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Liability for Future Harm

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I. INTRODUCTION

The House of Lords and the United States Supreme Court have recently addressed the issue of liability for a risk of future illness. This issue arose in connection with employees wrongfully exposed by their employers to asbestos. As a result of this wrongful exposure, the employees exhibited symptoms indicating an increased risk of developing fatal cancer diseases in the future. Both decisions have assumed as a common ground that this risk per se is not actionable in torts.[1] This presupposition moved the focus of the Law Lords' and the Justices' attention from real harm to the ethereal damage. The issue adjudicated in both instances was whether the plaintiffs are entitled to recover from their employers compensation for the mental anguish caused by the fear of developing cancer.

The American case, *Norfolk & Western Railway Company v Ayres*,[2] involved railroad workers who sued their employer under the Federal Employers Liability Act. The suit attributed to the defendant liability for emotional distress suffered by the plaintiffs as a consequence of contracting asbestosis. Each plaintiff contracted this disease following his exposure to an impermissibly hazardous quantity of asbestos, for which the defendant was unquestionably responsible. The plaintiffs' emotional distress (fear and anxiety) originated from a worrying statistical fact: about ten per cent of the people in a medical condition similar to theirs develop mesothelioma – a fatal cancerous disease – at some point in the future. The Supreme Court's narrow (5-4) majority decision allowed recovery to plaintiffs whose distress was proven to be 'genuine and serious'. Note again that recovery was allowed not for the increased risk of contracting cancer, but rather for the plaintiffs' fear of becoming afflicted in the future. The Court's decision relied on both policy and doctrine. As a policy matter, the Court underscored the problematics of the two-disease requirement that the defendant asked it to interpose: this requirement would deny compensation to an asbestosis sufferer who never develops cancer. As a result, this sufferer's fear of contracting cancer at some point in the future – an undeniably harmful consequence of the defendant's wrongdoing – would never be actionable in torts. As far as doctrine is concerned, courts across the United States have long recognised a tort victim's right to sue for any serious emotional harm resulting from her present physical injury. Any such harm is part of the

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[1] This assumption is more explicit in the British than in the American decision. See below.
[2] *Norfolk & Western Railway Company v Ayres* 538 US 135 (2003) [*Ayres*].

victim's 'pain and suffering'. This parasitic actionability is a deeply rooted common law principle. Allowing the plaintiffs to recover compensation for their asbestosis-induced fear therefore does not break away from the common law tradition.

The dissenters' objection to this decision alluded (inter alia) to its socially deleterious consequences. According to the dissent, the Court's compensatory generosity might drain the funds available for compensating *real* asbestos victims for their physical injuries. These injuries – held the dissent – are more immediate and more serious than the disruption of the plaintiffs' peace of mind.

The British case, *Johnston v NEI International Combustion Ltd*,[3] involved plaintiffs who developed pleural plaques (fibrous thickening of pleural membranes surrounding the lungs). Pleural plaques are generally benign. Nor do they cause any asbestos-related diseases. Those plaques, however, indicate the presence of asbestos fibres in the person's lungs and pleura. Asbestos, in turn, may independently cause a cancerous disease – a grim prospect upon which the plaintiffs based their suit. According to the plaintiffs, anxiety and emotional distress associated with this prospect constitute compensable harm.

The House of Lords disagreed. It held that a risk of future illness and the attendant anxiety are not actionable in torts as a stand-alone harm. The Law Lords clarified, however, that the parasitic actionability doctrine will still allow recovery in appropriate cases. That is, a person who sustains compensable injury can recover damages for the fear that the injury will develop into a more serious harm in the future. This factor makes *Johnston* the doctrinal equivalent of *Ayres*. The two decisions, however, are not completely identical to each other. *Ayres* contains no express pronouncement on whether a risk of future harm can ever become actionable as a stand-alone damage.[4] *Johnston*, in contrast, holds unequivocally that such risks are not actionable in torts. The Law Lords' adherence to the parasitic actionability doctrine was unambiguous and unqualified.[5]

In the pages ahead, we conduct a normative exploration of this issue. We examine the desirability of a rule that imposes negligence-based liability for a risk of future illness even when there is not any physical harm in the present. Our desirability criteria are efficiency and justice. Based on these criteria, we articulate the reasons for making a stand-alone risk of future illness actionable in torts. We argue that a person wrongfully exposed to such risk should be entitled to probabilistic compensation that matches his prospect of becoming ill. This compensation should equal the harm resulting from the illness multiplied by the illness's probability.

After demonstrating the efficiency and justice of this proposal, we discuss counterarguments. We first consider the objections to the probabilistic recovery rule as applying in cases of indeterminate causation. Those cases involve physical injury that may or may not have been caused by the defendant's negligence ('past-injury cases'). We show that arguments against probabilistic recovery in past-injury cases do not hold with respect to risks of future injury. We then discuss two additional objections to our proposal. One of them holds that small risks of future illness should not be actionable: allowing people to sue for such risks would be more costly than beneficial. We agree with this point and limit our proposal to suits involving substantial risk of illness.

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[3] *Johnston v NEI International Combustion Ltd* [2007] UKHL 39, [2008] 1 AC 281 [*Johnston*].

[4] See *Ayres* (n 2) 153 (Justice Ginsburg opinion): 'But the asbestosis claimants did not seek, and the trial court did not allow, discrete damages for their increased risk of future cancer'.

[5] *Johnston* (n 3) 10, 17, 32, 38, 40–41.

A much stronger objection to our proposal identifies a serious problem of collective action. Our proposal would allow tort victims to choose between immediate compensation for the risk of future illness and the 'wait and see' strategy. Victims who choose to wait and see would either become ill or avoid the illness. Victims who ultimately avoid the illness would not be able to sue the defendant. The remaining ill victims would become eligible to full compensation for the harm suffered. Alas, those victims' ability to recover compensation would depend on the defendant's solvency. If the defendant becomes insolvent, it would not compensate those victims. The defendant's prospect of remaining solvent would crucially depend on the victims' initial choice. If many victims choose to recover the immediate probability-based compensation, the defendant's funds may shrink to a degree that will deny compensation to wait-and-seers. Every victim would anticipate this contingency. The victims, however, would not be able to coordinate their suits because the required coordination is too costly to establish and enforce. Absence of coordination and the diluted-fund prospect would prompt all victims to opt for the instant probability-based recovery.

This problem is real. We believe, however, that it can be resolved by courts or through governmental intervention and offer two such solutions.

Structurally, our argument unfolds in three sections. In section II, we carry out a comparative analysis of *Ayres* and *Johnston*. In section III, we analyse the virtues and vices of probabilistic recovery in past-injury cases (also identifiable as cases of indeterminate causation) and relate this analysis to the future illness problem. In section IV, we make out the case for making risks of future illness actionable in torts and develop a number of suggestions on how to operationalise this proposal. A short conclusion follows.

II. *AYRES V JOHNSTON*

A. *Ayres*

In *Ayres*,[6] the United States Supreme Court addressed the question of whether an employee wrongfully exposed to asbestos at work is entitled to recover from his employer compensation for the fear of developing cancer. The plaintiffs suffered from asbestosis caused by a work-related excessive exposure to asbestos. About 10 per cent of the people suffering from this disease develop fatal cancer. Five Justices allowed recovery for the plaintiffs' fear. Specifically, they affirmed the plaintiffs' recoveries for pain and suffering – mostly fear-related[7] – ranging from $500,000 to $1,200,000.[8] The dissent opined that no such recovery should be allowed.

Justice Ginsburg, writing for the Court, held that mental anguish resulting from a person's fear of developing cancer in the future is compensable under the Federal Employers' Liability Act[9] as part of a successful plaintiff's entitlement to compensation for pain and suffering.[10] She set two cumulative conditions for a plaintiff's eligibility for this compensation.

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[6] *Ayres* (n 2).
[7] Justice Kennedy emphasised that the plaintiffs have sustained no significant harm other than this fear. See *Ayres* (n 2) 179–80.
[8] The lower recovery amounts were awarded to smokers owing to their comparative negligence. *Ayres* (n 2) 179.
[9] Federal Employers' Liability Act 45 USCS § 51 and following.
[10] *Ayres* (n 2).

First, the plaintiff must prove by a preponderance of the evidence that his fear is genuine and serious.[11] Second, the plaintiff must preponderantly establish that this fear results from an illness for which the defendant is responsible.[12]

Justice Kennedy spoke for the dissent. According to him, the plaintiffs' suits were causatively weak. First, the alleged fears could not be considered a direct consequence of the plaintiffs' disease.[13] Second, there was no dependable scientific proof of the causal nexus between the plaintiffs' disease and cancer.[14] Third, the alleged harms were speculative and quantitatively insignificant, given the presence of a significant asbestos-unrelated risk of contracting cancer (for smokers, in particular).[15] Justice Kennedy also alluded to social policy. According to him, making bare fears of cancer compensable would exhaust the financial resources that defendants could use for compensating asbestos victims who actually develop cancer.[16]

Justice Breyer took a middle-ground approach. He agreed with the Court that a tort victim's fear of a future illness should be actionable when it is genuine, serious, and originates from a proven disease. Yet, according to him, compensation for such fear should be generally unavailable when the following conditions are present:

(1) actual development of the disease can neither be expected nor ruled out for many years;
(2) fear of the disease is separately compensable if the disease occurs; and
(3) fear of the disease is based upon risks not significantly different in kind from the background risks that all individuals face.[17]

Justice Breyer clarified that these compensation-denying rules are not meant to be rigid:

'This is not to say that fear of cancer is never reimbursable. The conditions above may not hold. Even when they do, I would, consistent with the sense of the common law, permit recovery where the fear of cancer is unusually severe – where it significantly and detrimentally affects the plaintiff's ability to carry on with everyday life and work.'[18]

B. *Johnston*

In *Johnston*, as in *Ayres*, the claimants were exposed to excessive quantities of asbestos by their employers. The claimants, however, contracted no recognisable diseases (with the exception of one plaintiff who developed clinical depression). Instead, they developed pleural plaques – a condition not amounting to a physical impairment or disablement. Not being a disease, pleural plaques indicate the presence of asbestos fibers in the person's lungs. This contamination puts the person at risk of developing cancer in the future.[19]

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[11] *Ayres* (n 2) 157. Another issue was whether damages should be apportioned among multiple tortfeasors in a way that would allow the defendant to reduce its compensation duty to the plaintiff. The Justices have reached a unanimous opinion that the Federal Employers' Liability Act allows no such apportionment, ibid 159–66, but the defendants could still bring 'indemnification and contribution actions against third parties under otherwise applicable state or federal law.' ibid 162.

[12] *Ayres* (n 2) 157.

[13] ibid 171–72.

[14] *i*bid 173.

[15] ibid 179.

[16] ibid 168–69.

[17] ibid 187.

[18] ibid.

[19] As attested in *Johnston* (n 3)[80], 'The Claimant is at risk of future development of asbestosis (1%), diffuse pleural thickening (1%) and mesothelioma (5%) and as a result suffers anxiety for his future health and welfare'.

This risk may instill in the person fear of death and related anxieties. Alternatively, it may exacerbate a person's preexisting fear and anxiety. The claimants in *Johnston* had developed such anxieties. The House of Lords consequently had to decide whether this mental and emotional anguish constitutes compensable damage under the negligence doctrine.[20]

The Law Lords decided that it does not. This holding was both categorical and unanimous (it also extended to the claimant with a fully-blown depression). The Law Lords dismissed the claimants' argument that a combination of non-actionable plaques, a non-actionable risk of illness and a non-actionable anxiety constitutes actionable harm.[21] As Lord Scott explained, this argument fails 'because [n]aught plus naught plus naught equals naught'.[22] The Law Lords clarified, however, that presence of an actionable injury – asbestosis being an example – would make the attendant anxiety actionable as well.[23]

C. *Ayres*, *Johnston*, and Liability for Future Harms

We now attempt to extrapolate the two courts' attitude toward liability for a wrongfully imposed risk of illness. We leave behind the anxiety-related causes of action and focus instead on the risk of illness as compensable harm. We distinguish, as the courts did, between two scenarios. In the first scenario, the risk of illness originates from the plaintiff's actionable injury, for which the defendant is responsible. In the second, the plaintiff sustains no actionable injury and sues the defendant for the risk of harm as a stand-alone damage.

Under the first scenario, the Law Lords in *Johnston* would impose liability for the risk. As Lord Scott explained:

> [I]t is common ground that if some physical injury has been caused by the negligence, so that a tortious cause of action has accrued to the victim, the victim can recover damages not simply for his injury in its present state but also for the risk that the injury may worsen in the future[24]

Ayres did not address this issue.

Under the second scenario, the Law Lords in *Johnston* would impose no liability whatsoever. As already indicated, they held unanimously that a stand-alone risk of future harm does not constitute actionable harm.[25] The *Ayres* decision did not address this issue expressly,[26] but it seems that also American law would preclude liability for a stand-alone risk of future illness.

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[20] The Law Lords parenthetically mentioned the possibility of a contract-based action, but made no decision on that matter since it was not argued by the plaintiffs. *Johnston* (n 3) [59], [74].
[21] *Johnston* (n 3) [89].
[22] ibid [73].
[23] ibid [67].
[24] ibid.
[25] See section I.A.
[26] See n 4 and accompanying text.

<div align="center">III. PAST HARM</div>

A. Paradigmatic Cases

The problem of indeterminate causation arises when the defendant may or may not be the cause of the harm wrongfully inflicted on the plaintiff.[27] In the next few paragraphs, we present the paradigmatic cases in which this problem arises.

Consider a case in which several wrongdoers, acting independently of each other, negligently expose the plaintiff to a risk of sustaining harm. The plaintiff consequently faces several independent risks of sustaining harm. One of those risks materialises and the plaintiff suffers harm. This harm was brought about by one of the wrongdoers, whose identity is unknown.

In this type of cases – labelled 'unidentifiable wrongdoer' – both English and American courts allowed recovery. They held that the wrongdoers are jointly and severally liable for the plaintiff's damage.[28] As an alternative to this remedy, courts could have awarded pro-rated recovery: an award that equals the plaintiff's harm multiplied by each defendant's probability of being the cause of the harm (the 'probabilistic recovery principle', or PRP, for short). Courts, however, almost uniformly declined to adopt PRP in 'unidentifiable wrongdoer' cases.[29] This policy cannot be explained by the judges' mistrust of mathematical probabilities, because they do something very similar to applying PRP when they apportion damages among jointly liable tortfeasors (and also between tortfeasors and their victims). The decision to reject PRP and hold wrongdoers jointly and severally liable for the victim's entire damage is best explained by the courts' desire to afford the victim maximal protection against wrongdoers' insolvency.

Another paradigmatic case features a wrongful risk-creator and a natural cause as two mutually exclusive explanations for the victim's injury. Neither of these causal explanations can be confirmed or ruled out. Consider a doctor who negligently misdiagnosed a patient, thereby reducing the patient's chances to recover. The patient ultimately did not recover, but this outcome is attributable to his pre-existing medical condition for which the doctor is not responsible. Arguably, because of this condition, the patient would not have recovered even if the doctor had diagnosed him properly. Assume that the probability of this

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[27] In other cases that we discussed elsewhere, the defendant caused part of the plaintiff's harm, but the exact amount of that part could not be established. See Ariel Porat and Alex Stein, *Tort Liability Under Uncertainty* (Oxford, Oxford University Press, 2001) 76–83, 201–06; Ariel Porat and Alex Stein, 'Indeterminate Causation and Apportionment of Damages: An Essay on Holtby, Allen and Fairchild' (2003) 23 *OJLS* 667.

[28] *Fairchild v Glenhaven Funeral Services Ltd* [2002] UKHL 22, [2003] 1 AC 32 (in a subsequent decision of the House of Lords it was assumed that *Fairchild* left undecided the question of whether the defendants should be either jointly and severally liable to the claimant for the entire indivisible disease or whether they should be severally liable according to their relative contribution to the risk. *See Barker v Corus (UK) plc* [2006] UKHL 20, [2006] 2 AC 572. The *Barker* decision adopted the second approach. See n 29); *Summers v Tice* (1948) 199 P 2d 1 (Cal 1948). Some American courts awarded this remedy even against defendants whose negligence was unproven. See eg, *Ybarra v Spangard* 154 P2d 687 (Cal 1944). This decision, however, is an outlier.

[29] The main American exception is the 'Market Share Liability' doctrine: see *Sindell v Abbott* 607 P 2d 924 (Cal 1980); *Hymovitz v Eli Lilly Co* 539 NE 2d 1069 (NY 1989). The House of Lords applied *PRP* in a case where the harm to the plaintiff was the result of either a wrongful exposure to asbestos caused by his employer or of a non-wrongful exposure that occurred when the plaintiff was self-employed. See *Barker v Corus (UK) plc* (n 28). The legislature, however, overturned this ruling by introducing s 3 into the Compensation Act 2006 (c 29). This section only applies to mesothelioma victims.

argument, raised by the doctor, is 50 per cent or higher, which means that the patient is unable to establish his causal allegation against the doctor by a preponderance of the evidence. We identify cases exhibiting these characteristics as 'lost chance' cases.

Under the traditional 'winner takes all' approach, to which English courts adhere in such cases,[30] the patient would recover no compensation whatsoever. Under PRP, in contrast, the patient would recover compensation that equals his harm multiplied by the probability of the causal claim that attributes this harm to the doctor's negligence. In the United States, several courts have taken this route, while others have refused to do so.[31] In a recent decision, the House of Lords considered the adoption of PRP for 'lost chance' cases, but decided against it by a 3-2 majority.[32]

Another illustrative case involves a group of employees suffering from a disease that can be equally attributed to the employees' predisposition to develop the disease and to their exposure to asbestos wrongfully caused by their employer. While it can be established by a preponderance of the evidence that a certain percentage of the employees – typically less than 50 per cent of them – suffering from the disease contacted it because of the wrongful exposure to asbestos, it cannot be established who those employees are. We define cases falling into this category as 'unidentifiable victim' cases. Under the traditional 'winner takes all' approach that applies in England and in the United States, the court must dismiss all employees' suits against their employer. Under PRP, the employer must compensate all employees for the harm they suffered multiplied by the probability of the claim that the harm was caused by the employer's wrongdoing.[33]

B. The Vices of Probabilistic Recovery

PRP offers an attractive solution to the problem of indeterminate causation that arises in past-injury cases. Under this principle, victims recover partial compensation for their possibly wrongful injuries and wrongdoers pay for their misdeeds rather than go scot-free. On many occasions, PRP is preferable from an efficiency perspective because it promotes optimal deterrence of wrongdoers. The principle is also appealing as a retributive device because wrongdoers are required to pay for their wrongs even in the absence of a clear-cut causal nexus between those wrongs and the victims' harms (some theorists do not consider harm a *sine qua non* prerequisite of liability[34]).

These virtues, however, come accompanied with a number of vices that some consider fatal. One of those vices, which we discuss first, is epistemological. All others are (interchangeably) operational and moral.

As a factual matter, in each of the aforementioned cases, the defendant had either caused the plaintiff's entire harm or no harm at all. The defendant certainly did not cause *part* of the harm. Consequently, all decisions that PRP prompts courts to deliver would be

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[30] See *Hotson v East Berkshire Area Health Authority* [1987] AC 750 (HL); *Gregg v Scott* [2005] 2 AC 176 (HL).

[31] For applications of PRP see *Herskovits v Group Health Cooperative of Puget Sound* 664 P 2d 474 (Wash 1983). For other approaches taken by American courts, see Porat and Stein, *Tort Liability Under Uncertainty* (n 27) 73–76.

[32] *Gregg v Scott* (n 30).

[33] Porat and Stein, *Tort Liability Under Uncertainty* (n 27) 70–73, 193–95. See *Barker v Corus* (n 28). Even though this case deals with a bit different scenario, it may signal the emergence of a different approach to PRP in general, and, specifically, to the principle's application to 'unidentifiable victim' cases.

[34] See CH Schroeder 'Corrective Justice & Liability for Increasing Risks' (1990) 37 *UCLA Law Review* 439. For a retributivist account of harm as a pre-requisite for tort liability, see Jeremy Waldron, 'Moments of Carelessness and Massive Loss' in David G Owen (ed), *Philosophical Foundations of Tort Law* (Oxford, Clarendon Press, 1995) 387.

factually incorrect. This comprehensive incorrectness is a serious epistemological vice that also creates tensions with corrective justice.[35]

Application of PRP would also present moral and operational hurdles. Courts would have to make complicated determinations of probabilities, instead of deciding cases on a 'more probable than not' basis. That would increase *litigation costs*. In addition, PRP would allow courts to hold defendants liable on the basis of *naked statistics*. This liability format is contentious from a moral point of view.[36] Relatedly, PRP authorises courts to impose liability for *bare risks*. This authorisation is morally problematic as well: it clashes with the deeply entrenched moral intuition that considers the actual infliction of harm to be a prerequisite for imposing liability in torts.[37] According to this intuition, pure endangerment cannot be a reason for holding its creator liable.

From the deterrence perspective, PRP might be operationally *redundant*, as the 'winner takes all' rule works fine in deterring wrongdoers across cases. Under this rule, suits that are not preponderantly probable fail completely. This failure erodes deterrence because some (and possibly many) of the failed suits are meritorious. The 'winner takes all' rule, however, also provides that suits with a probability greater than 0.5 are unqualified winners. Plaintiffs recover full compensation even when their claims are only slightly more probable than not. This provision increases the expected amount of compensation for prospective wrong-doers and compensates for the erosion of deterrence on the other side.

Furthermore, PRP breaks away from the *minimal proof requirement* – preponderance of the evidence – set by the law as a condition for authorising courts to extract payments from defendants. This requirement is far from technical: it derives from a more general principle of evenhandedness that limits the courts' power to force transfers of money and property from one individual to another. Under this principle, a court must not order such a transfer unless the reasons for forcing it out are better than the reasons for preserving the status quo. In the domain of fact-finding, the required 'better reasons' must be present in the probability of the plaintiff's case. When the plaintiff's claims are not more probable than the defendant's, the court has no reasons for changing the status quo.[38]

C. Refinements

In this section, we outline a number of refinements in the conditions for applying PRP. Those refinements help identify cases in which the principle's vices fade away, partially or even completely. These cases call for PRP's application because the principle's attractiveness is no longer offset by its vices.

One refinement is a temporal distinction between two different categories of cases. Both categories involve causal indeterminacy. One of those categories accommodates cases in which the indeterminacy related to a past occurrence and was present all the time. Cases falling into another category are different. In those cases, causal indeterminacy attaches to

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[35] See SR Perry, 'Risk, Harm, and Responsibility' in David G Owen (ed), *Philosophical Foundations of Tort Law* (Oxford, Clarendon Press, 1995) 321. But see M Stauch, 'Causation, Risk, and Loss of Chance in Medical Negligence' (1997) 17 *OJLS* 205, 217–18, for the claim that ruling according to chances in past-injury cases is not contrary to the deterministic causation approach, since such a ruling does not make any claim about the state of the world, but, rather, about the state of our knowledge about the world. For a different view, see H Reece, 'Losses of Chances in the Law' (1996) 59 *MLR* 188.

[36] Charles R Nesson, 'Reasonable Doubt and Permissive Inferences: The Value of Complexity' (1979) 92 *Harvard Law Review* 1187, 1225.

[37] Perry (n 35).

[38] Alex Stein, *Foundations of Evidence Law* (Oxford, Oxford University Press, 2005) 219–25.

a hypothetical or future event that can be characterised as a past occurrence only at a later point in time.[39] This distinction eliminates the epistemological vice. Consider a wrongdoing that has just been perpetrated and assume that the prospective victim did not yet suffer the harm associated with that wrongdoing. At this point in time, the prospective victim can only complain about his wrongful exposure to a risk of sustaining the harm. His future prospects became blurred (or more blurred than previously) owing to the unwelcome imposition of the new risk of harm. The wrongdoing thus made the victim's future prospects less desirable and, consequently, less valuable than before.[40] Note that this assessment of the victim's ex ante situation will remain unmodified even if at a later stage he sustains the anticipated harm without being able to associate it with the wrongdoing. The worsened-prospect description of the prospective victim's situation is therefore empirically correct for the point in time at which the wrongdoing took place.

Compare this scenario with a different setup, in which the plaintiff suffers harm immediately after the defendant's wrongdoing. Assume that the probability of the allegation that the defendant's wrongdoing caused the harm is 0.5 or less, and that the plaintiff consequently cannot establish that the defendant caused his harm. This setup features no exposure-to-risk point along its timeline. There is no point in time (save for points in time that are completely artificial) at which the value of the plaintiff's future prospects decreases. The worsened-prospect description therefore does not fit this setup. As a result, any verdict other than no-liability or full-liability would be empirically unfounded. This 'all or nothing' setup is present in a case in which an obstetrician negligently induces labour and the baby he delivers dies. Assume that the baby's death could result from the obstetrician's negligence, or, alternatively, from the acute respiratory problem which could not have been overcome even if the obstetrician had taken due care. In this scenario, there was no point of time at which the baby's prospects of survival decreased by less than 100 per cent. Those prospects were either unaffected or completely eliminated by the obstetrician's negligence.

Another important refinement of PRP relies on a differentiation between shortages of evidence. In some cases, courts need scientific information about causation, but this information is not available. In other cases, courts do not have enough case-specific evidence for deciding the case. In the first category of cases, causal indeterminacy is uniformly present in the fact-pattern of every case. In the second category, it presents itself uniquely in each individual case.[41] Applying PRP in the first category of cases is more straightforward than in the second. When the uncertainty problem is general, some wrongdoers systematically escape liability. This happens when the probability of causation is 50 per cent or less and plaintiffs are systematically denied remedies under the preponderance standard. This effect is present in unidentifiable-wrongdoer cases, in unidentifiable-victim cases, and in many of the lost-chance cases. In those cases, the redundancy objection to PRP does not hold. Under the 'winner takes all' rule, all defendants – many of whom wrongfully damaged their plaintiffs – are held not liable. This outcome is both unjust and inefficient. To avoid this outcome, the legal system needs to implement PRP. This need makes PRP crucial rather than redundant.

For similar reasons, one cannot easily object to PRP by alluding to the problematics of naked statistical evidence. When uncertainty is present in every case and case-specific

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[39] The House of Lords analysed this distinction in *Gregg v Scott* (n 30) at 181-83, without determining its implications.

[40] See section III for further discussion of cases where the victim's future is blurred with uncertainty *at the time of the trial*.

[41] See *Gregg v Scott* (n 30) 184.

evidence is systematically scarce, adherence to the rule against naked statistics is a logical equivalent of a rule that absolves all defendants – many of whom are wrongdoers – from liability in torts. Adoption of PRP is the only plausible way to avoid this unjust and inefficient result.

When causal indeterminacy is recurrent in a well-defined category of cases, litigation costs triggered by the PRP are far from being crucial. Indeed, under PRP, courts would have to deal with mathematical probabilities and rely on experts more often than under the extant regime. Courts, however, would also develop expertise and amass information about causes, effects and probabilities. These knowledge and expertise would be applicable in many cases. This economy of scale would partially offset the increase in litigation costs. More crucially, in cases where uncertainty systematically allows wrongdoers in a specific field to escape liability, the inefficiency that PRP's adoption would avert outweighs any foreseeable increase in litigation cost.

Last, the torts system needs to pay special attention to cases in which the same wrongdoer recurrently causes harm. These cases are qualitatively different from those featuring wrongdoing as a unique or sporadic event. This distinction is important because in cases falling into the recurrent wrongdoer category, virtually none of the objections to PRP is valid. Consider the well-known case of DES, a drug designed to prevent miscarriages that was manufactured by hundreds of companies, mainly in the '50s and turned out to be latently carcinogenic to female foetuses. Twenty-five years later, numerous young women whose mothers had taken the drug were diagnosed with uterine cancer. It was found by the courts that the drug had not been tested adequately prior to its marketing and that the manufacturers had failed to take into account certain findings that had pointed to a risk of carcinogenic effect. Furthermore, the plaintiffs' mothers had never been cautioned against this risk. Finally, the drug had been marketed under a generic rather than brand name, which foiled attempts to trace each pill back to its actual manufacturer.[42] For the purpose of providing a remedy to the victims, courts developed the Market Share Liability doctrine (MSL). Under this doctrine, first adopted by the California Supreme Court in *Sindell*,[43] every defendant manufacturer was to assume liability for the plaintiff's harm unless it could prove (by a preponderance of the evidence) that it did not manufacture the drug taken by the plaintiff's mother. As the *Sindell* court clarified, this liability had to be imposed only on those manufacturers who produced a substantial proportion of DES in the relevant market. The court ultimately decided that the burden of compensating each plaintiff for her damage would be allocated amongst the manufacturers in accordance with their respective shares in the DES market.[44]

In the DES cases, recovery was probabilistic: the market share of each defendant substituted for the probability that the litigated harm was caused by that defendant. But since for each defendant the wrongdoing was a recurring event, in the long run, MSL made each defendant liable for the harm it actually caused. Indeed, each defendant was obligated to compensate other defendants' victims, but at the end of the day, after all claims have been satisfied, the final outcome was the same as in a case featuring no causal indeterminacy whatsoever.[45]

[42] See *Sindell v Abbott*, 607 P2d 924 (Cal 1980).

[43] ibid.

[44] This decision can be understood as imposing liability on each defendant for all of the plaintiff's damage (in which case, equitable apportionment of the compensation burden could be achieved through wrongdoers' indemnification claims against each other) or, alternatively, as imposing liability on each defendant for a prorated part of that damage. See *Brown v Superior Court*, 751 P2d 470, 485-87 (Cal 1988) (adopting the second interpretation of *Sindell*).

[45] We assume that none of the defendants becomes insolvent.

The DES scenario is far from being the only case in which PRP would make the wrong-doers internalise the harm they actually caused. Unidentifiable-victim cases often exhibit the same characteristic. Take the asbestos case discussed above, in which many employees were negligently exposed to asbestos by the same employer. In this case, PRP would make the employer pay money damages that correspond to the harm it caused. This socially desirable effect will be achieved by allowing a compensatory distortion. Because each of the injuries was either caused in its entirety by the employer's wrongdoing or by a natural cause, none of the employees will receive compensation for the harm *wrongfully* inflicted upon him or her. But this distortion is not a serious problem. Under any plausible criterion of justice and efficiency, allowing each employee to recover partial compensation while holding the employer liable for the harm it wrongfully caused is better than leaving all employees uncompensated and letting the employer go scot-free.

All the objections to PRP fade away when the principle is applied to recurrent-wrongdoer cases. The epistemological objection vanishes because wrongdoers eventually pay for the harms they actually cause. Moreover, in many (but not all) cases, victims of torts are compensated for their actual harms (DES cases are the prime example of this category of cases). The objection alluding to the minimum proof threshold weakens as well because there would be no significant departures from the proof requirements that ordinarily apply in civil cases. Under PRP, the plaintiff must prove by a preponder-ance of the evidence that the defendant committed a recurrent wrongdoing. The plaintiff also must preponderantly establish the approximate amount of the aggregate harm resulting from the defendant's wrongdoing. Arguments criticising PRP for establishing liability for bare risks become inapplicable, too. In cases involving recurrent wrongdoers, defendants would not be paying for bare risks. Rather, they would pay for the harms they actually caused. Finally, when recurring-wrongdoer cases systematically feature probability of causation of less than 50 per cent, and case-specific evidence is scarce, also the naked statistics, the redundancy and the litigation costs objections lose most of their power. The table below summarises the applicability of the different objections to PRP:

	Type of Event		Type of Uncertainty		Frequency of Wrongs	
	Past	Future/ Hypothetical	Case Specific	Inherent	Discrete	Recurrent
Epistemological Problem	A	N/A	A	A	A	N/A
Litigation Costs	A	A	A	N/A	A	N/A
Naked Statistics	A	A	A	N/A	A	N/A
Liability for Bare Risk	A	A	A	A	A	N/A
Redundancy	A	A	A	N/A	A	N/A
Minimum Threshold	A	A	A	A	A	N/A

A = applicable.
N/A = non-applicable.

D. Quantum of Damages

In the paragraphs below, we distinguish between two types of probability-based compensation:

1. forward-looking compensation for the risk of future injury; and
2. backward-looking compensation, based on the probability of causation.[46]

Take a person who sustains injury after being wrongfully exposed to a risk of sustaining that injury. Before the wrongdoing, this victim's probability of sustaining the injury equaled 1-p (eg, 0.25), which is parallel to her probability of remaining uninjured (p) (ie, 0.75). After the wrongdoing, the victim's probability of sustaining the injury became 1-q (eg, 0.75), which parallels her probability of escaping the injury (q) (ie, 0.25). Because the victim actually sustained the injury, her case falls into the 1-q category (ie, the 0.75 category). This statistical category comprises two jointly exhaustive and mutually exclusive scenarios that reflect the victim's initial position. In the first scenario, the victim sustains the injury irrespective of the wrongdoing. Under this scenario, the victim was doomed to sustain the injury, so that the wrongdoing made no impact on her well-being. As already indicated, the probability of that scenario equals 1-p (ie, 0.25). In the second scenario, it is the wrongdoing that causes the victim's injury. Under this scenario, the victim would have remained uninjured had she not been exposed to the wrongdoing. The probability of this scenario equals (1-q)-(1-p), that is, p-q (ie, 0.50). This ex ante probability represents the reduction in the victim's chances of remaining uninjured, as effected by the wrongdoing.

Now consider the probability of the scenario that the wrongdoing was the actual cause of the victim's injury. This probability is represented by the fraction of scenarios featuring a victim who could not sustain her injury without being subjected to a wrongdoing in the more general cluster of cases that feature an injured victim, a wrongdoing, and the exhaustive variety of causal factors that could inflict the same injury on the victim. The above fraction of scenarios equals p-q (ie, 0.50). The cluster of cases covering all possible scenarios equals 1-q (ie, 0.75). The ex post probability of the scenario in which the wrongdoing actually inflicts the victim's injury therefore equals (p-q)/(1-q) (ie, 0.50 / 0.75 = 2/3).

As we already mentioned, the victim's risk of sustaining injury as a result of the wrongdoing equals p-q (ie, 0.50). So long as the victim lives under the risk of becoming injured, his expected damage therefore equals (p-q)D (ie, D/2), when D denotes the average amount of harm suffered by similarly situated victims. This expected damage is what the victim facing the risk of injury or illness should recover from the wrongdoer.

Victims who actually become ill should be compensated differently. Using the same notation and the same numerical example as before, let p (ie, 0.75) and q (ie, 0.25) denote, respectively, the victim's chances of remaining uninjured before and after the wrongdoing. Allow D to denote the average amount of damage that the wrongdoing inflicts in the long run of cases, and let T denote the total number of cases in which the tortious activity takes place. The ideal compensation that the legal system should exact from the wrongdoer would thus equal (p-q)DT (ie, DT/2).

In reality, however, only injured victims can successfully sue the wrongdoer. Therefore, the number of cases in which the wrongdoer would have to pay compensation would equal

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[46] This discussion is based on Porat and Stein, 'Indeterminate Causation' (n 27) 685–88.

(1-q)T (ie, 0.75T). If the wrongdoer compensates each injured victim at the amount of (p-q)D (ie, D/2), then the wrongdoer's compensation duty would fall below the optimal. Using the probability of causation as an award-multiplier would eliminate this shortfall. As already established, the probability of causation equals (p-q)/(1-q) (ie, 2/3). Each injured victim's compensation would consequently be set at [(p-q)/(1-q)]D (ie, 2/3·D). The total amount of the wrongdoer's compensation duty would then be [(p-q)/(1-q)]DT(1-q), ie: (p-q)DT (ie, DT/2). This compensation duty equals the losses inflicted by the wrongdoer.[47]

American courts tend to conflate the two types of compensation by awarding injured victims the risk-based, rather than probability-based, amounts.[48] The draft of the *Restatement of the Law Third, Torts: Liability for Physical Harm* (Proposed Final Draft No 1) proposes to fix this error by differentiating, as we do, between the two types of awards.[49]

IV. FUTURE HARMS

In numerous cases in which one person acts wrongfully towards another, the prospective victim faces a continuous risk of illness that may or may not materialise in the future. Employees are exposed to the risk of contracting an occupational disease due to unsafe working conditions; residents of a polluted neighbourhood face the risk of becoming ill as a result of their exposure to pollution; consumers of defective products have a prospect of contracting diseases from those products; victims of medical malpractice face the risk of developing an affliction or handicap; and there are many other examples.

Should faulty creators of such risks assume liability in torts for the ensuing prospect of future illness?[50] This question is puzzling. Why not wait and see what happens in the end? If

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[47] Note that when the probability of causation is greater than 0.5, the court may decide to apply the 'winner takes all' rule and award the plaintiff full compensation.

[48] For examples of this mistaken approach in the United States, see *Wendland v Sparks* 574 NW2d 327, 333 (Iowa, 1998) (an oft-cited decision analogising the value of lost chances to that of a lottery ticket); *Mays v United States* 608 F Supp 1476 (DC Colo 1985), revd on other grounds 806 F2d 976 (10th Cir 1986), cert den 482 US 913 (upon finding that malpractice reduced the patient's chances of recovery from 40 to 15 per cent, the court reasoned that the damage related to net pecuniary loss caused by the medical centre was 25 per cent of the $173,200 total net pecuniary loss, or $43,300); *Herskovits v Group Health Cooperative of Puget Sound* 664 P2d 474 (Wash 1983) (holding a 14 per cent reduction, from 39 per cent to 25 per cent, in the decedent's chance for survival as sufficient evidence to allow the case to go to the jury); *Alberts v Schultz*, 975 P2d 1279, 1287 (NM 1999) (if medical malpractice reduced the patient's chance of recovery from 50 to 20 per cent, that patient's compensation would be equal to 30 per cent of the value of his or her life); *Jorgenson v Vener*, 616 NW2d 366, 372 (SD 2000) (if instead of completely eliminating the chance of recovery, the physician's negligence merely reduced the chance of recovery from 40 per cent to 20 per cent, then the value of the lost chance would be 20 per cent of the value of a complete recovery); *Smith v Washington* 734 NE2d 548 (Ind 2000) (affirming an award of 50 per cent of the patient's damage upon finding that the defendant's malpractice increased the patient's risk of incurring an already likely injury from 50 per cent to 100 per cent). For reasons provided above, the claimant should have recovered 29 per cent of the damage in *Mays*; 19 per cent of the damage in *Herskovits*; 37.5 per cent of the damage in the *Alberts* example; and 25 per cent of the damage in the *Jorgenson* example. In *Smith*, the outcome was correct because the defendant's malpractice *totally* eliminated the claimant's chances of recovery. Otherwise, the court's adherence to the lottery analogy would have generated an error (as it did in our previous examples).

[49] See Restatement of the Law Third, Torts: Liability for Physical Harm § 26 cmt n, (Proposed Final Draft No 1, 6 April 2005).

[50] For a theory favouring imposition of liability for a future disease when the plaintiff proves that the wrongdoing has more than doubled her risk of contracting the disease, see Andrew R Klein, 'A Model for Enhanced Risk Recovery in Tort' (1999) 56 *Washington & Lee Law Review* 1173. This theory justifies its 'doubling the risk' requirement by claiming that 'there should be no pre-manifestation recovery for possible illness that a plaintiff cannot eventually connect to a defendant's conduct using normal measures of actual causation'. id 1195.

the risk materialises into harm, its creator should then be obligated to compensate the victim; and if the victim remains unharmed, he should receive no compensation at all. Note that statutes of limitations would not deny compensation to victims who ultimately sustain harm because those victims' causes of action accrue only after the occurrence of the harm.[51] The repose provisions, in contrast, would yield a different result. These provisions render all suits non-actionable after a specified post-transgression period. The fact that the victim's harm had developed only after the statutory deadline is immaterial. This fact can toll a limitations period, but not a statute of repose because repose provisions have a special goal: to reduce the volume of litigation by denying actionability to suits in which the defendant's wrongdoing and the plaintiff's harm are separated by a long period of time.[52] This policy purposefully extinguishes all suits alleging deferred illness (or other latent injuries) that are filed after the expiration of the repose period. Whether prospective victims should be allowed to bypass this policy by suing wrongdoers for their prospects of illness consequently becomes a big question. This question concerns the limits that the law should impose upon suits for future harm, while our goal here is to determine whether such suits should ever be allowed to proceed. We therefore leave this question open.

The Law Lords in *Johnston* have upheld the rule that allows compensation for a future illness that might develop from the plaintiff's present injury, for which the defendant is responsible.[53] The prospect of future illness can thus be perceived as attaching to the present injury and becoming part of the plaintiff's present physical condition. Alternatively, this prospect instills in the plaintiff fear and anxiety that attach to his present pain and suffering. In both cases, the prospect's attachment is a legal move that creates a fusion between the plaintiff's present condition and future possibilities.

This move is artificial because in the empirical world no attachment actually occurs. Theoretically (and more than just theoretically), even with a present injury, the court could tell the plaintiff: 'Wait and see what, if anything, happens with your risk. If it materialises, come and see us; and if not then not'.

But why not abandon the artificial devices that operate in this area of the law? Why not allow a tort victim to recover compensation not only for the risks attaching to her existing injury but also for a *free-standing risk* of future illness? We now turn to discussing this question.

A. The Case for Liability

The case for making risks of future illness actionable in torts is straightforward. A person's prospect of becoming seriously ill erodes his well-being. Consider two people who happen to be equal in all respects except one: one of those people has a prospect of developing a serious illness in the future, while the other has no such prospect. The second person's well-being outscores the well-being of the first person (if forced to live one of those people's lives, a rational individual would prefer to be the second person rather than the first). Assume now, that the first person did not come upon this misfortune by himself. His prospect of becoming seriously ill resulted from exposure to a toxic substance by a negligent wrongdoer. We argue that under such circumstances, the law should allow the prospective

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[51] See eg, *Baird v American Medical Optics*, 713 A2d 1019 (NJ 1998).
[52] See eg, *Rudenauer v Zafiropoulos*, 445 Mass 353 (2005).
[53] *Johnston* (n 3) [67].

victim to choose between immediate recovery of compensation for his expected harm and a postponed entitlement to recover full compensation in the event of illness (for the sake of simplicity, our ensuing discussion assumes that once the illness develops, the court can verify with sufficient certainty that it was caused by the wrongdoing).

The victim should be able to recover from the wrongdoer compensation for the wrongfully imposed risk. The amount of this compensation equals the harm associated with the illness multiplied by the victim's probability of becoming ill owing to the wrongdoing. That amount typically represents the victim's increased cost in purchasing health or life insurance due to his or her wrongful exposure to the risk. After paying this compensation to the victim, the wrongdoer will become immune from further liability. If the victim ultimately becomes ill, he would not be allowed to collect from the wrongdoer the difference between the expected and the actual harm. Alternatively, the victim should be able to wait and see whether he actually becomes ill. If he becomes ill, the wrongdoer would have to fully compensate him for the harm suffered. If the victim develops no illness, however, the wrongdoer would pay nothing.

The victim should be allowed to choose between these remedies for a number of reasons. From the wrongdoer's perspective, the two remedies are economically identical. Therefore, he has no legitimate reasons to oppose their substitution by one another. Assume that the wrongdoer exposed 10 victims to a 10 per cent risk of sustaining physical harm in the amount of $1,000,000. Regardless of whether victims recover immediate compensation for their expected harm or are compensated in the future, if and when their harm materialises, the wrongdoer's expected liability would be the same: $1,000,000. Equally important, this liability also reflects the wrongdoing's social cost. Indeed, under our proposal, each victim would choose between immediate compensation in the amount of $100,000 and future compensation in the amount of $1,000,000, if harm materialises. This choice would not change the wrongdoer's expected liability.

Yet, it might change the wrongdoer's liability de facto. To illustrate, assume that nine victims out of ten recover $100,000 each, while the tenth victim chooses to wait and see. Subsequently, this victim sustains the harm and recovers $1,000,000. In this scenario, the wrongdoer ends up paying 1.9 million dollars rather than one million. But that possibility should not bother us. If our proposal is adopted, the insurance market would allow the risk-averse wrongdoer to insure against the risk of paying the ninth victim $1,000,000. The cost of this insurance would be around $100,000.[54]

As we already explained, the wrongdoer has no legitimate reasons upon which to base a claim that those two remedies are not identical to each other. The wrongdoer, for example, cannot invoke its hypothetical prospect of becoming insolvent in the future as a reason for not compensating the victim for his presently expected harm. Nor can the wrongdoer benefit from the victim's prospective inability to furnish evidence (typically, a long time after the wrongdoing's occurrence) that would causally relate his illness to the toxic exposure (given the presence of competing causes to which the victim would be exposed before suing). The wrongdoer also should not be allowed to take advantage of the victim's prospect of becoming fatally ill – a condition that may extinguish the victim's ability and motivation to wage a legal battle.

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[54] We thank Lord Hoffmann for raising this issue when this chapter was presented at the Aberdeen University symposium on causation.

All those prospects entail a risk of injustice for the victim: they indicate that denial of the victims' right to be compensated in the present for the risk of future harm may erode their entitlement to compensation if and when their physical harm materialises. Those prospects also dilute deterrence: wrongdoers expecting to undercompensate their victims in the future will be inefficiently under-deterred. The erosion-of-compensation prospect thus does not merely offset the wrongdoer's complaint about being held liable for bare risk. This prospect is an affirmative reason for imposing such liability.

The proposed liability system would bring about additional social benefits. First, when the future harm is a fatal disease, expedited compensation would allow victims to use the money they get during their lifetime.[55] Second, some victims might be able to use their expedited compensation towards mitigation of the risk of harm. For example, a victim might be able to undergo extensive medical tests and obtain preventive treatments that reduce her prospect of illness. Victims would also be able to change places of residence, work and lifestyles. Finally, some of the victims would also be able to purchase life and medical insurance. The cost of this insurance would increase as a result of the wrongdoing – yet another independent reason to have the wrongdoer pay for it.[56]

B. Objections

We now return to the objections raised against PRP as applied to past-injury cases. We consider the validity of those objections in the present context and find them unpersuasive. Subsequently, we consider some additional – more powerful – objections to our proposal.

The epistemic objection to probabilistic recovery falls apart once it is recognised – as an empirical matter – that a person's risk of becoming ill in the future erodes her well-being. This erosion is self-evident: risk of illness is an unquestionably unwanted condition. Indeed, it is epistemically rational for a person to buy insurance against such risks or to avoid them by paying a steep price (for example, by exercising and eating healthy, but untasty, food). The relationship between risk of future harm and people's well-being in the present is straightforward when the risk is for future property harm. In this case, the present market value of the property will be discounted by the risk of harm even the risk is below 50 per cent. For example, if a wrongdoer created a 30 per cent risk that the victim's house will collapse in the future, this risk would certainly reduce the house's market value. Admittedly, this analogy is far from perfect because, unlike real property and commodities, life and limb are not tradable. Yet, as we have demonstrated, risks to a person's life and health constitute detraction from her well-being. Those risks bring into the person's life deleterious economic and non-economic consequences.

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[55] For an argument in the same vein, in another context, see David Friedman, 'What is "fair compensation" for death or injury?' (1982) 2 *International Review of Law and Economics* 81.

[56] Even under a regime that imposes no liability for future harms, courts should allow recovery for money and efforts expended by victims on reducing such risks. For principles governing such awards, see Mark Geistfeld, 'The Analytics of Duty: Medical Monitoring and Related Forms of Economic Loss' (2002) 88 *Virginia Law Review* 1921 1940–49; Kenneth S Abraham, 'Liability for Medical Monitoring and the Problem of Limits' (2002) 88 *Virginia Law Review* 1975; John CP Goldberg and Benjamin Zipursky, 'Unrealized Torts' (2002) 88 *Virginia Law Review* 1626. Furthermore, even when a tort victim sustains no physical injury, courts should allow her to recover compensation for fear of future illness and for the increased cost of her health and life insurance. See Porat and Stein, *Tort Liability Under Uncertainty* (n 27) 121.

Litigation costs do not present a serious problem either. These costs should be considered money well spent, given the benefits that the proposed system would yield. Courts would also be able to reduce those costs by relying on information generated by the market for health and life insurance. Based on this information and expert testimony, courts should be able to evaluate risks and damages both adequately and expediently.

Courts also should not be reluctant to base wrongdoers' liability for future illnesses upon *naked statistical evidence*. This evidence is often the only proof that the plaintiff can furnish. Her inability to adduce case-specific evidence is hardly a good reason for allowing the defendant to go scot-free, especially when the defendant's wrongdoing is recurrent.

The objection against *liability for bare risks* is equally unpersuasive. We do not discuss here the pros and cons of a legal regime that imposes liability for risks, as opposed to harms. We have done it elsewhere.[57] As a general matter, arguments against liability for bare risks lose much of their validity when there is uncertainty as to whether the plaintiff was or will be harmed by the defendant's wrongdoing.[58] Furthermore, as we already explained, in cases involving risk of future harm, the plaintiff would normally be able to establish that this risk already constitutes harm for him or her.

The redundancy objection to our proposal would insist that a prospective victim should wait and see whether she actually becomes ill. As we already explained, however, there are good reasons for allowing the victim to choose between immediate recovery of compensation for her expected harm and the 'wait and see' option. Allowing the wrongdoer to dictate this choice to the victim would defeat justice and efficiency at once. Actionability of future illnesses thus cannot be considered redundant.

Finally, *the minimum-threshold* objection should not bother us at all. Under our system, risk of future illness would be actionable as a matter of substantive law. To succeed in an action for such risk, the plaintiff would have to prove its nature and extent by a preponderance of the evidence. The plaintiff would also have to preponderantly establish that the risk originated from the defendant's wrongful action. The conventional principles of proof would thus stay intact.

Typically (albeit not always), the uncertainty as to whether the plaintiff will develop illness in the future is inherent in the entire category of cases, as opposed to being present due to the absence of case-specific evidence. As we explained above,[59] in such cases, the objections to PRP fade away. Furthermore, as we have shown in relation to past-injury cases,[60] the recurrent character of the defendant's wrongdoing should be taken into account as well. When a repeat wrongdoer compensates each victim for her probabilistic harm, he ultimately pays the victims the right amount of compensation. The same mechanism will work well in future-harm cases when the defendant is a repeat wrongdoer.

Two additional objections against our proposal have more merit. These objections help set the limits to our proposed liability regime.

One of those objections focuses on the magnitude of the risk of illness. Sometimes, many people are exposed to a risk of illness, but only a few of them actually become ill. Consider a polluter who exposes 1,000,000 residents to a small risk of a serious illness. Damage associated with that illness equals $1,000,000 and its probability is 1:100,000 for each resident. That means that 10 out of 1,000,000 residents would suffer significant injury

[57] ibid 103–15.
[58] ibid 116–29.
[59] Above text accompanying notes.
[60] Above text accompanying notes.

at some point in the future. For obvious reasons, allowing each of 1,000,000 residents to sue the polluter for his or her expected harm in the amount of $10 makes no sense. *Small risks of future illness should not be actionable.*

We agree with this limitation to our proposal. Subject to this limitation, however, whenever there is enough information for evaluating victims' expected harm, prospective victims should be allowed to sue wrongdoers for risks of future illness.

C. The Problem of Collective Action

The remaining objection to our proposal identifies a serious problem of collective action. Suppose that victims can choose between immediate recovery for risks and future recovery for harms. For reasons discussed earlier, some victims would prefer immediate recovery. Their consumption of this remedy, however, will diminish the wrongdoers' resources and increase the risk that the wrongdoers would be unable to meet their obligations to victims who sue for materialised harms. A similar problem troubled Justice Kennedy in *Ayres*, who disagreed with a rule that allows recovery for fears of contracting cancer in the future. Justice Kennedy's reasons for disagreeing with this rule included the prediction that fear-based recovery of compensatory awards would exhaust the financial resources that defendants could use for compensating asbestos victims who actually develop cancer.[61]

But the problem at hand may be even more severe. If some potential victims (Group A) sue the wrongdoer for their risks of future illness – and they may have perfectly good reasons for filing those suits – other potential victims (Group B), who originally preferred to sue only in the event of illness, would find themselves in a different position. The increased risk of the wrongdoer's insolvency might prompt some of those victims to sue immediately. This choice will snowball: any additional suit – that is, any victim migration from Group B to Group A – will further increase the risk of the wrongdoer's insolvency. As a result, none of the potential victims would wait. All of them would migrate from Group B to Group A and sue the wrongdoer immediately. As in the 'Tragedy of the Commons', the ensuing flood of suits might exacerbate the wrongdoer's insolvency to the detriment of all victims.

This problem calls for a regulatory solution. One such solution is to authorise courts to deal with the prospect of the wrongdoer's insolvency on a case-by-case basis. If this prospect is insignificant, the court should allow the plaintiff to sue the defendant for the risk of future illness. If the prospect is real, the court should stay the proceeding and require the plaintiff to substitute her suit by a limited-fund class action.[62] Another solution is to set up a statutory fund to which wrongdoers would have to contribute sums that equal the amount of their victims' expected harm (a Pigouvian tax). This solution is particularly suitable for cases involving recurrent wrongdoers.

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[61] *Ayres* (n 2) 168-69.
[62] The goal of this proceeding is to make sure that all plaintiffs get compensated and that early filers of suits do nor exhaust the defendant's funds. See eg, *Ortiz v Fibreboard Corp* 527 US 815 (1999).

V. CONCLUSION

Probability-based compensation is a controversial remedy that departs from the established legal tradition. This remedy is fairly common, but still controversial, in the United States. Courts in England and other jurisdictions use it on rare occasions.

Most cases in which this remedy was used – or could be used, if courts did not feel reluctant about it – involved causally indeterminate harm that the plaintiffs had already sustained. Under such circumstances, even a partial success of the plaintiff's suit clashed with conventional wisdom. This wisdom requires courts to dismiss as unproven any suit that fails to satisfy the preponderance-of-the-evidence requirement. An attempt to bypass this requirement by awarding plaintiffs probability-based compensation consequently becomes suspicious. This suspicion accounts for the tort system's widespread refusal to treat risk of future illness as actionable harm. Another reason that explains this refusal is a general belief that future harm, without more, is identical to bare risk – an actuarial, rather than concrete, endangerment for which courts should impose no liability.

This essay questioned the validity of these two analogies. We hope to have shown that these analogies are untidy, if not altogether invalid. We also hope to have demonstrated that there are good reasons for treating serious risks of future illness or injury as actionable harm. If we are right, courts that persistently refused to allow probabilistic recoveries in past-injury cases should reconsider their position with regard to future harm.