for pecuniary losses (except for long term disability) at relatively low administrative cost and

more expeditiously than the tort system, as well as achieving significant safety gains. More individualized risk rating of workers' compensation levies than is typically the case at present holds out the potential for even greater safety gains.²⁴⁹ However, workers' compensation schemes have performed much less well with respect to occupationally related illness than to physical injuries. As with the tort system, problems of causation in settings involving complex etiologies and confounding intervening factors significantly afflict the claims adjudication process.

Beyond these injury-specific alternative compensation schemes, the availability of more general sources of compensation must be evaluated in assessing the compensation gaps in each of the foregoing contexts. Rounding out the total compensation picture are privately held life insurance, health insurance, and sick leave and disability insurance, as well as social insurance benefits, such as retirement benefits, survivors' benefits, disability benefits, Medicare, Medicaid, and Supplemental Security Income. Table 4 summarizes the relative contributions of various sources of compensation for injury and illness in the U.S. for the years 1960, 1982, and 1984.

²⁴⁹ Weiler, *supra*, note 241 at 113-16.

Table 4
Benefits Paid for Injury and Illness by Principal
Loss-Shifting Systems, 1960, 1982, 1984

<i>Loss-Shifting Mechanism</i>	<i>Percentage of Total</i>		
	<i>1960</i>	<i>1982</i>	<i>1984</i>
Total Tort (including no-fault)	7.9%	8.8%	9.8%
Workers' & Other Employment-			
Mandated Compensation	5.4%	5.0%	5.3%
Private Loss Insurance	36.5%	29.1%	31.0%
Sick Leave	5.1%	3.0%	2.8%
Social Insurance	18.1%	30.8%	28.9%
Public Assistance	6.3%	11.0%	11.1%
Veterans' Benefits	7.3%	5.4%	5.1%
Other Public Health	9.4%	3.7%	3.2%
Private Health	4.0%	3.0%	2.8%
Total Benefits Paid	100%	100%	100%

Columns do not add perfectly due to rounding.

Source: J. O'Connell & J. Guinivan, "An Irrational Combination: The Relative Expansion of Liability Insurance and Contraction of Loss Insurance" (1988) 49 Ohio St. L.J. 757 at 759.

Three general points can be made about this mixed system of compensation. First, while the above table aggregates only injury and illness, a recent Rand study of compensation for non-fatal injuries from accidents in the U.S. similarly finds that the tort system contributes a small fraction—about 7 per cent—of total compensation for economic losses from injury.²⁵⁰ However, in particular contexts, especially auto accidents, tort law assumes a more prominent role, accounting for 22 per cent of compensation for economic losses in this context.²⁵¹ Second, the plethora of compensatory systems in place lead to various problems of

²⁵⁰ D. Hensler *et al.*, *Compensation for Accidental Injuries in the United States* (Santa Monica: Rand, 1991).

²⁵¹ *Ibid.* at 107-08.

co-ordination among them, creating common instances of both over and undercompensation.²⁵² Third, even setting aside these co-ordination problems, there are still very significant and systematic gaps in compensation coverage for injury and illness. For example, about 18 per cent of the U.S. population hold no private insurance for medical costs (about 40 million people), while others are significantly underinsured. Nevertheless, the Rand study estimates that 84 per cent of the costs of basic health care with respect to injuries from accidents in the U.S. were borne by some source other than the injured individual. With the supplementation of Medicare, this figure approaches 93 per cent for the elderly, although most injured persons were not reimbursed for other health care expenses such as special equipment, home modifications, help with home chores, and vocational rehabilitation.²⁵³ However, much more serious gaps exist with respect to income loss arising from non-occupationally induced disability. The Rand study found that about one-quarter of injuries occurred while people were engaged in home activities, another quarter while people were on the job or on their way to and from work, and about 30 per cent while people were engaged in leisure activities. About one-third of accidents occurred in private residences, one-quarter on streets and highways, and about 8 per cent on industrial or construction sites.²⁵⁴ Over all types of accidents, individuals bear about 38 per cent of the pecuniary costs directly in out-of-pocket payments or in reduced earnings.²⁵⁵ While those experiencing short-term work loss recover about 66 per cent of their pre-tax income loss, those unable to work permanently or restricted significantly in the work they can perform recover only about 20 per cent of their pre-tax income loss.²⁵⁶ Moreover, these data relate to non-fatal injuries from accidents, and one would expect the compensation gaps to be substantially more severe with respect to fatalities and especially illness related disabilities. This has led to criticisms of workers' compensation schemes as reflecting an "industrial preference," or even much broader accident compen-

²⁵² See J. O'Connell & J. Barker, "Compensation for Injury & Illness: An Update of the Conrad-Morgan Tabulations" (1986) 47 Ohio St. L.J. 913 at 914-18.

²⁵³ Hensler *et al.*, *supra*, note 250 at 70-73.

²⁵⁴ *Ibid.* at 27.

²⁵⁵ *Ibid.* at 105.

²⁵⁶ *Ibid.*

sation schemes, such as the New Zealand Accident Compensation Plan,²⁵⁷ as reflecting an "accident preference."²⁵⁸ However, creating general compensation or social insurance schemes for illness related disabilities²⁵⁹ or other misfortunes that lead to income interruptions or deficiencies must confront the widely differential severity of the moral hazard problem for causal agents and claimants that arises in the various misfortune contexts that might plausibly engage our concern.²⁶⁰ Thus, a general social insurance alternative to the tort system, with non-risk rated financial contributions and high levels of income coverage, does not seem a feasible alternative.²⁶¹

In the final analysis, our review of the empirical evidence leads us to a relatively bleak judgment about the properties of the tort system as a deterrent mechanism and an even bleaker evaluation of the tort system as a compensatory mechanism. In most of the accident contexts that we have reviewed, regulatory alternatives seem to hold out more promise than the tort system from a deterrence perspective,²⁶² although, unfortunately, their adoption has sometimes been motivated by the threat of tort liability (and may not have occurred in its absence). Much room also exists for improving regulatory performance in all the accident contexts we have reviewed,²⁶³ but even with improvement it will retain many deficiencies.

²⁵⁷ See T.G. Ison, *Accident Compensation: A Commentary on the New Zealand Scheme* (London: Croom Helm, 1980).

²⁵⁸ See Trebilcock, *supra*, note 63.

²⁵⁹ Illness related disabilities are estimated at ten times the disabilities caused by accidents. *Ibid.* at 41.

²⁶⁰ *Ibid.*

²⁶¹ For an opposing argument and a detailed set of proposals, see S.D. Sugarman, *Doing Away with Personal Injury Law: New Compensation Mechanisms for Victims, Consumers, and Business* (New York: Quorum Books, 1989) and review thereof by M.J. Trebilcock, (1992) 42 U.T.L.J. 132.

²⁶² On this issue, generally, see S. Shavell, "Liability for Harm Versus Regulation of Safety" (1984) 13 J. Legal Stud. 357 and D. Wittman, "Prior Regulation Versus Post Liability: The Choice Between Input and Output Monitoring" (1977) 6 J. Legal Stud. 193.

²⁶³ See, for example, C.R. Sunstein, *After the Rights Revolution: Reconceiving the Regulatory State* (Cambridge, Mass.: Harvard University Press, 1990); R. Howse, "Retrenchment, Reform or Revolution? The Shift to Incentives and the Future of the Regulatory State" *Alta L. Rev.* (forthcoming); and R. Howse, J.R.S. Prichard & M.J. Trebilcock, "Smaller or Smarter Government?" (1990) 40 U.T.L.J. 498.

With respect to compensation, workers' compensation seems widely accepted as a superior alternative to the tort system in the case of workplace accidents. Automobile no-fault schemes and perhaps medical misadventure no-fault schemes seem to exhibit superior compensatory qualities to the tort system and far lower administrative costs. However, there is unresolved controversy in both cases as to the extent of the deterrence losses that are likely to be sustained by curtailment or abolition of the tort system in these contexts. In the case of product and environmentally related injuries, no general compensatory alternatives to the tort system for personal injuries readily suggest themselves. Here, and in other accident and disability contexts, we are left with no alternative but to attempt to co-ordinate in a more rational fashion the present mix of tort and private and social insurance sources of compensation, and to close some of the more glaring compensation gaps with respect to health care costs and particularly income losses in the case of long term disabilities.