Toward a New Paradigm for Multiple-Victim torts: The Problem of Victims Heterogeneity

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Abstract

Conventional wisdom in tort law holds that an injurer’s negligence, a product design defect, and a victim’s contributory negligence should all be decided by weighing the costs and benefits of the relevant activity. In multiple-victim accidents, the current paradigm maintains that liability should be determined by comparing aggregate costs with aggregate benefits. However, this aggregate liability paradigm—adopted by courts, scholars and the Restatement (Third) of Torts—fails to account for the natural differences that exist between tort victims. When victims are heterogeneous with regard to their expected harm or costs of precaution—as they typically are in real life—basing liability on aggregate amounts may be incorrect, and generate over-deterrence in some cases and under-deterrence and dilution of liability in other. A new paradigm for liability in multiple-victim torts is, therefore, needed. This Article suggests a novel and superior liability regime for multiple-victim accidents, which forsakes the traditional economic distinction between precaution costs and expected harm. The new liability regime combines disaggregated liability analyses with indemnification for efficient investment in precautions and a small “bonus,” given as an incentive to exercise efficient care.

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## INTRODUCTION

The development of technology in modern times has created a change in the paradigmatic tortious situation: the classic, one victim—one injurer, situation is becoming less significant as more and more accidents involve multiple victims. This change has awakened an ongoing debate over tort law’s ability to efficiently regulate such multiple-victim accidents.¹ Much of this debate, however, has focused on procedural issues, such as the law governing class actions and other multi-party litigations, while neglecting the need to adjust the substantive standards of liability to the differences that naturally exist between tort victims. This Article demonstrates, however, that procedural rules notwithstanding, inter-victim differences may render the existing liability standards incorrect and inefficient.

To determine liability in multiple-victim accidents, the literature advocates using an aggregative cost-benefit test that weighs aggregate risks against aggregate benefits.\(^2\) Analytically, this test comprises two stages; in the first, the factfinder aggregates the costs and the benefits of the injurer’s activity, thus transforming the multiple-victim accident into a single “aggregate victim” situation. In the second stage, the standard of care toward this “aggregate victim” is determined based on the familiar Learned Hand formula.\(^3\) This aggregative approach to liability constitutes an important part of the current tort paradigm, as manifested in the Restatement (Third) of Torts,\(^4\) in the legal literature,\(^5\) and in case law.\(^6\)

\(^2\) See, e.g., William H. Rodgers, *Negligence Reconsidered: The Role of Rationality in Tort Theory*, 54 S. Cal. L. Rev. 1, 10 (1981) (“The (correct) Hand calculus in a negligence action would ask whether B<LP1+LP2+…+LPn”); also Richard W. Wright, *Negligence in the Courts: Introduction and Commentary*, 77 Chi.-Kent L. Rev. 425, 437 (2002) (“References to ‘balancing’ tests of negligence, especially when referring to the Hand formula, are generally understood to mean a literal or ‘straight’ balancing of aggregate risks or costs against aggregate utilities or benefits, according to which the actor is negligent if and only if the aggregate risks or costs are greater … than the aggregate utility or benefits.”); also Heidi M. Hurd & Michael S. Moore, *Negligence in the Air*, 3 Theoretical Inq. L. 333, 365 (2002) (“(T)he concept of negligence demands that we include all harms risked by the defendant’s conduct in our calculus of the benefits and burdens of the defendant’s conduct.” (emphasis in original)). For criticism of their argument on other grounds see Israel Gilead, *Harm Screening Under Negligence Law, in Emerging Issues in Tort Law* 251, 261-2 (Jason W. Neyers et al. eds., 2007). For discussion and many more references, see infra Section I.b.


\(^4\) RESTATEMENT (THIRD), id., §3 cmt. e; RESTATEMENT (THIRD) OF TORTS: PRODUCT LIABILITY §2 (1998). For discussion see infra Section I.b.

\(^5\) Supra note 2.
The current paradigm’s focus on aggregate costs and benefits should be reassessed. Undoubtedly, a cost-benefit analysis of a specific activity must take into account every social cost and every social benefit of that activity. The social cost of an injurer’s activity, for example, is derived from the harm it inflicts upon all its victims.

Be that as it may, when those victims are heterogeneous, namely, when they differ from one another with respect to their expected harm levels, their costs of precautions, or the utility they derive from the activity in question, it may be improper to determine the injurer’s liability based on aggregate costs and benefits. The reason being that an aggregative cost-benefit test lumps together all the victims and is thus unable to provide different victims with different incentives. As a result, determining liability based on this test may yield inefficient outcomes: over-deterrence in some cases and under-deterrence in other.

In some cases, for example, the socially desirable outcome would require some victims to take precautions and other victims to bear the harm. The aggregative cost-benefit test, however, pools together those two types of victims, and thus may falsely indicate that the injurer is the accident’s least cost avoider and should have taken

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6 See, e.g., Ford v. Moore, 905 N.E.2d 418, 425 (Ind. Ct. App., 2009), aff'd in part, remanded in part on other grounds by 936 N.E.2d 201(2010) (“The Estate was required to show a proposed alternative design that would have prevented Moore's death in particular and also would have cost-effectively improved aggregate safety in general.”) Quintana-Ruiz v. Hyundai Motor Corp., 303 F.3d 62, 64 (1st Cir, 2002) (“The question here is whether a jury may find for a plaintiff … when the evidence is that the overall utility of the design exceeds the overall risk.”) Wright v. Dow Chem, 845 F. Supp. 503 (M.d. Tenn. 1993) (implicitly approving the plaintiffs’ claim “that the products fail the cost-benefit test for defective design because the products’ aggregate risks are greater than their aggregate utilities.”) See also Shute v. Moon Lake Electric Ass’n, 899 F.2d 999, 1004 (10 Cir. 1990) (“It is our judgment, therefore, that although the probability of this type of accident is low, the overall risk … outweighs the limited burden imposed by our holding. Consequently, we are not persuaded by (the defendant’s) claim that the burden of guarding against this type of accident is too great;”) Pries v. Honda Motor Co., 31 F.3d 543, 546 (7th Cir. 1994) (To prove that a specific product design is defective, the plaintiff is required to present “data about either the costs of additional precautions or the aggregate injuries avoidable by using them.”) For discussion and more references see infra Part I.b.

7 Regardless of whether all victims are involved in the litigation.

8 Yet, as those two adverse outcomes occur in substantially different situations, they do not cancel one another, but rather add up to an even greater social loss.
precautions. Consequently, basing liability on the aggregative test will generate over-deterrence, by driving the injurer to invest in precautions that, from society’s perspective, are too costly.

To illustrate, consider the following simple example: An injurer inflicted harm on two different victims, and the relevant costs are as follows:

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<th>Victim 1</th>
<th>Victim 2</th>
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<td>Expected Harm</td>
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<td>10</td>
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On aggregate, the injurer seems to be the accident’s least-cost avoider, since he could have prevented a risk of 110 had he invested only 70 in precautions, while the victims would have had to invest an overall of 120 to avoid the risk. Courts that focus on aggregate amounts will, therefore, assign liability to the injurer. A closer look, however, reveals that it is the victims in this case, and not the injurer, who are the least-cost avoiders. The efficient outcome here is not that the injurer takes precautions, but rather that Victim 1 invests in precautions and Victim 2 bears the harm—leading to overall societal costs of only 50 (Victim 1’s costs of 40 plus Victim 2’s harm of 10), instead of 70 if the injurer is driven to invest in precautions. Hence, the aggregative test yields, in this case, over-deterrence.9

Under-deterrence, on the other hand, may occur under three different scenarios. First, contrary to conventional wisdom,10 applying the aggregative test may diminish an injurer’s incentives to moderate her level of activity, even under the rule of strict liability. When the injurer’s additional activity poses a risk to additional victims whose precaution costs are relatively low, aggregation may yield that the victims are

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9 For further discussion of this example see infra Section II.a.
10 See, e.g., Alan J. Meese, *The externality of Victim Care*, 68 U. CHI. L. REV. 1201, 1208 (2001) (“According to the conventional model, then, strict liability with a defense of contributory negligence will induce … the optimal type and level of activity by the injurer.”)
contributorily negligent when the injurer’s level of activity is high, but not when her level of activity is low. Accordingly, the injurer is able to dilute her liability by raising her activity level above the efficient threshold, thereby causing too much harm.\(^{11}\)

Second, combined with negligence law’s reluctance to evaluate an injurer’s decision of which activity to pursue, as opposed to how to pursue it, the aggregative test may drive an injurer to opt for a riskier, rather than a safer, enterprise, thereby inflicting greater overall harm on more victims.\(^{12}\)

Third, in bilateral care situations,\(^ {13}\) the aggregative cost-benefit test may falsely indicate that taking precautions by either side is too costly, where in reality it is socially desirable for both the injurer and some (but not all) victims to exercise care.\(^ {14}\)

In real life, victims are for the most part heterogeneous. The level of harm to which they are exposed usually depends on factors that are typically different for each victim, such as the value of the property that is at risk, the victim’s earning capacity, age, health, etc. In addition, the \textit{ex ante} probability that the risk would materialize may also vary between the victims, depending, for example, on their proximity to an environmental hazard. Furthermore, neither the costs of precautions nor their efficacy are generally the same for all victims; even the same precautionary measure may place different burdens on different victims. It follows that, with respect to tort victims, heterogeneity is a much more realistic assumption than homogeneity.

However, in determining the standard of liability, both courts and scholars devote surprisingly little attention to victims’ heterogeneity, and generally support and apply

\(^{11}\) For elaboration, see infra Section II.b.
\(^{12}\) For elaboration, see infra Section II.c.
\(^{13}\) I.e., where both the injurer and the victim(s) must exercise care to reduce the expected harm from the accident.
\(^{14}\) For elaboration, see infra Section II.d.
the aggregative cost-benefit test. The attention to victims’ heterogeneity is often limited to *procedural* matters such as class certification in class actions; such procedural matters, however, do not, or at least should not, alter the substantive determination of liability toward each victim, nor should they change the injurer’s overall liability.\footnote{See, e.g., Shady Grove Orthopedic Assocs. v. Allstate Ins. Co., 130 S. Ct. 1431, at 1443 (2010) (Scalia, J., plurality opinion) and Bateman v. Am. Multi-Cinema, 623 F.3d 708, 722 (9th Cir. 2010) (“(A defendant’s) aggregate liability . . . does not depend on whether the suit proceeds as a class action,” because “(e)ach of the . . . members of the putative class could . . . bring a freestanding suit asserting his individual claim.”) For more on this point see infra notes 44-49 and accompanying text. Cf. Kenneth W. Simons, *Statistical Knowledge Deconstructed*, 92 B.U. L. Rev. 1 (2012) (establishing two related principles: the “Invariant Culpability when Acts are Aggregated” principle (ICAA) and the “Invariant Culpability when Risk-Exposures are Aggregated” principle, but limiting these principles to similar acts).}

Furthermore, the aggregative test may also prove inefficient in cases involving as few as two victims, where no class certification is required. As a result, courts may—and in fact do—determine liability incorrectly.\footnote{Examples of such erroneous determinations of liability are discussed in Section II.e.}

Prior scholarship has discussed victims’ heterogeneity primarily in contexts involving *potential* heterogeneous victims, where only one victim—randomly selected from the group of potential victims—is actually harmed.\footnote{See infra note 43 and accompanying text.} This Article deals with intrinsically different eventualities where a *group* of victims might suffer actual harm.\footnote{See infra Section I.c for elaboration on why the two cases are inherently different.}

When analyzing the standards of liability for the latter type of cases, the overwhelming majority of literature has assumed homogeneity of victims, either implicitly or explicitly, albeit justifying this assumption solely by a quest for “simplicity.” Assuming homogeneity of victims, however, may do more than just simplify the model: It may change the outcome dramatically, not just marginally. Part One will demonstrate that courts and scholars, including the Restatement (Third) of Torts, apply and support the aggregative test without controlling for the aforementioned inefficiencies.
After elaborating, in Part Two, the adverse outcomes that may arise from the aggregative test, Part Three will seek an alternative liability rule that would provide all parties with efficient incentives to exercise care. First, Section III.a will establish that dividing victims into homogeneous subgroups and determining liability toward each subgroup on its own merits is undesirable—due to high administrative costs, to the lack of clear-cut criteria for dividing the victims into such homogeneous subgroups, and to incorrect decisions that may result from this very option. I will then explore a new liability standard that determines liability, rather than by comparing aggregate costs with aggregated benefits, by aggregating, for each victim, the minimum of either the expected harm or the cost of precautions, and then comparing this aggregated minimum with the injurer’s precaution costs. This standard proves effective in assigning liability to the accident’s least cost avoider, but may be fraught with both pragmatic and conceptual problems if applied on its own. I will therefore propose a more comprehensive liability regime, which combines three different rules: First, in the pre-accident period, the law should allow restitution for efficient investments in precautions, with an added small “bonus,” given as an incentive to invest in efficient precautions. Second, in both pre-accident restitution claims and post-accident claims for damages, courts should conduct a “disaggregated liability analysis,” in which the factfinder should directly forecast the implications of finding for the plaintiff(s) and finding for the defendant—the same way this Article examines its examples; then, liability should be assigned to the defendant if, and only if, such liability could minimize the social costs of an ex-ante-similar accident. In cases where it can easily be

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19 In more technical terms, the bonus is intended to make the efficient investment in precautions the strongly dominant strategy, rather than a weakly dominant strategy. To the best of my knowledge, this is the first article to suggest such a mechanism.
applied, the “aggregate minimum” standard can assist the factfinder in determining the identity of the least cost avoider. Third, when the number of victims is too high, sampling can be used to cut down administrative costs.

This new combination of rules provides the parties with the right incentives to invest in the cost-justified precautions; at the same time, it retains the cost-saving properties of sampling when administrative costs are prohibitively high. Hence, acceptance of this proposal would result in reducing the social costs of accidents.

I. THE AGGREGATIVE COST-BENEFIT TEST IN PRIOR SCHOLARSHIP

A. Basic Economic Analysis of Tort Law

The goal of the normative economic analysis of law is to maximize social welfare by using legal rules as incentives for efficient behavior. In the context of tort law, this objective translates into designing liability rules that would minimize the social costs of accidents. These costs are, primarily, the expected harm to the victim on the one hand, and the costs of the precautions taken by both parties on the other.

Prior scholarship has devoted extensive attention to the effectiveness of negligence-based liability rules, i.e., negligence, comparative negligence, and strict liability with the defense of contributory negligence. These rules comprise, in essence, a cost-
benefit test, namely, the well-known “Learned Hand Formula,”24 which evaluates the reasonableness of a specific activity based on the balance between the costs and benefits of untaken precautions. Thus, an injurer’s negligence is determined by comparing his costs of untaken precautions (i.e., his “marginal cost of care”) with the risk that could have been avoided had he invested in those precautions (i.e., the “marginal expected harm”). Contributory negligence is economically determined by comparing the victim’s costs of care with the expected harm, and—in alternative care situations—also with the injurer’s costs.25 A cost-benefit test is also applied in product design-defect cases, where the manufacturer’s liability is determined by weighing the costs and benefits of the specific design and comparing them with the costs and benefits of an alternative, allegedly safer, design.26

It has long been established that, given some plausible assumptions,27 the negligence-based liability rules—when applied correctly—provide both the injurer and the victim with optimal incentives to exercise care.28 Negligence-based rules use tort liability to drive the parties to take such, and only such, precautions that would minimize the accident’s overall costs. This means, for example, that in alternative care

24 See supra note 3.
25 See SHAVELL, supra note 22. See also McCarty v. Pheasant Run, Inc., 826 F.2d 1554 (7th Cir. 1987) (dismissing a hotel guest’s claim for being attacked in her room, because the plaintiff could have prevented the attack more cheaply than the hotel).
26 See RESTATEMENT (THIRD) OF TORTS: PRODUCT LIABILITY §2(b) (1998) (“(A product) is defective in design when the foreseeable risks of harm posed by the product could have been reduced or avoided by the adoption of a reasonable alternative design ... and the omission of the alternative design renders the product not reasonably safe.”) See also W. Kip Viscusi, Wading through the Muddle of Risk-Utility Analysis, 39 AM. U. L. REV. 573, 598-600 (1990) and Michael D. Green, The Schizophrenia of Risk-Benefit Analysis in Design Defect Litigation, 48 VAND. L. REV. 609 (1995).
27 The common assumptions are that parties are rational, have full information, and are risk-neutral; that transaction costs are prohibitively high, that courts do not make systematic errors, and that damages equal the amount of harm. It is also generally assumed that each party can observe the actions of the other parties, and that courts set the standard at the socially efficient level of care.
28 See, e.g., SHAVELL, supra note 23, at 18; LANDES & POSNER, supra note 3, at 64-65; Brown, supra note 22, at 323; CALABRESI, supra note 22, at 135. Cf. Scott Hershovitz, Harry Potter and the Trouble with Tort Theory, 63 STAN. L. REV. 67 (2010) (Liability rules generate additional social benefits that are usually kept out of the calculations).
situations—i.e., when both the injurer and the victim can unilaterally minimize the risk of harm—these rules assign liability to the party that could avoid the accident at the lowest social cost (i.e., the “least-cost avoider,”) thereby driving her to invest in, and only in, such precautions that are socially desirable.

B. Multiple-Victim Torts and the Aggregative Test

As mentioned in the previous Section, the standard model indicates that negligence-based rules, which incorporate a cost-benefit test, can induce efficient investments in precautions, in torts that put a single victim at risk of harm. However, the technological, demographic, sociological and economic changes of the modern era have led to a growing number of accidents that involve multiple victims. In such multiple-victim cases, the current paradigm holds that cost-benefit analyses should compare overall costs with overall benefits.29 Thus, to determine an injurer’s negligence, the decisionmaker should weigh the injurer’s (marginal) cost of care against the aggregate amount of the victims’ (marginal) harms.

The Restatement’s commentators clearly adopt this aggregative standard. Section 3 of the Restatement (Third) of Torts provides that negligence be determined by comparing “the foreseeable likelihood (of) harm (and) the foreseeable severity of the harm that may ensue” with “the burden that would be borne by the person and others if the person takes precautions that eliminate or reduce the possibility of harm.” After providing that the same should hold for issues of contributory negligence,30 comment e explains section 3 as applying the aggregative test:

29 See infra. See also supra note 6 and LANDES & POSNER, supra note 3; Wright, supra note 2; Rodgers, supra note 2 and Washington v. Louisiana Power & Light Co., 555 So. 2d 1350, 1354 (La. 1990) (specifically adopting Rodgers’ aggregative interpretation of the Hand formula).
30 RESTATEMENT (THIRD), supra note 3, §3 cmt. b (“The definition of negligence set forth in this section applies whether the issue is the negligence of the defendant or the contributory negligence of the plaintiff.”)
**Balancing risks and benefits.** Insofar as this section identifies primary factors for ascertaining negligence, it can be said to suggest a “risk-benefit test” for negligence, where the “risk” is the *overall level of the foreseeable risk* created by the actor’s conduct and the “benefit” is the advantages *that the actor or others gain* if the actor refrains from taking precautions.  

This aggregative approach to liability seems reasonable, and even directly inferred by the goal of maximizing aggregate social welfare. Instrumental approaches to law, which have greatly affected American tort law, are less concerned with the repercussions of an injurer’s conduct on individual victims than with its repercussions on society as a whole. For that reason, scholars have suggested that the negligence doctrine “demands that we include all harms risked by the defendant’s conduct in our calculus of the benefits and burdens of the defendant’s conduct.” It may therefore seem justified, and even necessary, to determine liability by weighing overall risks against overall benefits. Professor Rodgers, for example, explains that without aggregations, “the Hand formula, B<PL,” does not capture the “full calculus of costs and benefits,” because:

single case applications of the Hand formula understate the social costs of the private investment decision by overlooking all other accidents that could be avoided by the same safety expenditures ... Construed to accomplish a full social cost-benefit analysis, the Hand calculus in a negligence action would ask whether B<LP+L_1P_1+L_2P_2+...+L_nP_n. The expanded benefit side of the equation accounts for the costs of all other accidents, discounted by their probability, that would be avoided by defendant’s investment in

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31 Id., § 3 cmt. e. (emphasis added.) See also Ronen Perry, Re-Torts, 59 ALA. L. REV. 987, 991 (2008) (“(The Restatement provides that) the reduction in risk refers not only to the specific victim but to the ‘overall level of the foreseeable risk’;” and at 1020: “this definition compares the cost of care with the aggregate level of foreseeable risk, not with the expected harm to a particular plaintiff.”) See also RESTATEMENT (SECOND) OF TORTS §293(d) (1965) (directing the court’s attention to “the number of persons whose interests are likely to be invaded if the risk takes effect in harm”) and RESTATEMENT (THIRD) OF TORTS: PRODUCT LIABILITY §2 (1998).


33 Hurd & Moore, *supra* note 2 (emphasis in original).
safety equipment or cessation activity.\textsuperscript{34}

A similar approach was taken by Fleming, and his views on this found their way into judicial reasoning: The Supreme Court of Oregon, for example, agreed with Fleming that “aggregate risks may make conduct negligent even though the specific risk to the particular plaintiff might in isolation be neither sufficiently unreasonable nor foreseeable.”\textsuperscript{35}

Most notably in his endorsement of the aggregation paradigm is Professor David Rosenberg. Rosenberg’s basic claim\textsuperscript{36} is that, when presented with a large number of victims, the courts should determine liability based on the average costs and harms of the victims (notice, that averaging and aggregating are essentially the same). Rosenberg argues that, although this averaging comes at the expense of individual justice, it is nevertheless justified based on efficient deterrence and access to justice—these advantages outweighing the disadvantage of abandoning individual justice. Rosenberg further claims that not only should society prefer deterrence over individual justice, but that potential victims should, and perhaps do, prefer optimal deterrence over individual justice.\textsuperscript{37} “For clarity of analysis,”\textsuperscript{38} Rosenberg assumes that averaging does not affect injurers’ or victims’ primary behavior, and maintains that the concern with averaging or aggregation is motivated solely by the issue of individual justice. He asserts, however,

\textsuperscript{34}Rodgers, \textit{Supra} note 2. \textit{See also supra} note 29.

\textsuperscript{35}Fazzolari v. Portland School District No. 1J, 734 P.2d 1326, 1331 (Or. 1987). The court cites FLEMIN\textsc{g}, \textit{THE LAW OF TORTS} 196 (5th ed. 1977). This quoted passage has remained in subsequent editions. \textit{See} FLEMIN\textsc{g}, \textit{THE LAW OF TORTS} 238 (9th ed. 1998).


\textsuperscript{37}David Rosenberg, \textit{Mass Tort Class Actions: What Defendants have and Plaintiffs Don’t}, 37 \textsc{Harv. J. on Legis.}, 393, 408 (2000).

\textsuperscript{38}HAY \& ROSENBERG, \textit{supra} note 36, at 3-4.
that individual justice notwithstanding, the \textit{ex ante} perspective requires that mass tort cases be decided based on averaging. In another paper, Rosenberg reasserts that:

\begin{quote}
Indeed, achieving optimal deterrence in mass tort cases entails no individualizing inquiries into and evidence of a defendant’s liability and damages in relation to a specific plaintiff or even any actual plaintiffs … (F)or deterrence purposes, all claims can be resolved in the aggregate, based on probabilistic projections that average out particularities.\textsuperscript{39}
\end{quote}

This Article, however, wishes to qualify these assertions by demonstrating that aggregations may lead to wrong determinations of liability, and that it is unrealistic to assume that averaging does not affect the ex-ante incentives. Because aggregation or averaging may provide the parties with improper incentives, the “individual injustice” which averaging creates may not be outbalanced by considerations of deterrence, but rather the opposite; individual injustice may join sub-optimal deterrence to make aggregations even more obstructive to the social goals of tort liability.\textsuperscript{40}

\textbf{C. Victims’ Heterogeneity}

It is a fact of life that victims of accidents differ from one another. Factors that are critical for the determination of liability, such as the victims’ level of harm, the probability that the risk would materialize, and the costs and efficacy of precautions—

\textsuperscript{39} David Rosenberg, \textit{Mandatory-Litigation Class Action: The Only Option for Mass Tort Cases}, 115 HARV. L. REV. 831, 862 (2002). Prof. Rosenberg advocated the same approach in David Rosenberg, \textit{The regulatory Advantage of Class Action, in REGULATION THROUGH LITIGATION} 244-309 (W. Kip Viscusi ed., 2002) (arguing for mandatory class action, as “a form of regulation that .... aggregate(s) all claims for collective litigation as a single claim for aggregate liability” (p. 246), while asserting that “(a)ll else being equal, to achieve optimal deterrence, mass production tort liability must threaten damages equal to the total aggregate tortious harm” (p. 248)). \textit{See also} Brian T. Fitzpatrick, \textit{Do Class Action Lawyers Make too Little?}, 158 PENN. L. REV. 2043, 2057-2061 (2010) (repeating Rosenberg’s arguments and concluding that the aggregation of claims to decide if and how much the defendant should pay helps achieving optimal deterrence).

\textsuperscript{40} It should be noted, however, that, under certain conditions, the two positions can be reconciled. Indeed, my claim relates only to specific circumstances; and even then, the magnitude of the inefficiency varies and in some cases may not exceed the benefits of averaging. Furthermore, my work does not address Rosenberg’s “easier access to justice” claim. If the benefit of easier access to courts outweighs the social price of implementing the second-best equilibrium, averaging may indeed be preferable.
depend on circumstances that typically differ, at times substantially, from one victim to another. Such factors may be the value of the property that is under risk, the victim’s earning capacity, her age, her health condition, the victim’s location (especially in environmental torts\textsuperscript{41}), the victim’s education and skills, etc.

When modeling multiple-victim scenarios, however, most of the literature has assumed (sometimes explicitly and sometimes implicitly) that victims are homogeneous.\textsuperscript{42} However, when scholars have assumed homogeneity, they seem to have neglected the need to justify this assumption other than by their attempt to simplify the model. While simplicity of models should be encouraged, it seems less valid where the simplifying assumption is both unrealistic and likely to change the conclusions dramatically in a non-trivial manner.

Prior literature\textsuperscript{43} has analyzed Victims’ heterogeneity with regard to potential

\textsuperscript{41} Victims’ location has an enormous impact on the likelihood of harm in environmentally-related torts. See, e.g., JAMES T. HAMILTON & W. KIP VISCUSI, CALCULATING RISKS? THE SPATIAL AND POLITICAL DIMENSIONS OF HAZARDOUS WASTE POLICY 100 (1999) (supplying data according to which the risk of cancer changes significantly every 1/4 mile).

\textsuperscript{42} The most notable example is Landes and Posner. In their seminal book, these authors develop a model of catastrophic accidents, which is based on the untenable assumption that the victims are identical. See LANDES & POSNER, supra note 3, at 258-272, and especially at 270, where they assume homogeneity without explanations or reservations. Their main innovation is in positing that, as the number of victims rises, so too does the amount of harm, and with it the probability of the injurer reaching limited solvency. Landes and Posner conclude that, in catastrophic accidents, negligence may be more efficient than strict liability—a contention that Section II.c will demonstrate to be overly general. See also THOMAS J. MICELI, THE ECONOMIC APPROACH TO LAW 97-99 (2004) (a repetition of Landes and Posner’s results). Other examples are Margherita Saraceno, Group Litigation, Access to Justice and Deterrence, Amsterdam Ctr. for Law & Econ. Working Paper No. 2008-04 (2008), available at http://ssrn.com/abstract=1128058 (addressing the different implications of group litigation of mass torts on, inter alia, the ex-ante incentives of the injurer, but assuming homogeneity of victims); and Dari-Mattiacci and Langlais, who compare two cases: harm inflicted on one person and the same harm inflicted on multiple victims. Crucially, implicit in their argument is the assumption that victims are homogeneous, a notion that leads them to conclude that, as the number of victims rises, the optimal level of care decreases (due to the spreading of the risk). See Giuseppe Dari-Mattiacci & Eric Langlais, Social Wealth and Optimal Care (Amsterdam Ctr. for Law and Econ. Working Paper No. 2008-04, 2008) available at http://ssrn.com/ abstract=1152302.

Recently, Kenneth Simons discussed injurers’ culpability in multiple-victim cases, but he too limits his discussions to homogeneous victims. See Simons, supra note 15, at 27 (“If, for one drive, $B > P \times L$, so that the actor is not negligent, then obviously for 10,000 drives, $[10,000 \times B] > [10,000 \times (P \times L)]$, and the actor is still not negligent.”).

\textsuperscript{43} See, e.g., Louis Kaplow & Steven Shavell, Property Rules versus Liability Rules: An Economic
victims, where a single actual victim (unknown \textit{ex-ante}) is randomly selected from a group of heterogeneous potential victims. These models highlight two main problems, both of which arise from the difference between the actual victim and other potential victims: the difficulty in setting an \textit{ex-ante}-efficient standard of care, and the problem of awarding \textit{ex-ante}-efficient damages to the actual victim. It is important to emphasize, however, that both of these problems become irrelevant in scenarios where a group of victims is at risk of being collectively harmed. The crux of those problems is the need to provide the proper incentives for parties that cannot know, \textit{ex ante}, which victim would be harmed. Thus, both the courts and the parties lack the knowledge of the actual harm that should be balanced against the costs of precautions. In contrast, when an entire group of heterogeneous victims is harmed, this amount is—or at least can be—known, so that such problems do not arise.\footnote{Some studies have briefly pointed to possible side effects in cases where the victims are heterogeneous, such as large transaction costs. See Mark D. West & Emily M. Morris, \textit{The Tragedy of the Condominiums: Legal Responses to Collective Action Problems after the Kobe Earthquake}, 51 \textit{Am. J. Comp. L.} 903 (2003). (In cases involving heterogeneous victims, transaction costs would rise, due to the variance in harm and disputes about what remedy to pursue). This point was also made by Gideon Parchamovsky & Peter Siegelman, \textit{Selling Mayberry: Communities and Individuals in Law and Economics}, 92 \textit{Cal. L. Rev.} 75, 95 (2004). Calabresi and Melamed, on the other hand, hold that the...}

\textit{Analysis}, 109 \textit{Harv. L. Rev.} 713 (1996) (Negotiations between potential victims and potential injurers may fail when either group is heterogeneous and each side knows only the distribution for the other group but not the specific realization of that distribution); Winand Emons & Joel Sobel, \textit{On the Effectiveness of Liability Rules when Agents are not Identical}, 58 \textit{Rev. of Econ. Stud.} 375 (1991) and Juan Jose Ganzuza & Fernando Gomez, \textit{Caution, Children Crossing: Heterogeneity of Victim’s Cost of Care and Negligence Rule}, 1 \textit{Rev. L. & Econ.} 365 (2006) (both papers calculate the right damage awards when one victim and one injurer are randomly picked from heterogeneous groups); Eric Talley, \textit{Precedential Cascade: an Appraisal}, 73 \textit{S. Cal. L. Rev.} 87 (2000) (using a similar model to show some adverse effects of precedents). Louis Kaplow, \textit{Accuracy in Adjudication}, 23 \textit{J. Legal Stud.} 307, 314-315 (1994) (In a heterogeneous potential victims setting, damage averaging creates adverse incentives when individuals know the actual level of harm). Tim Friehe, \textit{On the Incentive Effects of Damage Averaging in Tort Law}, 11 \textit{Economics Bulletin} 1-7 (2007) (showing, using a model with two types of potential victims and only one actual victim, that the negligence regime is efficient, but that, in order to create the right incentives for the parties, average damage awards should be used under strict liability); Tim Friehe, \textit{Screening Accident Victims}, 29 \textit{Int’l Rev. L. & Econ.} 272 (2009) (exploring the right mechanism to incentivize the actual victim to tell the truth about her real harm); Jacob Nussim, \textit{Distributive Aspects of Legal Standards} (2008), available at http://ssrn.com/abstract=1095282 (concluding that when the potential victims are heterogeneous, the negligence rule has a distributive effect, while strict liability does not. Nussim emphasizes that his results are limited to heterogeneity of only potential victims).
victim is randomly selected from a group of potential victims, first-best efficiency is unattainable; the question is then which second-best outcome should be preferred. However, cases where groups of heterogeneous victims, known *ex-ante*, may suffer harm are intrinsically different; in such cases—as Part III will show—the first-best outcome is indeed attainable, and should be pursued.

Courts’ attention to victims’ heterogeneity is limited to procedural issues, such as the certification of classes in mass torts, under rules similar to Rule 23 of the Federal Rules of Civil Procedure, which require commonality of issues among the class members and predominance of those issues over the individual issues. 

However, the procedural rules that govern the certification of class actions or other multi-party litigation do not affect the *substantive* standard of liability, and therefore cannot adequately address the problem of victims’ heterogeneity. In other words, the determination of the injurer’s liability does not, and should not, depend on the actual parties to the claim but rather on the parties to the accident in the world outside the courtroom. Moreover, even under rules similar to Rule 23, courts certify *somewhat* heterogeneous groups on a regular basis. Indeed, a rule under which only fully


45 USCS Fed. Rules Civ. Proc. 23(a)(2) and 23(b)(3) (hereinafter: “Rule 23”); Other jurisdictions adopt identical, or very similar, provisions.

46 See supra note 15.

47 See, e.g., Smilow v. Southwestern Bell Mobile Sys., 323 F.3d 32 (1st Cir. 2003), at 39 (“Courts traditionally have been reluctant to deny class action status under Rule 23(b)(3) simply because affirmative defenses may be available against individual members”) and at 40 (“courts generally find the predominance requirement to be satisfied even if individual damages issues remain.”) Scott v. First Am. Title Ins. Co., 2007 WL 135909 (D.N.H. 2007) (“When common questions predominate as to liability, courts will ordinarily find predominance even if individual issues concerning affirmative defenses or damages exist.”) See also Grant v. Becton Dickinson & Co., 2003 Ohio 2826 (Ohio App. 2003) (Summarizing, at §§ 46-52, the different attitudes to this question and concluding that, in the vast
homogeneous groups are certified will result in very few, if any, class actions.\textsuperscript{48}

Furthermore, in examining classes’ heterogeneity, courts are rarely concerned with the effect heterogeneity has on the parties’ incentives for primary behavior, and more focused on individual justice, procedural efficiency and constitutional rights.\textsuperscript{49}

Consequently, even decisions to decertify heterogeneous classes that may seem correct from this Article’s perspective are nevertheless based on non-economic considerations, making it likely that under slightly different settings the decision would be flawed.

\textsuperscript{48}Interestingly, the disregard for victims’ heterogeneity is not just an American phenomenon, and the situation is more or less similar in other common law countries. See, e.g., the Canadian case of Wilson v. Servier Can. Inc. (2000), 50 O.R. 3d 219 (Ont. S.C.J.). In this case, a class action for diet pills’ product liability, the victims class was certified despite the differences in affirmative defenses (in particular contributory negligence) and although the amount of harm for each plaintiff differed substantially between class members. This is an interesting case precisely because the court emphasizes economic efficiency as one of the reasons for the certification of the class. Needless to say, under the Canadian product liability law, the cost-benefit test is applied to decide whether a product is defective (See \textsc{Lawrence G. Theall}, \textsc{Product Liability: Canadian Law and Practice L2–L2–L2–L2} (2006)).

\textsuperscript{49}See, e.g., Anchem Products Inc v. Windsor, 521 US 591 (1997) (rejecting a settlement in a mass tort because of differences in harm levels between individual plaintiffs). The Supreme Court based its decision on individual justice, rather than on economic efficiency, and its decision was limited to the question of damages rather than the issue of liability. See also \textsc{In re Rhode-Poulenc Rorer Inc.}, 51 F.3d 1293 (7th Cir. 1995), \textit{cert. denied}, 516 U.S. 867 (1995). In this case, the District Court certified a class of around 300 AIDS-infected hemophiliacs from different states, and ordered that the case be bifurcated, so that one jury would decide the defendants’ liability towards the class as a whole, and afterwards different juries from different jurisdictions would decide the comparative or contributory negligence of each of the plaintiffs. The Seventh Circuit, however, ordered that the class be decertified. The majority based its decision on the differences in the contributory/comparative negligence issues among jurisdictions and among the plaintiffs. Interestingly, however, although the majority opinion was written by Judge Posner, it does not rely on economic, but rather on constitutional, considerations. Judge Posner implies that if one jury could have been assembled, then the mere existence of differences between the plaintiffs would not have been a reason to decertify the class.
II. THE INEFFICIENCY OF THE AGGREGATIVE COST-BENEFIT TEST

When victims differ from one another, balancing aggregate costs against aggregate benefits may yield incorrect assignments of liability. The reasons for this are twofold. First, aggregations create a pool of victims, thereby eliminating the ability to provide different victims with different incentives, or to provide the injurer with incentives to accord different treatment to different victims. Second, aggregate amounts are a poor indicator of the identity of an accident’s least-cost avoider(s), since aggregations veil the distribution of costs among victims. As a result, the aggregative cost-benefit test evaluates an injurer’s conduct not towards its actual victims, but rather towards an imaginary aggregate, or average, victim; but when victims have non-identical costs of care, or different levels of expected harm, or when they derive different utilities from the relevant activity, then the actual victims may differ from their average a great deal. In such cases, some of the victims may require the exact opposite incentive than the average, or the aggregate, victim; however, by providing the same incentive to every victim, the aggregative test may induce sub-optimal deterrence. The following Sections elaborate how the aggregative test may sometimes lead to over-deterrence and sometimes to under-deterrence; these two adverse outcomes occur under dissimilar conditions, and therefore, rather than canceling, they amplify one another, adding up to an even greater social loss.

A. Over-Deterrence

Consider the following example: Two guests, Alice and Beth, slip and fall in the front yard of their host, Diane. Alice, who suffers substantial harm, could easily have avoided falling, while Beth, who suffers less harm, could not have done so. On the other hand, Diane could have eliminated the risk only at great cost. Assume the
following *ex ante* amounts: 50

**Table 1: Over-Deterrence**

<table>
<thead>
<tr>
<th>Expected Harm</th>
<th>Alice</th>
<th>Beth</th>
<th>Aggregation</th>
<th>Diane</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>10</td>
<td>110</td>
<td>120</td>
<td>70</td>
</tr>
</tbody>
</table>

Should Diane be deemed liable for the harm? The aggregative cost-benefit test deems Diane liable. On aggregate, she seems to be the accident’s least-cost avoider, since she could have prevented a risk of 110 had she invested only 70 in precautions. Alice and Beth, on the other hand, would have had to invest an overall of 120 (larger than Diane’s 70, and larger than the risk of 110) to avoid the risk. Hence, if aggregate amounts were used as the criteria for reasonableness of conduct, then Diane would be deemed liable for the harm, under every negligence-based rule: Under negligence, Diane would be deemed negligent since her costs of precaution (70) are lower than the expected harm (110); and under strict liability, the victims would not be deemed contributorily negligent, since their precaution costs (120) are higher than the expected harm. Notice, that both Alice’s costs of precaution (40) and Beth’s precaution costs (80) are higher than Diane’s average cost of precaution (35) and, accordingly, deciding on each victim’s contributory negligence on its own merits cannot change the assignment of liability to Diane. 51

However, a decision to hold Diane liable in this case is incorrect, since it will generate over-deterrence. Diane, being rational and expecting such decision, will invest

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50 In the following example I make the same simplifying assumptions commonly used (*supra* note 27). Since this is an alternative-care example, I assume that the taking of precautions by either side eliminates the risk, and that Diane’s utility is high enough (higher than 70). Bilateral care and unilateral care situations are discussed in Parts II.c and II.d.

51 Obviously, even an individual determination of contributory negligence must consider the injurer’s *average*, rather than total, costs of precaution. Otherwise, even in a case in which there are, for example, 100 victims, 99 of which are similar to Alice and one similar to Beth, contributory negligence would be assigned to the “Alice victims,” thereby driving societal costs to as high as 99×40+10=3,970, instead of only 70.
70 in precautions in order to avoid having to pay 110 in damages. But consider what the overall social costs would be if, under the same circumstances, the court exempted Diane from liability: Alice, who would not expect any compensation, would avoid the risk of 100 at a cost of 40, while Beth would choose to bear the expected harm of 10. The overall societal costs would thus amount to only 50 (10 + 40), instead of 70. Overall, it is the victims in this case, and not Diane, who are the accident’s least-cost avoiders, but the aggregative test fails to detect that, thereby inducing Diane to invest in the inefficient and too costly precautions.

Most jurisdictions today apply comparative negligence, rather than the contributory negligence defense. This, however, does not change the example’s qualitative results, and the same over-deterrence effect occurs under comparative negligence. The calculations of each party’s percentage of fault is slightly complex, and therefore is given in full in the Appendix, but the main result therein is that an aggregative approach to comparative negligence leads to an unjustified reduction in the victims’ percentage of fault, and, accordingly, to an increase in the injurer’s percentage of fault. Applying any of the conventional formulas for comparative negligence to the above example generates the same result: it drives Diane to invest in the too-costly precautions.\textsuperscript{52}

In this example, Diane should be exempt from liability to each of her guests for interconnected reasons: she should not be held liable toward Alice because—given that Beth’s risk is too low to justify Diane exercising care—Alice’s precautions are cheaper than Diane’s; on the other hand, Diane should not be deemed negligent toward Beth because—given that Alice invests in her own precautions—Beth’s risk is too low to justify Diane’s exercising care. The paradox here is that pooling together these

\textsuperscript{52} See Appendix for exact calculations and proof.
interconnected decisions on Diane’s liability generates the wrong decision on the aggregate level.

In general, over-deterrence may occur when efficiency requires that some of the victims invest in precautions while other victims bear the harm. This happens when one subgroup of victims has both high levels of harm and relatively cheap precautions, while another has low levels of harm yet costly precautions. The former group (represented by Alice in the example above) comprises least-cost avoiders who should exercise their precautions; the latter group (represented by Beth in the above example) comprises victims whose level of harm is too low to justify the injurer’s investing in precautions. Under such circumstances, the aggregative test may indicate that the injurer’s exercising care is socially desirable, despite there being a more efficient way to avert the risk, namely, to have the former subgroup invest in precautions and the latter subgroup bear the harm.

B. Under-Deterrence and Levels of Activity: A Dilution of Liability

The aggregative approach to liability may lead not only to over-deterrence, but to under-deterrence as well. One way that this may occur is through distorting the injurer’s incentives to moderate her level of activity.

Conventional wisdom maintains that the rule of strict liability provides potential injurers with proper incentives to engage in their socially-desirable level of activity.53 However, if additional activity might harm additional victims, determining liability based on aggregate amounts may enable the injurer to dilute her liability by raising her

53 Shavell, supra note 21. See also Meese, supra note 10 (“According to the conventional model, then, strict liability with a defense of contributory negligence will induce … the optimal type and level of activity by the injurer.”)
activity level above the efficient threshold.\textsuperscript{54}

To illustrate, imagine a factory in proximity to two farms, one closer than the other. This factory pollutes the stream that supplies water to the farms. Suppose that there are two levels of activity available to the factory: a low level of activity that results in a low level of pollution, thereby posing a risk only to the closer farm; and a 20\% increase in activity, which generates a higher level of pollution, thereby adding a risk to the distant farm as well. Suppose further that either the factory or the farms can eliminate the risk by installing a filtering system (either in the factory itself or in each of the farms’ pumping systems). Consider the \textit{ex ante} costs shown in Table 2.

\textit{Table 2: The Aggregative Test and Levels of Activity under Strict Liability}\textsuperscript{55}

<table>
<thead>
<tr>
<th>Low Level of Activity (100%)</th>
<th>High Level of Activity (120%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Factory</td>
</tr>
<tr>
<td>Expected Harm</td>
<td></td>
</tr>
<tr>
<td>Cost of Filtering</td>
<td>100</td>
</tr>
<tr>
<td>Utility for the Factory</td>
<td>150</td>
</tr>
</tbody>
</table>

An aggregative standard of liability under these circumstances will cause the factory to undesirably set its activity at the high level. In the low-activity-level situation the factory’s net utility, after having to pay damages to Farm A,\textsuperscript{56} amounts to 120 (150-30). On the other hand, in the high activity level the farms would be deemed contributorily negligent, since their cumulative cost of filtering, 110, is less than both

\textsuperscript{54} For other examples of dilution of liability see Alon Harel & Assaf Jacob, \textit{An Economic Rationale for the Legal Treatment of Omissions in Tort Law: The Principle of Salience}, 3 \textit{THEORETICAL INQ. L.} 413 (2002) (The dilution of every injurer’s liability under the rule of joint and several liability).

\textsuperscript{55} For simplicity, I assume that the two farms are the sole potential victims of this pollution, and that there is no further environmental harm. This is, of course, a contrived assumption, but one that does not change the results of this example.

\textsuperscript{56} The factory will be held liable to pay damages, regardless of it being non-negligent, since the legal regime here is strict liability. The farm will not be deemed contributorily negligent since its filtering costs are higher than its expected harm, which makes its decision not to filter the water reasonable.
the factory’s cost of filtering, 120, and their aggregate harm, 130. In other words, when the factory’s activity level is high, the farms may seem the least cost avoiders of harm. Consequently, if the factory were to engage in the high level of activity, it would have to pay no damages at all, and its utility would rise to 180. As a result, Farm B would have to install the filtering system at a cost of 60 and Farm A will suffer the harm of 30. The overall societal costs would thus amount to 90 (60+30), and the net societal gains would also be 90.57

From society’s perspective, however, it is preferable that the factory sets its activity at the low level. The factory’s utility is then 150 and Farm A’s harm is 30 (for which—under the strict liability rule—the farm owner is fully compensated), leading to net societal gains of 120, as opposed to only 90 in the high-activity-level scenario. It is therefore evident from this example, that—contrary to conventional wisdom—the strict liability rule does not drive the injurer to set its activity at the socially-desirable level. Such a distortion of incentives generates, in this example, a social loss of 30.

To conclude, the aggregative cost-benefit test may indicate that victims are contributorily negligent when a potential injurer operates at a high level of activity, but not at a low activity level. This may encourage excessive activity by potential injurers.

C. Under-Deterrence in Unilateral Care Situations

The two preceding Sections have explored the adverse outcomes that may result from applying the aggregative test to alternative care situations. Many of the multiple-victim accidents, however, are unilateral care cases, in which precautions are realistically available only to the injurer. In these cases, too, applying the aggregative test may result in under-deterrence. Combined with tort law’s reluctance to examine an

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57 The factory’s utility of 180 minus 60 in precaution costs and minus 30 in harm. 180-60-30=90.
injurer’s original decision as to which activity to pursue (under negligence), or what type of product to manufacture (in design-defect cases), an aggregative approach to liability may paradoxically drive an injurer to prefer an overall riskier enterprise to a safer one.

Courts’ evaluation of an injurer’s conduct is limited to the specific activity in which the injurer engaged. The injurer’s original decision of which activity to pursue, or which type of product to manufacture—is left out of the cost-benefit calculations. The fact that the injurer decided, for example, to manufacture product ‘A’ rather than an altogether different type of product, ‘B’, is irrelevant for the determination of liability.\(^{58}\) Courts may decide, of course, that a specific activity is too dangerous to be pursued at all,\(^ {59}\) but if the particular activity is reasonable in and of itself, courts may not impose liability based on the mere fact that society would have been better off had the injurer decided to pursue a different activity. I will name this doctrine “the Specific Activity Doctrine,” or “SAD.”

SAD, in itself, may provide problematic incentives for potential injurers, but this issue is beyond the scope of this Article.\(^ {60}\) Of relevance to this discussion, however, is that an aggregative approach to liability may exacerbate the inefficiencies caused by SAD even further. A potential injurer who expects that courts apply both the aggregative test and SAD may prefer pursuing an activity that inflicts greater overall risk upon a larger group of victims, to an activity that puts a smaller group at a lesser

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58 *RESTATEMENT (THIRD), supra* note 3, §3, reporters’ note on cmt. j (“the negligence doctrine does not apply to the defendant’s original choice of activities.”)

59 Or, as the Restatement commentators put it, his “very decision to engage in a particular activity created an unreasonable risk of harm.” *See RESTATEMENT (THIRD), supra* note 3, §3 cmt. j. *See also* *RESTATEMENT (THIRD) OF TORTS: PROD. LIAB.*, § 2 cmt. e (1998).

60 SAD may be justified both on deontological grounds of individual autonomy and liberty, and on efficiency-based grounds of courts’ lack of information.
For illustration, imagine a wine-bottle factory that can produce either colorless or green bottles, both of which can be sold for the same price in the market and cost the same to manufacture. The only difference between the two bottles, from the factory’s standpoint, is the toxicity of fumes emitted from the furnace in the case of an accident. Producing colorless bottles would result in the emission of moderately toxic fumes that might pose a risk to one employee only: the production engineer, who works in direct contact with the furnace. Producing green bottles, on the other hand, would result in the emission of highly toxic fumes that would pose an additional risk to four maintenance workers. Assume that the probability of an accident is 0.1% per day, and if such accident occurs, the skilled engineer would suffer a harm of $10,000 and the low-skilled maintenance workers a harm of $5,000 each. The factory can avert the harm by supplying each worker with special single-use masks that cost $8 each. For simplicity, assume that there is no Workers Compensation Act and that the legal regime for employer liability is negligence.\(^{61}\) Table 3 summarizes the relevant data.

**Table 3: A Unilateral Care Situation**

<table>
<thead>
<tr>
<th>Producing Colorless Bottles</th>
<th>Producing Green Bottles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Engineer</td>
</tr>
<tr>
<td>Expected Harm</td>
<td>10</td>
</tr>
<tr>
<td>Precaution Costs</td>
<td>8</td>
</tr>
</tbody>
</table>

From society’s perspective, it is better that the factory produce colorless rather than green bottles, since the only difference between them is that colorless bottles inflict less risk of harm than the green ones. However, the combination of the aggregative test and

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\(^{61}\) I also assume that the per-day social utility from the factory’s activity is sufficiently high (greater than $30).
SAD drives a rational factory owner to produce green, rather than colorless, bottles. The reason being that producing colorless bottles puts the factory under a risk of liability for the engineer’s harm;\(^\text{62}\) the factory would be required to equip the engineer with masks, thereby adding $8 per day to the production costs. However, if the factory produces green bottles, then under the aggregative test its policy not to supply its workers with masks would not be deemed unreasonable,\(^\text{63}\) and would thus save the factory the additional costs of $8 per day. In other words, the factory may be able, in this case, to escape liability and cut down its costs by choosing to manufacture a riskier product and inflicting a larger and overall risk on all its workers.

This socially undesirable outcome would be mitigated if courts adopted a non-aggregative standard of liability. Deciding on the factory’s liability towards each of its employees on their own merits\(^\text{64}\) would make the factory liable solely towards the engineer, regardless of which bottles the factory produces, because the risk to any of the maintenance workers ($5 per day) does not justify supplying them with $8 masks. Accordingly, the factory would become indifferent between the two production options. Moreover, if, for some reason,\(^\text{65}\) the factory cannot provide masks only to some of its at-risk workers, then the factory would strictly prefer to produce colorless bottles, thereby serving the socially desirable end of minimizing overall costs. The reason is that if the factory manufactures colorless bottles, it would be able to provide masks to the engineer (who is the only at-risk worker), thereby adding only $8 to its production.

\(^{62}\) Applying the Learned Hand rule, the court will find that \(P \times L > B\) (0.1\% × $10,000 = $10 > $8).

\(^{63}\) This is because if \(L\) denotes the aggregate harm, and \(B\) the aggregate precaution costs, then \(P \times L < B\) (0.1\% × ($10,000 + 4 × $5,000) = $30 < $40 = 5 × $8). Note, that there may be reasons (such as rules demanding equal treatment of workers, labor unions action etc.) why manufacturing the green bottles but supplying only the engineer with masks is unfeasible. Therefore, supplying the engineer with masks might not be considered the factory’s marginal precaution.

\(^{64}\) For now, deciding separately on each victim’s case can suffice. In Part III, however, I will reason that this practice is far from perfect, and suggest better solutions.

\(^{65}\) See supra note 64 for such reasons.
costs, rather than exposing itself to liability toward the engineer at a cost of $10, which would be the case if it produces green bottles, and not provide masks to all its workers.

The above example demonstrates two important yet unintuitive results. First, it illustrates a case in which, if the aggregative test is applied, some potential victims would actually prefer a legal rule of no-liability to negligence. The reason being that under negligence the factory would manufacture green bottles and the four maintenance workers would be at risk of suffering harm with no compensation, while in a world without liability the factory would either be indifferent between its two production options or strictly favor manufacturing colorless bottles. The maintenance workers’ expected utility is thus higher in the no-liability world.

Second, this example suggests that as long as the aggregative test continues to be the standard of liability for multiple-victim accidents, strict liability may be socially more desirable than negligence—contrary to suggestions in prior scholarship that the negligence rule may be preferable. Under strict liability, the factory will be liable for every worker’s harm; producing green bottles will therefore cost the factory at least $20 per day more than producing colorless ones, so the factory will choose colorless over green bottles. Thus, strict liability—but not negligence—drives the factory to opt for the efficient behavior.

To conclude, when a potential injurer’s precaution technology is such that its costs depend on the number of potential victims, the cumulative effect of SAD and the aggregative test may drive the injurer, under negligence, to engage in activities that inflict a greater risk of harm on a larger group of victims, rather than in activities that

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66 Landes & Posner, supra note 3, at 259 (“Paradoxically, then, a negligence standard may give the injurer a greater incentive to use due care than strict liability would do.”)
create less overall risk. This result is, of course, socially undesirable.

**D. Under-Deterrence in Bilateral Care Situations**

The aggregative cost-benefit test may also generate under-deterrence in bilateral-care situations, where the precautionary measures of the injurer and the victims are complementary, so that both are needed to minimize the harm.

For illustration, consider a modified version of the first example: Three guests, Alice, Beth, and Carol, slip and fall in the front yard of their host, Diane. To prevent this harm from occurring, Diane would have had to hire a gardener to mow her lawn\(^{67}\) and, in addition, the guests would have had to buy and wear expensive, personally designed, shoes.

\[\text{Table 4: Under-Deterrence in a Bilateral Care Case}\]

<table>
<thead>
<tr>
<th></th>
<th>Alice</th>
<th>Beth</th>
<th>Carol</th>
<th>Aggregate Victim</th>
<th>Diane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precaution Costs</td>
<td>40</td>
<td>80</td>
<td>30</td>
<td>150</td>
<td>130</td>
</tr>
<tr>
<td>Expected Harm</td>
<td>120</td>
<td>10</td>
<td>120</td>
<td>250</td>
<td></td>
</tr>
</tbody>
</table>

Aggregatively, the socially-desirable outcome might seem to be that no party takes precaution, since the victims’ aggregate harm (250) can only be avoided at a higher aggregate cost of 280 (the victims’ aggregate cost of 150 plus Diane’s cost of 130). Accordingly, under negligence, the aggregative test yields no liability for Diane, thus leaving her with no reason to mow her lawn. As a result, the victims too will not exercise care (since buying special shoes is pointless if the lawn is not mown) and the overall costs will amount to the aggregate harm of 250. A closer look, however, reveals that in order to minimize the overall societal costs, Diane should mow her lawn and

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\(^{67}\) Assume that hiring the gardener and mowing the lawn have no other purpose than preventing the fall of those three guests.
Alice and Carol (but not Beth) should buy and wear the special shoes, thereby reducing the overall costs to 210. But, under an aggregative liability standard this efficient outcome is obtainable only through a collective action of Alice and Carol; such collective actions by tort victims, however, are difficult to achieve and may entail high transaction costs.

Under strict liability, the outcome is a bit more complex. Strict liability requires Diane to pay 250 in damages. The question whether this can actually drive her to mow her lawn (at a cost of 130) depends on whether Alice and Carol buy and wear the shoes—and this, in turn, depends on the method by which contributory negligence is determined. If contributory negligence is determined aggregatively, then only the costs of untaken precautions should be considered, so that Alice and Carol would be deemed contributorily negligent if Diane hires the gardener but they do not buy and wear the shoes. However, as some scholars have indicated, considering only untaken precautions is the wrong way to determine contributory negligence, since it may lead to strategic investments in inefficient precautions. Yet, if courts considered overall precaution costs, rather than only untaken precautions, the Victims here would not be deemed contributorily negligent; Alice and Carol would have no incentive to exercise care—and, consequently, Diane would have no reason to mow her yard. Thus, under-deterrence may result in this bilateral care example, even under strict liability.

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68 Diane’s costs of 130, plus Alice’s cost (40), Carol’s cost (30) and Beth’s expected harm (10).
70 Since, once the Injurer invests 130 in his own precautions, it is efficient for the Victims to invest an overall of 150 to prevent the aggregate harm of 250.
E. Examples of Erroneous Determinations of Liability

The previous Sections have used hypothetical examples to demonstrate that weighing aggregate costs against aggregate benefits may lead to inefficient determinations of liability. Such inefficiencies, however, are not limited to hypothetical examples; they also occur in real life.

One case where the court’s aggregative approach clearly generated under-deterrence is Johnstone v. American Oil.\textsuperscript{72} The plaintiff, a seaman who suffered (and later died from) mesothelioma as a result of exposure to asbestos, sued, \textit{inter alia}, the asbestos manufacturer to whose products he had been exposed, claiming that those products were unreasonably dangerous.\textsuperscript{73} The jury found that the defendant’s asbestos had, indeed, caused Mr. Johnstone’s illness. However, the defendant’s asbestos-containing materials were reasonably safe, according to the jury, since the overall benefits of using them (including in warships during World War II) outweighed their overall societal risks. Nevertheless, the magistrate judge granted the plaintiffs’ motion for judgment notwithstanding the verdict and ruled against the defendant, on the basis that the specific risk to Mr. Johnstone outweighed the utility of the product. The manufacturer appealed, and the Fifth Circuit reversed the judgment notwithstanding the verdict and approved the jury’s findings. The Fifth Circuit held that, although the defendant’s asbestos was unreasonably dangerous in the specific use that caused the plaintiff’s illness and death, its cumulative risks did not outweigh its aggregate utility, and therefore the product was not unreasonably dangerous per se:

\textsuperscript{72} 7 F.3d 1217 (5th Cir. 1993).

\textsuperscript{73} Under Louisiana law, as applied by the Fifth Circuit in this case, a product is “unreasonably dangerous per se” if “a reasonable person would conclude that the danger-in-fact of the product, whether foreseeable or not, outweighs the utility of the product.” \textit{Id.}, at 1219.
In setting aside the jury’s verdict, the magistrate judge seems to have focused on the risks to Mr. Johnstone, as opposed to the risks to society as a whole... In concluding that (the) products were not unreasonably dangerous per se, the jury did not confine its assessment of the risks of (the) products to the risk actually realized by Mr. Johnstone, but instead correctly considered the risks of the products to society as a whole. ... The jury was entitled to find that, even though (the) products were a substantial contributing cause of Mr. Johnstone’s mesothelioma, the overall utility of (the) products nevertheless outweighed the risks of those products to society as a whole.74

Even the dissenting judge in this case explicitly agreed with the majority that it is “undoubtedly true” that “the danger in fact of the product to society as a whole (should) be weighed against the utility of the product to society as a whole.”75

The Fifth Circuit’s decision suffers from the very same flaws I have described earlier.76 In a nutshell, the court examined the injurer’s liability by aggregating different risks posed to heterogeneous victims, as well as different benefits from different uses. Consequently, the manufacturer was exempted from liability for the unreasonable-in-itself risk it had inflicted upon Mr. Johnstone, only because its products were also used for other, more effective, purposes (namely, warships during World War II) and posed relatively fewer risks to other victims. This aggregative approach to the manufacturer’s liability generates under-deterrence. It allows a manufacturer to refrain from investing in cost-effective precautions for the “high risk” uses. Consequently, a producer of a product that has high societal utility and relatively small risks is given a “license to harm”: this manufacturer would be exempted from liability for distributing the product further, to places and for uses that are more risky and less socially desirable.

74 *Id.*, at 1223 (emphasis added).
75 *Id.*, at 1226 (Johnson, J., dissenting) (emphasis in original). The disagreement between the majority and the minority opinions was only over whether “society as a whole” should mean “society at the time of injury” or “society throughout the ages.”
76 Note, that this “over-distributing” effect is the product-liability-equivalent of the dilution of liability effect, discussed in Section II.b.
Furthermore, when reversed, the manufacturer of a product that creates great risk and has little, if any, social utility, can dilute its liability by distributing the same product to places and for uses that inflict less relative risk (or have greater social utility). In any case, the aggregative approach enables manufacturers to save the costs of efficient precautions for “high risk” victims, knowing that the “low risk” (or the “higher utility”) victims would outbalance the “high risk” use.

It is clear from the 5th Circuit’s decision that the aggregative cost-benefit analysis resulted in no liability because of the benefits generated from asbestos in war ships during WWII, and that this net benefit outweighed the net risk caused to Jonstone and other seamen who worked on civilian ships. It follows, therefore, that the manufacturer should have actually marketed its products solely for military use, during WWII. Thus, society would have enjoyed the net benefits from the military use without incurring the net losses from the civilian use. The aggregative cost-benefit analysis made by the 5th Circuit pooled together those two (military and civilian) uses, so that overall benefits still outweighed overall risk, thereby generating under-deterrence.

The Johnstone case is not unique, of course, in adopting the aggregative approach in a way that may lead to under-deterrence. Other courts either followed this decision or independently used the same approach.

There are also examples of over-deterrence that result from courts’ adoption of the aggregative approach. As demonstrated in the Appendix, under comparative negligence over-deterrence is manifested in reducing a victim’s percentages of fault, based merely

77 Johnstone was followed by Coates v. A C & S Inc., 844 F. Supp. 1126 (E.D. La. 1994), which specifically used the aggregative approach in Johnstone to deny the plaintiffs’ motion to declare asbestos products as unreasonable per se as a matter of law.

78 See supra note 6. See also Crespo v. Chrysler Corp., 75 F.Supp.2d 225, 228 (S.D.N.Y., 1999) (“the requirement that the plaintiff prove that it is “feasible to design the product in a safer manner…” must mean safer to the relevant set of users overall.”)
on the fact that the injurer’s activity posed a risk to other victims as well. One case that demonstrates this effect is Brooks v. Henson Fashion Floors, Inc.79

In Brooks, the plaintiff slipped and fell outside her office, in a hallway that the defendant had widened. The defendant had removed a wall, “leaving the regular carpeted three-foot wide path and a bare concrete floor which was to be carpeted,”80 and later spread glue on the exposed concrete floor. The plaintiff “stepped onto the concrete portion and slipped and fell in the freshly laid glue, injuring her left shoulder, elbow and knee.”81 The trial court had exempted the defendant from liability, but the appeal court reversed this outcome. After establishing that the defendant had failed the cost-benefit test, and was therefore negligent,82 the court turned to examine the plaintiff’s comparative negligence, concluding that the plaintiff “should have proceeded with more than usual caution,” and that “plaintiff’s inattention to where she stepped constitutes negligence.” However, the court emphasized that “other mall employees who traversed the hallway that morning managed to step over the obstacles without mishap,” and because the defendant’s fault “created a risk of harm to every person who traveled the hallway,” the court apportioned the percentages of fault at 40% to plaintiff and 60% to defendant.83

As usual in these types of cases, the court’s specific calculations are not available,84 but the reduction in the plaintiff’s fault can be explained by the court’s adoption of the aggregative approach to comparative negligence. As explained earlier and shown in the

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79 647 So. 2D 440 (La.App. 2 Cir. 12/7/94).
80 Id., at 441.
81 Id., at 442.
82 Id., at 443 (“(T)he likelihood of injury was relatively high ... (and) the injuries associated with slip and fall cases can be severe and debilitating. In contrast, the cost of precautions would have been nominal.”)
83 Id., at 444.
84 See also RICHARD EPSTEIN, TORTS 215 (1999) (“The selection of percentages of fault does not admit precise mathematical precision.”)
Appendix, the aggregative approach leads to an unjustified reduction in a plaintiff’s percentages of fault whenever the defendant’s actions place more people at risk of harm—as was the case in *Brooks*. In reducing Brook’s percentages of fault because the defendant’s actions also posed risk to others, the court has completely ignored the fact that the other persons who “traveled the hallway” probably differed from Brooks in their expected harm levels and in their subjective costs of paying more attention. Since the court’s implicit adoption of an aggregative approach to comparative negligence led to an increase in the defendant’s share of fault, it may very well have resulted in over-deterrence. Moreover, even if in the specific case the court’s decision did not generate over-deterrence, the court’s reasoning is a problem in itself, since other potential injurers who make their decisions in the shadow of the court’s decision may in fact be over-detered.

**F. Some Final Distinctions**

To summarize the previous Sections, the aggregative cost-benefit test, when applied as the standard of liability, may have four major adverse effects:

a) it may render the injurer the least-cost avoider, and therefore liable for the harm, in cases where the victims are the efficient bearers of harm;

b) it may drive a potential injurer to engage in too high a level of activity, or to over-distribute its products, even under strict liability.

c) it may aggravate the inefficient incentives that SAD creates, by encouraging potential injurers to opt for a risky activity, thereby imposing too big a risk of harm on a larger group of victims;

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85 Because the court in *Brooks* did not articulate the comparative negligence calculations, one cannot know for sure if the aggregative approach did in fact lead to the actual distortion of incentives.
d) it may generate under-deterrence, in bilateral care situations, by indicating that taking precautions by either side is socially undesirable, while in reality it is socially-optimal for the injurer and some victims to exercise care.

A common characteristic of all problematic situations is the heterogeneity of victims. And, as was stated earlier, in the majority of tort situations, victims are indeed heterogeneous. Moreover, the larger the group of victims, the more likely it is to be heterogeneous. The social loss caused by the aggregative test is therefore likely to become exacerbated as the number of victims increases.

The inefficiency stems from the fact that different victims may require opposite incentives, whereas the aggregative test provides the same incentive to every victim. In more economic terms, the aggregative test imposes a pseudo-“pooling equilibrium” on the tortious situation, in that it induces every victim to adopt the same strategy, and induces the injurer to adopt the same strategy towards every victim. Yet, as economic theory teaches us, pooling equilibria may be inefficient precisely because they embody equal treatment to substantially different cases.

Moreover, applying the Learned Hand formula to the “aggregate victim”—even if the aggregation is of marginal costs and benefits—contradicts the fundamental insight that the Hand formula should only be applied in its incremental form; the gist of an incremental evaluation of aggregate marginal costs lies in applying a separate cost-benefit test for each victim’s case. However, while courts and scholars rightly insist

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86 See Parchamovsky & Siegelman, supra note 44.
87 In economic theory, the term “pooling equilibrium” refers to signaling games with asymmetric information, yet here we discuss a different context, hence the prefix “pseudo.” The aggregative test forces an equal-treatment equilibrium on the situation, just like in “real” pooling equilibria.
88 Formally, if we denote by $U_i(X_i)$ the utility of victim $i$, as a function of her level of care, $X_i$, and denote by ‘A’ the aggregate social utility ($A = \sum_{i=1}^{n} U_i + U_{injur}$), and assuming that the injurer’s utility is
on using the Hand formula in its incremental form when one victim is involved,\(^89\) they neglect the implication of this insight on cases of multiple victims. A new liability paradigm for multiple-victim torts—one that will embody an assumption of heterogeneity of victims—is therefore needed.

The next step is to find an efficient and feasible alternative to the aggregative determination of liability. Such an alternative will be explored in the next Part.

III. POSSIBLE ALTERNATIVES TO THE AGGREGATIVE TEST

A. Disaggregation

A straightforward strategy in the case in point would be to conduct a separate cost-benefit test for each victim, or for each homogeneous subgroup of victims, with no regard for the other victims. I shall name this alternative “disaggregation.”

Disaggregation follows a simple rationale: if the source of the problem is the pooling together of qualitatively different victims, the apparent solution would be to simply refrain from creating such a pool.\(^90\) To understand why disaggregation may seem compelling at first glance, let us reconsider the example in Table 1 (on page 20). Evaluating Diane’s liability to each victim separately would result in the efficient outcome: Alice alone would be deemed contributorily negligent (and hence she, and only she, will take the efficient precautions at a cost of 40). Under the negligence rule, Diane would not be held liable toward Beth, since Beth’s expected harm is less than Diane’s costs of precautions. Under the strict liability rule, Diane would not be held liable toward Beth, since Beth’s expected harm is less than Diane’s costs of precautions. Under the strict liability rule, Diane would prefer paying independent of the victim’s costs of care, then \(\frac{\partial A}{\partial X_i} = \frac{\partial U_i}{\partial X_i}\). However, see Section III.a for explanation why this may actually not be the best alternative for multiple-victim torts.

\(^89\) See, e.g., LANDES & POSNER, supra note 3, at 102 (“Courts apply the formula in marginal rather than total terms.”)

\(^90\) For a more formal justification for disaggregation see supra note 88.
10 in damages to Beth rather than avert the harm at the cost of 70. Hence, disaggregation induces the socially desirable outcome of bringing the social costs down to as low as 50.

However, as will presently be shown, this alternative suffers from two major shortcomings. The first is the additional administrative costs that may arise from subcategorization into homogeneous subgroups, as it would require the court to process large amounts of data. The issue of administrative costs is a matter of concern in every economic analysis, but even more so in the case of multiple-victim torts. In these cases in particular, achieving optimal deterrence with regard to injurers’ primary behavior is closely linked to the issue of administrative costs. The reason is the “insolvency threshold,” which limits the amount of damages that a potential injurer expects to pay, and might be lowered substantially by the cost of conducting a trial. The fact that in multiple-victim torts both the overall harm and the administrative costs tend to be high may suggest that tort law’s deterrent effect may be substantially compromised by the cost of an individualized litigation.

Another factor that may further exacerbate the problem of high costs is the difficulty in creating clearly defined subgroups, namely, finding a clear-cut way to subcategorize the victims group, other than into single-person groups. Particularly when the number of types of victims is large, the separation line between possible subgroups can become too vague, and as the number of victims rises—and with it their

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91 Cf. Jeffrey M. Davidson, *Theories of Asbestos Litigation Costs - Why Two Decades of Procedural Reform Have Failed to Reduce Claimants’ Expenses*, 7 Nev. L.J. 73, 74-75 (2006) (“(A) large percentage of asbestos defendants were insolvent and therefore willing to take excess risks.”)

92 David Rosenberg & Steven Shavell, *A Simple Proposal to halve litigation Costs*, 91 Va. L. Rev. 1721, 1727 (2005) (“(O)n average, it costs approximately one dollar in legal expenses for the legal system to transfer one dollar from a defendant to a plaintiff.”)

heterogeneity—no clear-cut line of separation may present itself. The option of dividing
the group into homogeneous, or at least more homogeneous, subgroups, before
thoroughly investigating the issue of liability may thus be redundant.\textsuperscript{94}

The second disadvantage of disaggregation may be even worse than the first, and
may render this alternative undesirable. Even when victims differ from one another, in
some cases the aggregative test may be required to achieve optimal deterrence. For
example, if the injurer’s precaution technology is such that its costs are independent of
the number of potential victims, then whenever the injurer should be liable towards one
victim he should be liable towards all them.\textsuperscript{95} In such a case, no matter how
heterogeneous the group of victims may be, the aggregative test would yield the
efficient outcome.\textsuperscript{96} Moreover, in some cases, only the aggregative test would yield
efficiency, whereas disaggregation would generate inferior results. This is evident from
Table 5.

\textsuperscript{94} This point can be illustrated using the following example:

<table>
<thead>
<tr>
<th>Victim 1</th>
<th>V-2</th>
<th>V-3</th>
<th>V-4</th>
<th>V-5</th>
<th>V-6</th>
<th>Aggregate Victim</th>
<th>Injurer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs of Precaution</td>
<td>35</td>
<td>45</td>
<td>25</td>
<td>50</td>
<td>40</td>
<td>30</td>
<td>225</td>
</tr>
<tr>
<td>Expected Harm</td>
<td>15</td>
<td>25</td>
<td>35</td>
<td>45</td>
<td>55</td>
<td>65</td>
<td>240</td>
</tr>
</tbody>
</table>

Applying the aggregative test here yields the inefficient result whereby the injurer is held liable (since 198<225<240) and the overall costs amount to 198. This is inefficient because if the injurer is exempt from liability, the social costs would amount to only 180 (victims 3, 5, and 6 would take precautions, while V-1, V-2, and V-5 would suffer the harm).

However, there exists no feasible method to divide the victims that would yield an efficient result. Neither of the two seemingly adequate lines of subcategorization—namely, according to harm levels (victims with harm higher than 33 or lower than 33), and according to costs of precaution (victims whose precaution costs are higher than 33 and victims whose precaution costs are lower than 33)—yields efficiency. Both yield that the injurer should be deemed liable towards one of the subgroups, and therefore should be deemed liable towards the other group as well—to prevent a worst-case equilibrium where both the injurer and some victims take precautions.

\textsuperscript{95} Otherwise, worse scenarios might occur, where both the injurer and some victims invest in precautions.\textsuperscript{96} Furthermore, the aggregative test may yield desirable outcomes when there is a strong interdependence among the victims’ utility functions, such as in cases of close communities, in which the exercise of care by some victims affects not only their own welfare but other victims’ welfare as well. See Parchamovsky & Siegelman, supra note 44.
Table 5: A Situation Where Efficiency Necessitates Aggregation

<table>
<thead>
<tr>
<th></th>
<th>Victim A</th>
<th>Victim B</th>
<th>Victim C</th>
<th>Aggregation</th>
<th>Injurer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precaution Costs</td>
<td>85</td>
<td>15</td>
<td>20</td>
<td>120</td>
<td>70</td>
</tr>
<tr>
<td>Expected Harm</td>
<td>50</td>
<td>25</td>
<td>40</td>
<td>115</td>
<td></td>
</tr>
</tbody>
</table>

In this example, the socially desirable outcome would be for the injurer alone to take precautions, and the aggregative test indeed yields this efficient result.\(^{97}\) Disaggregation, on the other hand, will not—or, rather, will not necessarily—result in the efficient outcome. If each individual victim’s case were decided on its own merits, then victims B and C would be deemed contributorily negligent and would therefore invest in their own precautions. Under negligence, the injurer would not be held liable towards Victim A either, while under strict liability she would nevertheless prefer to pay 50 in damages to Victim A rather than to invest 70 in precautions. Such an individualized determination of liability results in overall societal costs of 85\(^{98}\) instead of only 70, and is therefore inefficient. Only a division of the victims group that somehow lumps together Victim A and one other victim can yield the efficient result, yet such a separating line cannot be deduced from any general rule: Victims B and C bear more resemblance to each other than to Victim A. Consequently, even when information is available at low cost, disaggregation may not be useful and, therefore, cannot serve as a general solution to the problem of victims’ heterogeneity.

One way to mitigate the shortcomings of disaggregation would be to use samples of victim cases, instead of adjudicating each separate case. This sampling mechanism,

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\(^{97}\) Since the injurer’s costs (70) are less than both the aggregate harm (115) and the aggregate precaution costs available to the victims (120), the injurer would be deemed liable, and thus would be driven to take precautions.

\(^{98}\) Victim A would suffer a harm of 50, and B and C would invest 15 and 20 in precautions, respectively.
also known as bellwether trials, has been proposed by several scholars as a method to cut down administrative costs in mass torts, and is sometimes used by courts. The version proposed by Rosenberg, for example, involves the defendant and the prospective plaintiffs deciding on the number of claims to be randomly sampled from the entire group, and then litigating only those claims. The results of the randomly-chosen claims is then averaged, and each plaintiff whose claim was not individually adjudicated receives the average amount of damages, irrespective of the merits of her specific claim. Thus, sampling dramatically decreases the administrative costs, and may therefore be preferable to disaggregation.

However, from an ex ante perspective, this type of sampling does not change the parties’ incentives and, therefore, in cases where disaggregation yields a wrong result, so would sampling. For example, the case illustrated in Table 5 would not have resulted in a different outcome had sampling been used instead of disaggregation. If only one claim were to be litigated, the expected damages the injurer would have to pay would amount to only 50. As a result, the injurer would prefer not to invest in the socially desirable precautions, and the overall societal costs would again amount to 85 instead of 70. If two out of the three claims were to be adjudicated, the result would

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101 If Victim A is picked, the damages would be 3×50=150, but if either Victim B or Victim C are picked, the claim would be rejected as they would be deemed contributorily negligent. The expected damages are therefore ⅓×150 +⅓×0 +⅓×0 = 50.
remain the same.\textsuperscript{102} Sampling may thus be preferable to disaggregation, in that it saves some administrative costs—but it cannot be considered a general solution to the problem.

\textit{B. Restitution and “Restitution Plus”}

As a solution to the problem of strategic investment in inefficient precautions, Professor Guttel has suggested a legal regime based on a combination of liability and restitution for efficient investment in precautions.\textsuperscript{103} According to Guttel’s proposal, a tortfeasor should be entitled to restitution from a potential victim—or from a potential joint-tortfeasor—for cost-justified precautions. Other scholars, too, have advocated a similar approach.\textsuperscript{104} This idea, if expanded to allow for restitution from the injurer to victims as well, may also be desirable in multiple-victim cases. Under this rule, both the victims and the injurer would be entitled to restitution from the other party, in exchange for an efficient investment in precautions. Once a party invests in efficient precautions, she would be able to sue the other party for full indemnification for her costs. To illustrate how this rule works, let us reconsider the first example:

<table>
<thead>
<tr>
<th></th>
<th>Alice</th>
<th>Beth</th>
<th>Aggregation</th>
<th>Diane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected Harm</td>
<td>100</td>
<td>10</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>Precaution Costs</td>
<td>40</td>
<td>80</td>
<td>120</td>
<td>70</td>
</tr>
</tbody>
</table>

\textsuperscript{102} If victims A and B are picked, the injurer will have to pay 75 in damages (50 to Victim A, 0 to Victim B and 25 to Victim C). If victims A and C are picked, the injurer will again have to pay 75 in damages (50 to Victim A, 0 to Victim C and 25 to Victim B). If victims B and C are picked, the injurer will not have to pay anything. The expected damages in this case are therefore 50. ($\frac{1}{3} \times 75 + \frac{1}{3} \times 75 + \frac{1}{3} \times 0 = 50$).

\textsuperscript{103} Guttel, supra note 3.

Under the restitution rule, the efficient outcome (i.e., an outcome under which Alice and no one else invests in precautions) would become a Nash equilibrium. In other words, if Alice, and only she, takes precautions—no party would be able to improve their payoffs by choosing another strategy. Restitution provides Alice with a net payoff of 0 (she invests 40 in precautions, for which she is fully indemnified); Beth has a payoff of (-10) and can only decrease her payoff if she decides to exercise care; Diane’s payoff is (-40), and can only decrease to either (-70) or (-110) if she invests in precautions. Thus, an efficient Nash equilibrium, whereby the overall social costs amount to 40, is achieved.

It is clear that this option should be limited to precautionary measures that have real market values and require monetary expenditures. For these types of precautions, restitution carries a number of advantages over the previously-discussed options. First, the overall administrative costs should amount to less than under disaggregation. Not only would courts need less data under this rule than under disaggregation, but the available data would also be less ambiguous: recall that under this rule, the plaintiffs sue only after investing in the precautions, and therefore facts about the precaution costs are easily available and less ambiguous. Second, under the restitution rule courts examine the efficiency of an investment in precautions ex ante, and, therefore, their

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105 Nash equilibrium, which is the basic solution concept in game theory, is defined as a set of strategies, such that each strategy is the best response to the all the other strategies. Put differently, in a Nash equilibrium, given the strategies of all the other players, no player can improve her payoff by unilaterally changing her strategy. See generally DOUGLAS G. BAIRD ET AL., GAME THEORY AND THE LAW 310 (1994).

106 Because the investment in B’s precautions is inefficient, she would not be entitled to restitution.

107 This limitation is necessary to save administrative costs. Most people take many precautions every day, and it is neither practical nor desirable to allow reimbursements for each time one slows down her car, or looks more carefully where she steps, etc.

108 Data about the actual harm that was averted may be more ambiguous than in the case of actual harm. However, to achieve optimal deterrence, costs and benefits must be considered from an ex ante perspective, and the ex ante expected harm is not more ambiguous if the harm is averted than after harm actually occurs.
decision would be less biased and less affected by the fact that the harm did occur.\textsuperscript{109} Third, this solution provides the parties with much more realistic options. Some potential victims, for example, would be able to receive financing for costly yet efficient precautions if they had a right to indemnification for these precautions.

Per se restitution, however, may not be efficient enough. In the previously-illustrated problematic cases, restitution does result in an efficient Nash equilibrium, but this equilibrium is not \textit{unique}. In cases like Table 1, for example, the profile of strategies in which Diane and no other party invests in precautions also constitutes a Nash equilibrium. Similarly, the inefficient outcome of Table 5, whereby Victims B and C invest in precautions, would also constitute a Nash equilibrium. The source of the problem is in that, for Alice in Table 1 and for the Injurer in Table 5, exercising care is only a \textit{weakly dominant} strategy, rather than a \textit{strictly dominant} one: their net payoffs would amount to 0 irrespective of whether they avert the harm and sue for indemnification for their costs or not.

The desirable way to obtain uniqueness for the efficient Nash equilibrium is to adopt a “restitution plus” rule, under which the party who invests in the efficient precaution is fully indemnified for her investment and, in addition, receives a \textit{small} “reward.” In the example illustrated in Table 1, for example, Alice would receive a certain amount, say $41, for her investment of $40 in precautions. This small reward provides an incentive to invest in efficient precautions, and thus makes the efficient investment a \textit{strictly dominant} strategy, resulting in an efficient and unique Nash equilibrium.

\textsuperscript{109}See, e.g., Jeffery J. Rachlinski, \textit{A Positive Psychological Theory of Judging in Hindsight}, 65 U. Chi. L. REV. 571 (1998) (describing the “hindsight bias”: the tendency to overestimate the \textit{ex ante} likelihood of an event when there is knowledge of its actual occurrence).
However, the restitution-plus rule would only be efficient when a correct determination of “efficient investment in precautions” is made. If, in deciding on which precautions are efficient, courts resort to the aggregative test, the result of the rule of restitution-plus might still be as inefficient as the aggregative test itself. The solution for this problem is provided in the next Sections. The next Sections also demonstrate why, especially in multiple-victim cases, “restitution plus” may be crucial for achieving optimal deterrence.

C. The Aggregation of Minimal Amounts

The next alternative involves abandoning the distinction between precaution costs and levels of harm. Indeed, from an economic perspective, the traditional distinction between costs of precautions and expected harm makes little sense. In a tortuous situation, the injurer externalizes costs to the victim. But in the absence of tort liability, a rational and risk-neutral victim would take precautions if they are cheaper than the risk; therefore, the externalized cost is not necessarily the level of harm, but rather the lesser of either the expected harm or the costs of precautions. Accordingly, this new liability standard requires the court to still use an aggregative test, but not aggregate separately the victims’ costs of precautions and their levels of harm. Rather, the court should aggregate the minimum of these costs, and compare the injurer’s costs with the victims’ aggregate minimal costs.\textsuperscript{110}

To illustrate how this would work, let us return once more to Table 1:

\textsuperscript{110} Algebraically, the adjusted aggregate Hand formula should be $B < \sum_{i=1}^{n} \min\left( P_i, L_i, C_i \right)$, where $B$ denotes the injurer’s costs of precaution, $n$ is the number of victims, $P_i, L_i$ is Victim $i$’s expected harm, and $C_i$ is Victim $i$’s costs of precaution.
Here, Alice’s minimal cost is 40, and Beth’s is 10. The factfinder will aggregate these minimal amounts and compare the victims’ 50 with the Injurer’s 70. Thus, the right conclusion, that the victims in this case are the least-cost avoiders, can be reached. From this example, it is easy to see that in alternative-care situations, this aggregate minimum standard will indeed lead to minimizing the costs of accidents. The same holds true for bilateral-care situations. Consider the example that was given in Table 4:

<table>
<thead>
<tr>
<th>Expected Harm</th>
<th>Alice</th>
<th>Beth</th>
<th>Aggregate Minimal Amounts</th>
<th>Diane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precaution Costs</td>
<td>40</td>
<td>80</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>Minimal Amount</td>
<td>40</td>
<td>10</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

Here, the victims’ aggregate minimum is 80, and in addition to Diane’s costs, the overall minimal amount is 210, lower than the aggregate harm of 250. The minimal amounts standard makes it clear that Diane should take precautions, so the over-deterrence problem is solved.

However, this “aggregate minimum” (AM) standard, if applied on its own, is still fraught with two major problems. The first is that in unilateral care situations aggregating minimal amounts will not perform better than the simple aggregative test. The reason is that in unilateral care accidents, where only the injurer can take precautions—each victim’s “minimal amount” is the expected harm. Accordingly, in cases such as the Johnstone case or the example in Table 3, this alternative cannot lead
to the efficient solution.

The second problem is that, much like under negligence, the AM standard takes as given the injurer’s level of activity. As a result, it cannot, in and of itself, adequately address such problems as in Table 2:

<table>
<thead>
<tr>
<th>Low Level of Activity (100%)</th>
<th>High Level of Activity (120%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Factory</td>
</tr>
<tr>
<td>Expected Harm</td>
<td>Factory</td>
</tr>
<tr>
<td>Cost of Filtering</td>
<td>100</td>
</tr>
<tr>
<td>Utility for the Factory</td>
<td>150</td>
</tr>
<tr>
<td>Minimal Amount</td>
<td>30</td>
</tr>
</tbody>
</table>

Determining whether the farms are contributory negligent based on the AM standard will create the same distortion of incentives as the aggregative test; if the factory sets its activity at the high level, the farms will still, under the AM standard, be held contributorily negligent, and thus the factory will be under-deterred. The solution to this problem is the “restitution plus” rule, as the next Section will explain.

In light of the above, to fully address the problems presented here, the AM standard can only be a part of a more comprehensive regime. This new regime is proposed in the next Section.

D. Disaggregated Liability Analysis

As can be deduced from the analysis above, the inefficiency of the aggregative cost-benefit test is case-specific. It is sometimes efficient, yet at other times not. This “illusive” character suggests that the solution to the problem should neither categorically reject the aggregative test, nor categorically apply it. Rather, the optimal
solution is in the form of a new liability regime, “Disaggregated Liability Analysis”\textsuperscript{111} (DLA) that combines “restitution plus”, idiosyncratic analysis, the AM standard (when applicable), and sampling.

Under DLA, courts will determine the identity of the least cost avoider the same way this Article has determined it, \textit{i.e.}, by constructing the relevant “precaution costs—expected harm” table. Then, courts should try explore the social welfare of every combination of precautions and identify the combination of precautions which yields the highest expected welfare. In bilateral and alternative care situations, the AM standard can be used to determine the identity of the least cost avoider. After this determination, courts should either, before the accident happens, award indemnification of the efficient precaution costs,\textsuperscript{112} plus the added small bonus, or—if the accident has occurred—assign liability to parties which took less than optimal precautions.

As promised, I will now explain why, coupled with “restitution plus,” the AM standard does yield the efficient results with respect to levels of activity. In the example in Table 2, if the factory sets it’s activity at the high level, the Farm B will be able to filter the water \textit{and then ask for reimbursement}. Under the “restitution plus” rule, the factory would be liable to pay Farm B 61 as indemnification for the farm’s investment in precautions. Furthermore, it would have to pay Farm A 30 in damages (since it is subject to strict liability.) Consequently, the factory’s net utility would amount to only 89 (180-61-30), which is much lower than its net utility in the low-activity-level scenario. The factory would, therefore, prefer to set its activity at the low level, and the socially desirable outcome would thus be achieved.

\textsuperscript{111} This name was suggested to me by Daniel M. Klermann, and for that I am grateful.
\textsuperscript{112} With the limitation set forth in \textit{supra} note 107.
When the number of victims is too large, the administrative costs associated with constructing a table may be prohibitively high. Courts will still need large amounts of data, and although administrative costs would probably amount to less than under disaggregation, one can still expect them to be high.\footnote{113} To solve this, courts may use sampling to cut down costs. Courts may use a sufficiently large sample of the victims, and determine liability based on a smaller-scale “precaution costs—expected harm” table. Importantly, this sampling solution is inherently different from other sampling solutions, such as bellwether trials or other methods mentioned earlier.\footnote{114} The main difference is that under this solution, samples would not used to directly determine liability, even for those plaintiffs that are sampled. Rather, the sampling data would be used to construct a smaller table. In deciding whether or not to use samples, and determining the size thereof, courts should use expert testimonies, in order to reduce biases and weigh the benefit of cutting down costs against the errors that may result from using samples rather than full information.

The DLA combined regime, with the AM standard, sampling and “restitution plus,” is the optimal adjustment to the current law. It induces the efficient result in all the problematic cases described in this Article. Should it be implemented, the growing number of multiple-victim accidents would be efficiently regulated, and the social costs of these accidents would minimize.

\footnote{113} The lower costs are associated with cases where, for example, it is obvious that the marginal harm levels are lower than the marginal precaution costs. When applying the AM standard to such cases, the court would not require any data on precaution costs, and could be satisfied with the data on levels of harm alone.

\footnote{114} Supra notes 99-102 and accompanying test.
CONCLUSION

Multiple-victim accidents are markedly different from the classic “one injurer – one victim” accidents in that they may involve heterogeneity in factors that are important for the determination of liability, namely, precaution costs, expected harm and the utility derived from the relevant activity. This heterogeneity poses significant challenges to the current standards of liability that focus on aggregate costs and benefits. The Article has demonstrated that when victims are heterogeneous, applying the aggregative cost-benefit test to determine liability may result in adverse, counter-intuitive yet realistic, consequences. Thus, under some circumstances, an injurer may be driven to cause more rather than less harm, while the mere existence of liability-rules encourages her to take a less socially-desirable course of action than she would in a world with no liability. In other cases, an injurer who should be held liable toward some of the victims individually might escape liability altogether when other victims too suffer harm; or, an injurer who is not liable toward any of the victims individually might wrongfully be held liable toward all of them jointly.

In this Article, I have restricted my criticism of the aggregative cost-benefit test to the economic perspective. Future research may focus on other valid critical perspectives, such as distributive justice, corrective justice, or individual autonomy. Future research may also concentrate on relevant behavioral biases, among which is the Outgroup Homogeneity Bias: people’s tendency to perceive a group to which they do not belong as more homogeneous than their own ingroup, and as more homogeneous

than that outgroup actually is.116

The problems presented in this Article have a broad spectrum of real-world implications, and may arise in a wide range of multiple-victim accidents: in both unilateral and bilateral care situations, and from two-victim accidents to catastrophic injuries. Tort law can regulate such multiple-victim accidents in an efficient way only if new liability standards are tailored to them. Hence, instead of determining liability based on aggregate harm, aggregate benefits or aggregate cost of precautions, this Article has argued for a different combination of rules: To achieve optimal deterrence and minimize the social costs of accidents, a new liability regime—one that embodies a new “aggregate minimum” liability standard, restitution of precaution costs with an added small bonus, and sampling—should be applied. This new regime and combination of rules may help achieving an important social goal of tort liability, i.e., minimizing the social costs of accidents.

116 See, e.g., Charles M. Judd, Bernadette Park, Vincent Yzerbyt, Ernestine H. Gordijn & Dominique Muller, *Attributions of Intergroup Bias and Outgroup Homogeneity to Ingroup and Outgroup Others*, 35 EUR. J. SOC. PSYCHOL. 677 (2005). The outgroup homogeneity (OH) bias was found to be robust even in artificial, laboratory-based, groups with no prior stereotypes. It is enough for the ingroup and the outgroup to share but a few superficial laboratory-based traits in common in order for there to be a robust OH bias. See, e.g., Mark Rubin, Miles Hewstone & Alberto Voci, *Stretching the Boundaries: Strategic Perceptions of Intragroup Variability*, 31 EUR. J. SOC. PSYCHOL. 413 (2001); Alberto Voci, *Perceived Group Variability and the Salience of Personal and Social Identity*, 11 EUR. REV. SOC. PSYCHOL. 177 (2000).

These findings may indicate the possibility that in multiple-party tortious events, OH bias may influence both the parties and the courts. The demonstration of an OH bias in ad hoc laboratory-based groups may indicate that a robust OH bias can be invoked by the mere separation into, e.g., “residents” and “businessmen,” “injurers” and “juries,” or “victims” and “judges.” OH bias should be significant especially in mass tort cases. The research suggests that when groups of victims are large, the expected OH bias would be stronger. Moreover, in cases where the group of victims is less socially powerful than the injurer (or, in a bench trial, than the judge), this group is likely to be perceived as overly homogeneous. Furthermore, the legal system’s insistence on separation between the judge or juries and the parties, although crucial to justice, may ironically induce a much stronger bias in the court. It is unlikely that the judge, the jury, or the injurer should be closely acquainted with individuals from the victims group, and in addition, it is feasible that in mass tort situations, the group of victims will share some common properties, such as location, illness, interests, occupation, etc. In such cases, a significant OH bias might therefore be observed.
APPENDIX: INEFFICIENCY UNDER COMPARATIVE NEGLIGENCE

An aggregative approach to liability may result in over-deterrence under comparative negligence. To see how, let us return to Table 1.

<table>
<thead>
<tr>
<th></th>
<th>ALICE</th>
<th>BETH</th>
<th>AGGREGATION</th>
<th>DIANE</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXPECTED HARM</td>
<td>100</td>
<td>10</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>PRECAUTION COSTS</td>
<td>40</td>
<td>80</td>
<td>120</td>
<td>70</td>
</tr>
</tbody>
</table>

To compute a party’s share of liability, the literature suggests two formulas:\(^{117}\)

(i) Party’s share of liability = \(\frac{(\text{expected harm}) - (\text{party’s precaution costs})}{2 \times (\text{expected harm}) - (\text{total precaution costs})}\)

(ii) Party’s share of liability = \(\frac{(\text{total precaution costs}) - (\text{party’s precaution costs})}{\text{total precaution costs}}\)

In the example above, if the court were to use the first formula, the aggregative approach would result in no share of liability to the plaintiffs,\(^{118}\) thus encouraging Alice to refrain from taking precautions, and instead driving Diane to invest in her too-costly precautions. In contrast, an individualistic, non-aggregative, approach would result in a share of liability of 66.67% to Alice\(^{119}\) and 53.84% to Beth.\(^{120}\) Thus, under the individualistic approach, Alice will prefer to take precautions at the cost of 40, rather than to suffer the harm of 100 and be compensated for only 33.3. Diane would prefer not to invest 70 in the socially-undesirable precautions, since the prospective damages

\(^{117}\)See Gary T. Schwartz, Contributory and Comparative Negligence: A Reappraisal, 87 YALE L. J. 697, 705-706 (n. 44) (1978). See also WERNER Z. HIRSCH, LAW AND ECONOMICS: AN INTRODUCTORY ANALYSIS 157 (3rd ed., 1999). David Sobelsohn has suggested yet another formula. See David C. Sobelsohn, Comparing Fault, 60 IND. L. J. 413, 420 (n. 58) (1985). However, Sobelsohn’s formula is unfeasible for two main reasons. First, it yields that the injurer has to pay damages even when she is not negligent. Second, in multiple-victim cases, the amount of damages that the injurer pays differs from the amount of damages that the victims receive.

\(^{118}\)There will be no liability assigned to the plaintiffs since the result of the calculation of the guests’ share, \(\frac{110 - 120}{220 - 190}\), is negative, while the calculation of Diane’s share is greater than one: \(\frac{110 - 70}{220 - 190} = \frac{4}{3}\). This result is, of course, reasonable in itself, since the guests are, on aggregate, not negligent at all.

\(^{119}\)\(\frac{100 - 40}{200 - 110} = \frac{2}{3}\)

\(^{120}\)\(\frac{10 - 80}{20 - 150} = \frac{7}{13} = 0.5384\ldots\)
are only 37.95\textsuperscript{121}. Hence, the individualistic approach to comparative negligence results in overall societal costs of 50, while the aggregative approach results in societal costs to the amount of 70.

If the court were to use the second formula, the aggregative approach would result in the plaintiffs’ share of liability of 36.84\%,\textsuperscript{122} thus again driving Alice to refrain from taking precautions. Diane likewise would then prefer not to invest in precautions, since she would expect to pay only 69.5 to the plaintiffs (less than her precaution costs, 70). In this case, the aggregative approach to comparative negligence would yield an even worse outcome: societal costs that would rise to 110, since no party will take precautions. An individualistic approach, however, would result in a Alice’s share of liability of 63.6\%\textsuperscript{123} and Beth’s share of 46.7\%.\textsuperscript{124} Alice would therefore prefer to take precautions at the cost of 40, rather than to suffer the harm of 100 and be compensated for only 36.4. The overall societal costs of the individualistic approach, under the second formula, would thus be 50, instead of 110 as under the aggregate liability approach.

To conclude, an aggregative approach to comparative negligence leads to an unjustified reduction in the victims’ share of fault, and thus may over-deter the injurer.

\textsuperscript{121} Diane would be made to pay 33.33 to Alice and 4.62 to Beth.
\textsuperscript{122} \[\frac{190 - 120}{190} = \frac{7}{19} = 0.3684...\]
\textsuperscript{123} \[\frac{110 - 40}{110} = \frac{7}{11}\]
\textsuperscript{124} \[\frac{150 - 80}{150} = \frac{7}{15}\]