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“Personalizing Negligence Law”

by

Ariel Porat

**(The Buchmann Faculty of Law, Tel Aviv University;
Visiting Professor, Stanford Law School)**

Note: It is expected that you will have reviewed the speaker’s paper before the seminar. Since this paper is longer than usual, the author was asked to provide a “reader’s guide” to it. Here is his response: “If you are short of time, it would be enough to read for the workshop pp. 627-36, 646-56, 659-68, 686-88. Also, please take a quick look at pp. 674-86. Looking forward to discussing this paper with you (which is part of a larger project).”

PERSONALIZING NEGLIGENCE LAW

OMRI BEN-SHAHAR[†] & ARIEL PORAT[‡]

The most fundamental feature of negligence law is the “reasonable person” standard. This feature bases negligence law on a strictly objective foundation: It requires people to behave in the prudent way that, as Holmes explained, the ordinary, typical member of their community observes. In this Article we argue that with the increasing availability of information about actors’ characteristics, negligence law should give up much of its objectivity by allowing courts to “subjectify” the standard of care—that is, to tailor it to the specific injurer’s tendency to create risks and his or her ability to reduce them. We discuss the effects of this personalization of the standard of care on injurers’ and victims’ incentives to take care, injurers’ activity levels, and the injurers’ ex ante investments in improving their skills. We also discuss justice considerations as well as the feasibility of personalization with the aid of “Big Data.”

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[†] Leo and Eileen Herzel Professor of Law, University of Chicago.

[‡] Alain Poher Professor of Law, Tel Aviv University and Fischel-Neil Distinguished Visiting Professor of Law, University of Chicago. For very helpful comments we thank Hanoch Dagan, Bar Dor, Michael Frakes, Daniel Hemel, Saul Levmore, Jonathan Masur, Anthony Niblett, Julie Roin, Catherine Sharkey, Michael Trebilcock, Ernest Weinrib, David Weisbach, and workshop participants at the University of Chicago, the Hebrew University, the NYC Tort Group, Tel-Aviv University, University of Toronto, UCLA, and the 2015 American Law & Economics Association meeting. We also thank Daniel Kopilov, Peter Salib, and Dana Zuk for excellent research assistance. We are grateful for financial support from the Coase-Sandor Institute at the University of Chicago Law School and the Cegla Center for Interdisciplinary Research in the Law at Tel-Aviv University. Copyright © 2016 by Omri Ben-Shahar & Ariel Porat.

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INTRODUCTION

The law takes no account of the infinite varieties of temperament, intellect, and education which make the internal character of a given act so different in different men.¹

The most fundamental feature of negligence law is the “reasonable person” standard. This feature bases negligence law on a strictly objective foundation: It requires people to behave in the prudent way that, as Holmes explained, the ordinary, typical member of their community observes.² The standard of care is uniform across the population, rarely varying with the skills and dangers of each actor.

¹ O.W. HOLMES, JR., THE COMMON LAW 108 (Boston, Little, Brown & Co. 1881).

² DAN B. DOBBS, THE LAW OF TORTS § 117, at 277 (1st ed. 2000) (“The duty owed by all people generally—the standard of care—is the duty to exercise the care that would be exercised by a reasonable and prudent person under the same or similar circumstances” (footnote omitted)); *id.* § 122, at 290 (“A reasonable person will act in the light of . . . knowledge shared by the community generally”).

This Article challenges the reasonable person paradigm. We argue that with the increasing availability of accurate information about actors' characteristics, negligence law should give up much of its objectivity by allowing courts to "subjectify" the standard of care—that is, to tailor it to the specific actor's tendency to create risks and her ability to reduce them. Rather than addressing each actor as a nondistinct member of a large pool and commanding her to meet the level of reasonable precautions that correspond to the average competence within the pool, a *personalized negligence law* would separate the actor from the pool and require her to meet her *own* customized standard of care. The reasonable person standard, traditionally derived from an aggregate relevant pool, would be replaced by the "reasonable you" standard—a personalized command that is based on information about *this* actor's specific characteristics.

The idea that standards of care ought to be personalized to the particular circumstances of the particular defendant may strike our readers as old news. Surely, a doctor is required to perform a treatment at a more advanced level of care than a layperson, and a physically disabled person may be allowed to satisfy a lower level of precaution. An actor who has special knowledge or experience may be required to do more than one who has not.

Despite this intuition, tailored standards of care are the exception in tort law, not the rule. From its early days, negligence law has wrestled with the personalization problem. When a cognitively limited defendant who caused a fire asked the court to acknowledge his incompetence and apply a more forgiving standard of care, the court—in a landmark decision—refused, explaining that it would be impossible for negligence liability to be "co-extensive with the judgment of each individual, which would be as variable as the length of the foot of each individual."³ The court, instead, chose "to adhere to the rule which requires in all cases a regard to caution such as a man of ordinary prudence would observe."⁴ Holmes later explained that this approach was justified by the "impossibility of nicely measuring a man's powers and limitations."⁵

Yet, over time, negligence law has created subcategories of actors, lowering or raising the standard of care within each category to reflect special skills. For example, children or the physically disabled may be held to lower standards of care (although their license to

³ *Vaughan v. Menlove* (1837) 132 Eng. Rep. 490, 493; 3 Bing. 468, 475.

⁴ *Id.*

⁵ HOLMES, *supra* note 1, at 108.

engage in the activity in the first place may be more stringent).⁶ And, conversely, medical professionals are held to higher standards than nonprofessionals.⁷

Personalized negligence law—the reasonable you standard—takes this already familiar (but sparingly applied) approach of partitioning injurers into relevant classes, and expands it to its conceptual limit. Whereas the heightened standard of care for doctors creates a specific pool (all doctors in the relevant practice, or the specific advanced specialty), it still relies on average competence within a defined pool to determine what is reasonable. Personalized negligence law creates a *pool of one* for each defendant. What is reasonable for this defendant would be determined, not by reference to the average traits of some larger reference group to which this defendant belongs, but only according to the information available about this defendant.

Consider, for example, a typical problem addressed by negligence law: What is a reasonable driving speed in treacherous road conditions? Imagine that a sixty-five-year-old driver, cruising at thirty-five miles per hour, injures a child who jumped into the street chasing a ball. Under prevailing negligence law, the court assumes that the driver is no different than any other driver in the population and would accordingly set the standard of care according to the capabilities, the reaction time, and the tendency to inflict harm that the court expects the average driver to have. If at a speed of thirty-five miles per hour, the average brake time for drivers is thought to be short enough even in relation to the risk of children playing in a residential neighborhood, the sixty-five-year-old driver would not be regarded as negligent.

Under personalized negligence law, the capabilities of the average driver are not relevant. First, it might be true that the average sixty-five-year-old driver has inferior driving capabilities and slower response times than the average driver. If so, a speed of thirty-five miles per hour might not be negligent for younger drivers, but would be negligent for the elderly.⁸ Merely partitioning the population of

⁶ See *infra* Section I.A (describing lower standard of care for children and physically disabled).

⁷ See *infra* Section I.B (describing heightened standard of care sometimes imposed on those with elevated capacity).

⁸ It might be that older age brings more experience and responsibility, which could pull in the other direction. This is typically the case with very young drivers versus older drivers, but not when the ages are, say, forty-five and sixty-five. See, e.g., Judith L. Charlton et al., *Older Driver Distraction: A Naturalistic Study of Behaviour at Intersections*, 58 ACCIDENT ANALYSIS & PREVENTION 271, 277 (2013) (“[O]lder drivers self-regulate by limiting their engagement in secondary activities when the driving task is more challenging compared with less demanding situations.”); Tim Horberry et al., *Driver Distraction: The*

drivers and deriving the applicable standard of care from a smaller subset of the population would be a first, albeit crude, step in personalization.

But personalization would not stop there. Not all sixty-five-year-old drivers are alike. The courts might have additional information about the specific defendant, which would allow for further refinement of the standard of care. Some of that information might relate to his past driving experience. This would allow the court to make a statistical inference about the defendant's risk "type" and adjust his standard accordingly. Such personalization based on past experience is similar to the "experience rating" methodology that insurers use in inferring idiosyncratic risk, which then impacts the pricing of automobile insurance policies.⁹ It is also similar to the approach used in criminal law—treating past offenders differently than first timers.¹⁰

More interestingly, some of the additional information deployed in constructing the reasonable you standard might relate to the defendant's other characteristics, beyond his past driving record. It is information reflecting on his driving capabilities, other risky activity he takes, and his skills in reducing these risks. This information would allow the court to make more reliable inferences about the risk that this defendant creates, the risk he should have created, and the precautions he should have taken given his characteristics. With the aid of more advanced information tools—including what has come to be known as "Big Data"¹¹—courts might know that the defendant is very risk averse (or risk preferred), that he engages in frequent activities that make his instincts and reactions faster (or slower) than those of the average driver, or that in other parts of his life he is generally a very careful (or careless) person. A clumsy, impulsive, or prone-to-

Effects of Concurrent In-Vehicle Tasks, Road Environment Complexity and Age on Driving Performance, 38 ACCIDENT ANALYSIS & PREVENTION 185, 189–90 (2006) (studying effects of distractions upon driving performance and finding that drivers over age of sixty tend to drive more slowly and cautiously while distracted in order to compensate for slower reaction times).

⁹ See Ragnar Norberg, *The Credibility Approach to Experience Rating*, 1979 SCANDINAVIAN ACTUARIAL J. 181, 181–82 (“[Driver] premiums are adjusted annually according to bonus rules, which are to the effect that drivers with a favourable claims record are allowed a premium deduction (bonus), whilst those with an unfavourable one will experience a premium increase (malus).”).

¹⁰ David A. Dana, *Rethinking the Puzzle of Escalating Penalties for Repeat Offenders*, 110 YALE L.J. 733, 735 (2001) (“The legal system punishes repeat offenders more severely than nonrepeat offenders. Second-time offenders receive more severe punishment than first-time offenders; repeat offenders with many previous offenses receive more severe punishment than repeat offenders with a few previous offenses.”).

¹¹ See Ariel Porat & Lior Jacob Strahilevitz, *Personalizing Default Rules and Disclosure with Big Data*, 112 MICH. L. REV. 1417, 1433–53 (2014) (discussing concept of “Big Data,” its legal applications, and its possible role in personalization of default rules).

lapses person may need to be confronted with a more demanding standard of care. Again, similar to the “feature rating” methodology that insurers use to rate policyholders, courts could use statistical correlations in assessing the risk posed by the defendant. Taking into account every known relevant factor would assist the court in setting the more efficient reasonable you standard, where the level of care is tailored to a specific individual’s risk creation and capacity to mitigate that risk.

This Article examines the case for personalized negligence law along two channels of inquiry. The first channel is normative: Does personalization advance the goals of negligence law—efficient deterrence and just compensation? In exploring these questions, one of the major contributions of this Article is the distinction between *skill-based* and *risk-based* personalization. The Article demonstrates the effects of personalization along those dimensions in various ways. The first dimension—skill-based personalization—addresses each actor’s subjective ability to take precautions. This dimension measures how effectively an actor can take precautions to reduce the risk of injury. Thus, if there is a costly technological device that drivers can use to reduce risks of driving, but which requires high technical skills to use effectively, it might be cost justified to require only the technically skillful drivers to use it.

The second dimension—risk-based personalization—addresses each actor’s riskiness. This dimension measures the different risks that actors create at any given investment in care. Risk-based personalization would place a greater precaution burden on actors who, at any given level of care, create higher risks. For example, drivers with poor eyesight, or who are easily distractible, create higher risks at any given speed, and should be required to take more precautions and drive slower than those with better eyesight or instincts.

In reality, actors’ characteristics may combine both idiosyncratic skill and riskiness. A driver may be both highly skilled and low risk. She may have good eyesight and good instincts (that is, low risk), but also high proficiency in utilizing accident prevention technologies. In such cases, personalization should take into account both aspects, which might counteract. Conversely, a low-skill driver would not be required to install a costly skill-intensive precaution technology. But if she is also a high-risk type, she would be required to take high alternative precautions.

This distinction between skillfulness and riskiness is fundamental to our analysis. To be sure, under some abstractions the two dimensions may be regarded as equivalent. Both high risk and low skill increase the injurer-specific *expected risk*. It might be thought, then,

that unifying the two dimensions into a single analysis of *personalized expected risk* would economize the analysis without sacrificing insight. We show throughout the Article that this reductive form is too impoverished to capture important insights of legal design. Skill-based personalization raises a host of different concerns and implementation problems than risk-based personalization. In an important set of cases, we find that risk-based personalization is easier to defend, both on efficiency and justice grounds.

The effects of personalization on efficient precaution taking are just the tip of the iceberg. The Article identifies a wealth of effects that personalized standards of care would have on injurers' precaution, activity levels, and ex ante incentives to invest in reducing their harmfulness. Relative to a regime of uniform standards, personalization leads to more efficient precaution and has the potential to alleviate the excessive-activity distortion inherent in negligence rules. Currently, negligence law incentivizes actors to become more skilled at harm reduction but not to reduce their riskiness when possible. This latter effect can be tackled, we show, if personalization is designed correctly. Personalized standards also affect victims in predictable ways. It might be intuitively thought that by facing personalized standards of care by injurers (say, drivers each obeying a different, personalized speed limit), victims endure a more uncertain and volatile environment, thereby diminishing their ability to take efficient contributory care. Not so. While drivers' speed—and other precautions—may vary more under personalized standards, the risks that they pose to victims may in fact be *less* variable and more easily mitigated.

The Article then turns to provide some benchmark observations about how to evaluate personalization from a justice perspective. Under some conceptions of corrective justice, personalization may be regarded as problematic. Its primary prescription—to adjust the injurer's obligation based on the cost of care—infringes the notion of equality between the injurer and victim, because it allows the injurer to unilaterally draw the line between his and the victim's rights. We disagree with this evaluation. Why should a particularly skilled injurer not owe a heightened duty of care to a victim, and be required to correct this victim's harm when breaching the duty? Moreover, personalization is not merely about different burdens of care, but also about different risks which different injurers create. We argue that raising the liability standard for people who create above-average risk and lowering the standard for people who create below-average risk is *required* by any plausible corrective justice account. Lastly, we comment on the distributive justice aspects of personalization. True, it treats similarly situated injurers differently, and it might expose some

victims to higher risks of physical injury. But, quite intuitively, personalization has the potential of promoting equality among injurers along important aspects, while at the same time increasing victims' safety.

After presenting the normative inquiry, the Article turns to a positive channel. It asks whether personalization can be implemented. What are the information obstacles to personalization and how can they be addressed? What sources of information might be harnessed to the personalization enterprise? Not surprisingly, we envision a process that relies on advances in information technology, from in-depth screenings of individuals to statistical analysis of large data. If Big Data is reliably predictive in high-stakes industries like financial services, insurance, and increasingly in medicine, why not utilize this predictive power in law?

It is not enough, however, to show that more data and better screening could be deployed by courts in adjudication. The challenge for a successful negligence regime is to show that actors would be able to anticipate the more refined burdens and adjust their behavior. Otherwise, if the greater *ex post* accuracy does not translate to *ex ante* behavior, it might merely impose excessive information costs.¹² Recognizing this dilemma, we make the counterintuitive argument that personalization could make it *easier*, not harder, for actors to predict the standard of care applicable to them. People often know better what is reasonable for them to do, given their idiosyncratic characteristics. It is harder to know what the average skills and risks are. Thus, in the driving example, the prevailing reasonable person standard asks the driver to meet a standard of care tailored to the *impersonal* reasonable driver. But he is not this driver, and he would need much more information than mere self-introspection to figure it out.

This Article fits within a literature that examined the optimal tailoring of legal rules.¹³ The idea of personalizing default rules, for example, has been studied in various contexts by several authors,¹⁴

¹² See Louis Kaplow, *A Model of the Optimal Complexity of Legal Rules*, 11 J.L. ECON. & ORG. 150, 151 (1995) (arguing that low information costs for enforcement authority improve complex rules' efficiency); cf. Louis Kaplow, *General Characteristics of Rules*, in 5 ENCYCLOPEDIA OF LAW AND ECONOMICS 502, 504 (Boudewijn Bouckaert & Gerrit De Geest eds., 2000) [hereinafter Kaplow, *General Characteristics*] (discussing connection between increased specificity in the law and greater information costs to both government enforcement and private actors seeking to comply).

¹³ At the most general level, Louis Kaplow's work on the optimal precision of legal rules lays a foundation for the inquiry into tailoring any legal command. Kaplow, *General Characteristics*, *supra* note 12, at 502–07 (discussing possible problems caused by rule precision and analyzing its negative and positive effects).

¹⁴ See Ian Ayres & Robert Gertner, *Filling Gaps in Incomplete Contracts: An Economic Theory of Default Rules*, 99 YALE L.J. 87, 89–95, 97–98, 115–18 (1989)

and further expanded recently by Ariel Porat and Lior Strahilevitz.¹⁵ In the torts literature, early law and economics writers recognized that tailored duties could improve efficiency.¹⁶ Judge Richard Posner and Steven Shavell have separately explained that the reason why the standard of care is not adapted to the specific injurer is the saving of administrative costs.¹⁷ Shavell further showed that if courts are constrained to apply a uniform standard of care for all injurers, they should minimize the costs of some injurers taking too much, and others taking too little, care.¹⁸ These writers, as well as Warren Schwartz in an excellent article, have recognized that personalized standards of care might have problematic effects on the level of activity.¹⁹ They recognized that uniform standards could drive out the activities of very high-risk injurers.²⁰ Finally, both Shavell and Schwartz recognized that the incentives to make ex ante investments (such as being sober while driving or acquiring information about

(differentiating between tailored, untailored, and penalty default rules in contract law and providing theory for when courts should fill contractual gaps using each method); George S. Geis, *An Experiment in the Optimal Precision of Contract Default Rules*, 80 TUL. L. REV. 1109, 1114–15, 1129–59 (2006) (offering models of tailored and untailored default rules under particular sets of assumptions to analyze welfare implications of trading off precision against complexity); Cass R. Sunstein, *Deciding by Default*, 162 U. PA. L. REV. 1, 7–10, 56–57 (2013) (differentiating between impersonal default rules, active choosing, and personalized default rules, and concluding that the choice between regimes is dependent on costs of decisions and errors, and therefore varies between target groups).

¹⁵ Porat & Strahilevitz, *supra* note 11, at 1470–72 (suggesting use of Big Data to personalize disclosures, thereby increasing their relevance and effectiveness).

¹⁶ See WILLIAM M. LANDES & RICHARD A. POSNER, *THE ECONOMIC STRUCTURE OF TORT LAW* 124 (1987) (arguing that uniform standard creates two effects of misallocation: injurers with low marginal costs of taking care would have no incentive to take care beyond the reasonable person standard, even though it would be socially desirable for them to do so, and injurers with slightly higher than average marginal costs of care would nevertheless adhere to the uniform standard so as to avoid bearing all liability).

¹⁷ RICHARD A. POSNER, *ECONOMIC ANALYSIS OF LAW* 218 (8th ed. 2011) (arguing that reasonable person standard adhered to by courts is justified by administrative costs courts would bear in attempting to measure actual individual costs of each party); see STEVEN SHAVELL, *ECONOMIC ANALYSIS OF ACCIDENT LAW* 89 (1987) (suggesting that classification of injurers would allow courts to set optimal level of care for each class type and therefore “it is socially desirable for courts to acquire information about an injurer’s type if the cost of doing so is sufficiently low”).

¹⁸ See SHAVELL, *supra* note 17, at 86–88 (showing that if courts cannot determine an injurer’s type, they would choose single care level that is optimal for average type of injurer).

¹⁹ E.g., Warren F. Schwartz, *Objective and Subjective Standards of Negligence: Defining the Reasonable Person to Induce Optimal Care and Optimal Populations of Injurers and Victims*, 78 GEO. L.J. 241, 247–50 (1989) (“[A] single standard is preferable to a rule of subjective negligence because, unlike a rule of subjective negligence, it creates self-enforcing incentives for optimal behavior in deciding whether to engage in the activity.”).

²⁰ E.g., SHAVELL, *supra* note 17, at 91 (“[I]t may be socially beneficial for courts not to reduce due care for types of injurers for whom the socially optimal level of care would be low, because such types of injurers may thereby be induced not to engage in the activity.”).

risks) would be affected by a personalized standards regime.²¹ None of these authors, however, have examined the distinction between injurers who vary by skill and injurers who vary by riskiness.²²

The Article proceeds as follows: Part I introduces the concept of personalizing the standard of care and outlines some of its appearances in prevailing tort law. Part II develops the claim that personalizing the standard of care is generally more efficient than having a “one-size-fits-all” standard of care. Part III looks at personalizing the standard of care from a justice perspective, showing that while corrective justice notions might be consistent with personalization in only some cases, distributive justice considerations support personalization in many more cases. Part IV explains how personalization could be broadly implemented in negligence law with the aid of Big Data, among other things. It also makes the claim that even if full-fledged personalization could not be implemented (yet), two alternatives would be (i) to apply a gradual personalization regime, according to which courts would have to choose whether to impose a high, medium, or low level of care at any specific case brought before them; and (ii) to utilize presumptions designed to elicit private information out of litigants. Lastly, the Conclusion summarizes our proposal for personalization of the standard of care, pointing out several options for personalization, and offers a few extensions to other fields of the law.

I

PERSONALIZED NEGLIGENCE UNDER EXISTING LAW

Current law does not personalize standards of care. It adheres, instead, to a regime of uniform, nonpersonalized standards. The Third Restatement states: “A person acts negligently if the person does not exercise reasonable care under all the circumstances.”²³ Reasonable care requires balancing the “foreseeable likelihood that the person’s conduct will result in harm, the foreseeable severity of any harm that may ensue, and the burden of precautions to eliminate or reduce the

²¹ *Id.* at 92 (“[I]f due care equals the socially optimal level, then injurers will be led to choose both the socially optimal level of prior precautions and the socially optimal level of care.”); Schwartz, *supra* note 19, at 254–57, 259 (arguing that subjective negligence standard generally results in underinvestment of precaution).

²² *But see* Charles R. Korsmo, *Lost in Translation: Law, Economics, and Subjective Standards of Care in Negligence Law*, 118 PENN. ST. L. REV. 285, 292–95 (2013) (making this distinction, but not exploring full set of incentive effects due to two types of personalization).

²³ RESTATEMENT (THIRD) OF TORTS: LIABILITY FOR PHYSICAL AND EMOTIONAL HARM § 3 (AM. LAW INST. 2010).

risk of harm.”²⁴ The Third Restatement clarifies that its balancing approach is identical to the reasonably careful person approach “[b]ecause a ‘reasonably careful person’ . . . is one who acts with reasonable care”²⁵ The “reasonably careful person” standard is explicitly objective and, therefore, nonpersonal.²⁶ The law does not generally ask whether a given person took as much care as *she personally* ought to have taken, given the risk she creates and the risk reduction skills she has. Rather, it insists that individuals be judged according to the standard of an external reasonable actor, representing some aggregate community measure.²⁷

Objective standards do not mean one-size-fits-all. The present objective regime permits some partition of the reference group against which an actor’s behavior is judged. While the partition does not go so far as to personalize negligence law, courts have been willing to adjust standards of care to account for several special human characteristics that are thought to have a strong correlation with riskiness of actors and with the effectiveness of their precautions. These characteristics, discussed below, include inherently diminished physical and cognitive capacity; enhanced special skills, intelligence, or knowledge; and doctors and medical institutions with either enhanced or diminished resources.

A. *Diminished Capacity*

Tort law treats several groups of people with diminished capacity differently, applying a separate standard of care for each. These groups include the physically disabled, children, and the mentally disabled.

Physically Disabled. Actors with physical disabilities generally face a standard of care in accordance with their condition: “The conduct of an actor with a physical disability is negligent only if the conduct does not conform to that of a reasonably careful person with the

²⁴ *Id.* This wording indicates that the Restatement endorsed the Hand Formula for determining negligence. See *United States v. Carroll Towing Co.* 159 F.2d 169, 173 (2d Cir. 1947) (determining liability on whether burden of adequate precautions is smaller than multiplication of damages caused by their probability).

²⁵ RESTATEMENT (THIRD) OF TORTS: LIABILITY FOR PHYSICAL AND EMOTIONAL HARM § 3 cmt. a (AM. LAW INST. 2010).

²⁶ While the Restatement determines “reasonable care” by considering the objective primary factors set out in § 3, considerations of more personal characteristics such as age and knowledge are permitted for particular categories of cases. See RESTATEMENT (THIRD) OF TORTS: LIABILITY FOR PHYSICAL AND EMOTIONAL HARM § 3 cmt. d (AM. LAW INST. 2010) (setting out certain categories of torts where more personalized factors should be considered).

²⁷ See, e.g., *Rappaport v. Nichols*, 156 A.2d 1, 8 (N.J. 1959) (“[T]he standard of care is the conduct of the reasonable person of ordinary prudence under the circumstances.”).

same disability.”²⁸ For example, a blind or deaf person is only required to take the contributory precautions reasonable in light of her limitation.²⁹ This adjustment of the standard of care is often downward. For example, required precautions for the blind or deaf do not include looking or listening for a train at a railroad crossing.³⁰ This is consistent with what later in the Article we call *skill*-based personalization: People whose skill in taking precautions is lower (or whose private cost of taking precautions is higher) should optimally take less care.³¹ But, the adjustment of standards may also go the opposite way, raising the burden of precautions. A paralyzed driver whose physical disability diminishes his control of the car might be required to take additional precautionary measures that an able-bodied driver would not be required to take, such as installing special steering mechanisms or special brakes.³² This is consistent with what later in the Article we call the *risk*-based personalization: people whose conduct creates higher risk should take more care.

Children. Children face standards of care distinct from, and generally lower than, those of adults: “A child’s conduct is negligent if it does not conform to that of a reasonably careful person of the same age, intelligence, and experience”³³ This, again, is consistent with

²⁸ RESTATEMENT (THIRD) OF TORTS: LIABILITY FOR PHYSICAL AND EMOTIONAL HARM § 11 (AM. LAW INST. 2010).

²⁹ *E.g.*, *Muse v. Page*, 4 A.2d 329, 331 (Conn. 1939) (“[R]easonable care in the case of one with such defective vision as the plaintiff had is such care as an ordinarily prudent person with a like infirmity would exercise under the same or similar circumstances.”); *Fink v. City of New York*, 132 N.Y.S.2d 172, 173 (Sup. Ct. 1954) (ruling that deaf mute hit by fire truck sounding its alarm is free from contributory negligence, having exercised necessary due care allowed by his affliction).

³⁰ *See, e.g.*, *Iron Mountain R.R. Co. v. Dies*, 41 S.W. 860, 862 (Tenn. 1897) (“These obligations to stop and look and listen [before going over the tracks of a railroad] must receive a reasonable construction and interpretation. . . . [A party] cannot be required to listen if he is deaf . . .”).

³¹ A related justification is that adjustment of the standard of care affords people with physical disabilities some security in living their daily lives. *See DOBBS, supra* note 2, § 119, at 282 (noting that in some cases the rule is “especially protective of persons with disabilities or physical limitations”); *see also* Avihay Dorfman, *Negligence and Accommodation: On Taking Others as They Really Are* 12–13 (Dec. 27, 2014) (unpublished manuscript), http://works.bepress.com/avihay_dorfman/18/ (noting that cases in which physical disadvantage warranted watered-down standard of care were cases of contributory or comparative negligence, whereas cases concerning conduct of tortfeasors did not make allowance for her physical disability).

³² While the law does not require sighted individuals to use seeing eye dogs or canes to navigate public walkways, a blind person who fails to do so and is injured can be considered contributorily negligent. *See, e.g.*, *Poyner v. Loftus*, 694 A.2d 69, 71–72 (D.C. 1997).

³³ RESTATEMENT (THIRD) OF TORTS: LIABILITY FOR PHYSICAL AND EMOTIONAL HARM § 10(a) (AM. LAW INST. 2010); *see also, e.g.*, *Hoyt v. Rosenberg*, 182 P.2d 234, 236 (Cal. Dist. Ct. App. 1947) (“While a minor, like an adult, is required to exercise ordinary

skill-based personalization: “A child may be so young as to be manifestly incapable of exercising any of those qualities of attention, intelligence and judgment which are necessary to enable him to perceive a risk and to realize its unreasonable character.”³⁴ This adjustment is more finely personalized: If the child has different intelligence and experience than children of comparable age, the standard would be further adjusted. It could shift upwards: “[A] child who has not yet attained his majority may be as capable as an adult.”³⁵ And it can shift downwards if a child of a given age is demonstrably less capable than his or her peers—perhaps because of immaturity or other developmental delays.³⁶

Mentally disabled. In general, tort law makes no allowance for mental disability or insanity: “An actor’s mental or emotional disability is not considered in determining whether conduct is negligent, unless the actor is a child.”³⁷ But in one specific area, standards of care may be adjusted downwards for mentally disabled individuals. This is in determining whether a mentally disabled plaintiff was contributorily negligent.³⁸ Lowering the standard of contributory care for

care he is only required to exercise that degree or amount of care that is ordinarily exercised by one of like age, experience and development.”).

³⁴ *Lutteman v. Martin*, 135 A.2d 600, 602–03 (Conn. C.P. 1957).

³⁵ *Id.* at 603. For example, children are often held to a higher standard of care, similar to that of adults, when performing what are considered “adult activities” such as driving an automobile or operating a snowmobile. *See, e.g., Dellwo v. Pearson*, 107 N.W.2d 859, 863 (Minn. 1961) (“While minors are entitled to be judged by standards commensurate with age, experience, and wisdom when engaged in activities appropriate to their age, experience, and wisdom, . . . in the operation of an automobile, airplane, or powerboat, a minor is . . . held to the same standard of care as an adult.”). Bernstein’s view is that by partaking in such activity, a child “assume[s] the combination of selected risks, pleasures, and accountability that characterizes autonomous adult life” and therefore “must accept . . . the rigors of adult-level reasonable care.” Anita Bernstein, *The Communities that Make Standards of Care Possible*, 77 CHI.-KENT L. REV. 735, 759 (2002).

³⁶ *See Soledad v. Lara*, 762 S.W.2d 212, 214 (Tex. App. 1988) (“[T]he fact that a child is mentally retarded, or that he is unusually bright for his years is to be taken into account.”).

³⁷ RESTATEMENT (THIRD) OF TORTS: LIABILITY FOR PHYSICAL AND EMOTIONAL HARM § 11(c) (AM. LAW INST. 2010); *see also Johnson v. Lambotte*, 363 P.2d 165, 166 (Colo. 1961) (quoting 44 C.J.S. *Insane Persons* § 122 (1936)) (“The general rule is that an insane person may be liable for his torts the same as a sane person, except perhaps those in which malice and, therefore, intention are necessary ingredients.”); *Burch v. Am. Family Mut. Ins.*, 543 N.W.2d 277, 280 (Wis. 1996) (“[A] tortfeasor’s mental capacity cannot be invoked to bar civil liability for negligence.”).

³⁸ *See, e.g., Birkner v. Salt Lake Cty.*, 771 P.2d 1053, 1060 (Utah 1989) (noting that “[i]n contrast to the use of an objective standard in cases of primary negligence, the majority of courts have adopted a more compassionate stance regarding the contributory negligence of the mentally impaired,” specifically that “[t]hose who are insane are incapable of contributory negligence, whereas lesser degrees of mental impairment should be considered by the jury in determining whether the plaintiff was contributorily negligent”); *Snider v. Callahan*, 250 F. Supp. 1022, 1023 (W.D. Mo. 1966) (“[W]ith respect to contributory negligence, in Missouri and in many other states a subjective standard is

mentally disabled victims shifts greater liability and cost of precaution to their negligent injurers, and relieves these victims of some of the losses they would have otherwise had to bear. Adjusting the standard of care of the mentally disabled victim—but not the injurer—is a manifestation of the idea (also embedded in the egg-shell skull principle³⁹) that the defendant “takes the victim as she finds him.”⁴⁰

It is something of a mystery why tort law treats the mentally disabled differently from the physically disabled and children. One possible justification is evidentiary: it is relatively easy to determine physical disability and the age of a child but relatively difficult to verify the specific effects of mental illness.⁴¹ This justification ignores the fact that the law takes a highly granular approach to determining standards of care for children, including their mental development (but perhaps children are less likely to bluff cognitive impairment in legal proceedings). It also runs against the increased accuracy of psychiatric diagnosis⁴² that might improve the abilities to assess the skills and riskiness of a defendant alleged to be mentally disabled. Another justification for the reluctance to personalize standards of care for the mentally disabled is that doing so would hurt the incentives of their caretakers.⁴³ But this justification, if it has any force, should apply even more strongly to children than it does to mentally disabled

applied to children and persons suffering from a mental deficiency.”). See generally Joseph P. Flynn, Note, *Contributory Negligence of Incompetents*, 3 WASHBURN L.J. 215 (1964) (discussing case law examples of contributory negligence by mentally ill tortfeasors).

³⁹ See, e.g., *Vosburg v. Putney*, 50 N.W. 403, 404 (Wis. 1891) (“The rule of damages in actions for torts . . . [is] that the wrongdoer is liable for all injuries resulting directly from the wrongful act, whether they could or could not have been foreseen by him.”).

⁴⁰ See Dorfman, *supra* note 31, at 33–34 (justifying asymmetrical measurement of reasonable care across defendant/plaintiff divide by notion that tortfeasors should take potential victims as they find them).

⁴¹ See RESTATEMENT (THIRD) OF TORTS: LIABILITY FOR PHYSICAL AND EMOTIONAL HARM § 11 cmt. e (AM. LAW INST. 2010) (explaining that limited or moderate mental disorders, as opposed to psychoses, are disregarded partly due to “the problems of administrability that would be encountered in attempting to identify them and assess their significance”); cf. David E. Seidelson, *Reasonable Expectations and Subjective Standards in Negligence Law: The Minor, the Mentally Impaired, and the Mentally Incompetent*, 50 GEO. WASH. L. REV. 17, 29 (1981) (differentiating between the reasonable expectations of a plaintiff facing a minor to those of one facing a mentally disabled defendant, and arguing that “to give the [defendant] the benefit of the less demanding standard, when the [plaintiff] has no knowledge, actual or constructive, of the first actor’s impairment, would impose on the [plaintiff]”).

⁴² See Harry J.F. Korrell, *The Liability of Mentally Disabled Tort Defendants*, 19 L. & PSYCHOL. REV. 1, 35 (1995) (“The task [of distinguishing between legitimate and spurious defenses] may be simpler now than when this rationale was first offered, given the increased accuracy of psychiatric diagnosis under the new Diagnostic and Statistical Manual (DSM-III-R) and the modern recognition of physiological indicators of mental disorders.” (footnote omitted)).

⁴³ *Id.* at 29–30 (presenting and refuting caretaker incentive justification).

adults. Children are more likely to be under the direct supervision of a caretaker who could take supervisory care. And yet children's standards are adjusted downwards, effectively exempting their caregivers from the onus of step-in care, while the same forgiving standards are denied for the mentally disabled.

B. Elevated Capacity

In an apparent asymmetry, tort law principles allow courts to take into account elevated capacity more broadly than diminished capacity. First, elevated capacity is relevant generally as a category and is not limited to a closed list of cases. Thus, “[i]f an actor has skills or knowledge that exceed those possessed by most others, these skills or knowledge are circumstances to be taken into account in determining whether the actor has behaved as a reasonably careful person.”⁴⁴ Second, elevated capacity is relevant not only when it is inherent, but also when it is deliberately acquired.⁴⁵ However, in practice this principle of elevated capacity is applied inconsistently. For example, courts have been willing to account for certain kinds of special skill—like medical training⁴⁶—while ignoring others—like professional skill as a driver.⁴⁷

Defendant's special skills are most often taken into account in cases where the defendant's profession is relevant to the injury. For example, doctors are held to a standard of care for their patients that is considerably higher than the reasonable person standard.⁴⁸ The same is true (although this varies across jurisdictions),⁴⁹ for example,

⁴⁴ RESTATEMENT (THIRD) OF TORTS: LIABILITY FOR PHYSICAL AND EMOTIONAL HARM § 12 (AM. LAW INST. 2010).

⁴⁵ See, e.g., *Everett v. Bucky Warren, Inc.*, 380 N.E.2d 653, 659 (Mass. 1978) (holding hockey coach to higher standard of care due to his substantial experience and knowledge).

⁴⁶ See *Martinez v. Cal. Highway Patrol*, No. F056592, 2010 WL 625838, at *7 (Cal. Ct. App. Feb. 24, 2010) (finding material issue of fact as to whether highway patrol officer was negligent for having carelessly extracted accident victim from car, taking into account “that [the officer] had received medical training and recertification as an [Emergency Medical Responder] at the CHP, and that his training would have included teaching patient assessment related to C-spine precautions”).

⁴⁷ See, e.g., *Capital Raceway Promotions, Inc. v. Smith*, 322 A.2d 238, 246–47 (Md. Ct. Spec. App. 1974) (affirming trial court's instruction not to hold professional race car driver to higher standard of care).

⁴⁸ See *Palandjian v. Foster*, 842 N.E.2d 916, 920 (Mass. 2006) (“[A] specialist should be held to the standard of care and skill of the average member of the profession . . . [practicing] the specialty, taking into account the advances in the profession.” (first alteration in original) (quoting *Brune v. Belinkoff*, 235 N.E.2d 793, 798 (Mass. 1968))).

⁴⁹ For example, in *Cervelli v. Graves*, 661 P.2d 1032, 1037–39 (Wyo. 1983), the court refused to hold a professional truck driver with over ten years of truck driving experience to a higher standard of care. See also *State v. Robbins*, 246 P.3d 864, 867 (Wyo. 2011) (reaffirming ruling in *Cervelli*).

of architects, physical therapists, and engineers.⁵⁰ Even construction workers have been held to a standard of care that reflects their familiarity with heavy machinery.⁵¹

It is unclear to what extent tailored standards based upon professional experiences are personalized *within* the profession. For example, in medical malpractice, the law requires care commensurate with the “average qualified practitioner.”⁵² But the level of care to which a doctor is held—the “average” against which the doctor is evaluated—varies quite a bit by specialty. Specialists are held to a higher standard when treating an illness that falls within their purview.⁵³ Some courts have gone even further, holding that, whatever the medical standard of care is, each individual doctor is required to make decisions to the best of her own judgment, when the doctor has superior knowledge, skill, or intelligence in reducing risks inherent to a common practice.⁵⁴

Considerations of special skill, knowledge, and intelligence are, for the most part, a one-way street. While all courts are willing, in a variety of circumstances, to raise standards of care above the level of the “reasonable person” for individuals with enhanced capacity, they refuse to decrease standards of care for individuals with lower-than-average skill, knowledge, or intelligence⁵⁵ (with the exceptions, as we saw, of children, physically disabled, and sometimes mentally disabled victims⁵⁶). Part of our goal in Parts II and III below is to offer a possible rationale for this asymmetric personalization regime.

⁵⁰ See, e.g., *Simon v. Drake Constr. Co.*, 621 N.E.2d 837, 839 (Ohio Ct. App. 1993) (architects); *Rehab. Care Sys. of Am. v. Davis*, 73 S.W.3d 233, 234 (Tex. 2002) (physical therapists); *Affiliated FM Ins. v. LTK Consulting Servs.*, 243 P.3d 521, 529 (Wash. 2010) (en banc) (engineers).

⁵¹ See *Hill v. Sparks*, 546 S.W.2d 473, 476 (Mo. Ct. App. 1976) (ruling that earth moving machine operator was negligent for failing to warn decedent “[d]espite his knowledge and experience”).

⁵² *Palandjian*, 842 N.E.2d at 920–21.

⁵³ See *supra* note 48.

⁵⁴ *Toth v. Cmty. Hosp. at Glen Cove*, 239 N.E.2d 368, 372–73 (N.Y. 1968) (“[A] physician should use his best judgment and whatever superior knowledge, skill and intelligence he has. Thus, a specialist may be held liable where a general practitioner may not.” (citation omitted)).

⁵⁵ See, e.g., *Stevens v. Fleming*, 777 P.2d 1196, 1199 (Idaho 1989) (plurality opinion) (“Individual inexperience is not a legitimate reason for a lower standard of conduct.”); *Summerill v. Shipley*, 890 P.2d 1042, 1046 n.7 (Utah Ct. App. 1995) (“[The defendant]’s inexperience or lack of knowledge cannot excuse his actions if the jury finds that the reasonable person would have acted differently in his place.”); see also RESTATEMENT (THIRD) OF TORTS: LIABILITY FOR PHYSICAL AND EMOTIONAL HARM § 12 cmt. b (AM. LAW INST. 2010) (“The fact that a person is below average in judgment, knowledge, or skills is generally ignored in considering whether the person is negligent . . .”).

⁵⁶ See *supra* Section I.A.

C. Resource-Based Personalization

Precautions are costly, and individuals face different resource constraints that vary the level of care they can optimally satisfy. While in general negligence law resources do not matter in setting the standards of care,⁵⁷ in medical malpractice law they do.

We saw that doctors are generally required to provide care that is at least as good as the average qualified medical practitioner, perhaps adjusted upwards to account for personal expertise. But what is the reference group from which the average qualification is derived? One dimension of reference is geographical. Traditionally, medical malpractice law has taken as the relevant reference the practices of other doctors from the same locality as the doctor under scrutiny.⁵⁸ More recently, reference groups have been broadened to include similar localities, either across the state or across the country⁵⁹ (an expansion designed to prevent groups of small-town doctors from shielding themselves from liability by collectively refusing to update methods of care to conform to modern practices⁶⁰).

Such regional variations in the standard of care are certainly a partial response to perceived variances in levels of physician skill or knowledge.⁶¹ But, they are also explicit responses to variations in medical resources. As one court explained, “[i]n applying this standard it is permissible to consider the medical resources available to the physician [S]ome allowance is thus made for the type of community in which the physician carries on his practice.”⁶²

⁵⁷ Jennifer H. Arlen, *Should Defendants' Wealth Matter?*, 21 J. LEGAL STUD. 413, 428 (1992). Arlen opposes this notion, arguing that under the assumption that individuals are risk averse, optimal deterrence requires an account of wealth differences. *Id.* at 419–27. For a discussion regarding the possible usage of information concerning wealth in the design of negligence standards, see *infra* Section IV.B.4.

⁵⁸ See DOBBS, *supra* note 2, § 244, at 635 & n.1 (discussing rule's origin in *Small v. Howard*, 128 Mass. 131 (1880)).

⁵⁹ See, e.g., *Bahr v. Harper-Grace Hosps.*, 528 N.W.2d 170, 172 (Mich. 1995) (“[T]he standard of care for general practitioners is that of the local community or similar communities, and is nationwide for a specialist.” (footnote omitted)).

⁶⁰ See, e.g., *Pederson v. Dumouchel*, 431 P.2d 973, 977 (Wash. 1967) (“The fact that several careless practitioners might settle in the same place cannot affect the standard of diligence and skill which local patients have a right to expect. Negligence cannot be excused on the ground that others in the same locality practice the same kind of negligence.”).

⁶¹ See, e.g., *Geraty v. Kaufman*, 162 A. 33, 36 (Conn. 1932) (“[W]e recognize that a country surgeon should not be expected to exercise the high degree of skill possessed by eminent surgeons living in large cities and making a specialty of surgical operations.”).

⁶² *Brune v. Belinkoff*, 235 N.E.2d 793, 798 (Mass. 1968).

Resource-based adjustments in standards of care apply to hospitals, as well.⁶³ Hospitals serving smaller communities may not be asked to maintain the same medical equipment as their larger neighbors, even if such absence means lower care. Interestingly, such considerations can be relevant even where the hospital's alleged negligence is not in the provision of medical treatment. If, for example, the hospital applies only limited security and supervision, enabling a patient to escape the hospital and later suffer due to lack of proper treatment, the hospital's resources are deemed relevant.⁶⁴ In one such case, the court held that "[t]he protection of patients is not a medical function of a hospital; rather, it is a service provided by a hospital to its patients, and the ability of a small rural hospital to provide such a service is limited by its location and resources."⁶⁵

D. *Personalization Through Insurance?*

Insurance is another mechanism by which personalized standards of care may emerge. When potential injurers purchase liability insurance, the premiums they pay are tailored to the risks they create. Any information that insurers have about factors affecting these risks—including injurers' skills and riskiness—would be reflected in the premium. For example, auto liability insurance would offer discounts to drivers whose known characteristics are correlated with low risk (such as high grades in college) or with high skill (driving experience).

If insurers were able to observe the precautions injurers take and adjust premiums accordingly, would insurance policies incentivize injurers to adopt personalized levels of care, reflecting their idiosyncratic traits? Could insurance therefore substitute for the tort system by privately regulating a personalized standard regime?⁶⁶

The idea that insurance can promote personalized care is intuitive, and it seems consistent with ways in which insurance personalizes policy premiums according to risk. Insurance is the business of data sorting, and it is indeed at the forefront of personalized underwriting. For example, insurers install "telematics" devices in cars and collect data about driving patterns, thereby fine tuning the premiums that

⁶³ See *Johnson v. Wills Mem'l Hosp. & Nursing Home*, 343 S.E.2d 700, 702 (Ga. Ct. App. 1986) (applying locality rule in wrongful death action against small rural hospital with limited resources).

⁶⁴ See *id.* at 701–02.

⁶⁵ *Id.* at 702.

⁶⁶ See generally Omri Ben-Shahar & Kyle D. Logue, *Outsourcing Regulation: How Insurance Reduces Moral Hazard*, 111 MICH. L. REV. 197, 220 (2012) (examining ways in which insurance regulates standards of safety).

drivers pay.⁶⁷ But perhaps surprisingly, insurance is not going to be effective in personalizing the safety measures and care levels that policyholders adopt.

Insurers set premiums according to what they predict to be the expected liability of the policyholder—this is the payout that they would have to make under the liability coverage. Since the expected liability depends on the standards set by tort law, the premiums insurers charge would merely reflect the uniform standards prevailing under the legal system. Even if the insured-injurer is high skill or high risk, and should ideally take a high level of care, the insurer has no reason to create incentives to take more than an average level of care. Requiring policyholders to do more than is required by law would not lead to lower premiums, and thus policyholders would reject such policies.

What about policyholders with low skills or with low risks? Would insurers incentivize them to take the personalized and optimal level of care, which is less than the legally required uniform level? No. Here, too, insurers would not go any further than inducing the care levels that injurers would take absent insurance, under a uniform standard of care. Under such a regime, as we will explain below, injurers have the incentive to meet the uniform standard of care and bear no liability. Inducing people to take lower than the required level of care would only expose insurers to liability coverage.⁶⁸

Our brief survey demonstrates the existence of some personalization in negligence law. This is only crude personalization, partitioning the population of injurers into subgroups that, as a general approximation, have different skills or a different degree of riskiness.⁶⁹ Sometimes it is more finely done, as in the case of children, where the courts are willing to look at their individual developmental stage. We also saw that personalization is, in professional cases, unidirectional:

⁶⁷ See TODD LITMAN, VICTORIA TRANSP. POLICY INST., PAY-AS-YOU-DRIVE INSURANCE: RECOMMENDATIONS FOR IMPLEMENTATION 7 (2011), http://www.vtpi.org/payd_rec.pdf (describing use of GPS transponders installed in cars to price insurance policies based on location and time driven); Chris Woodyard, *Drivers May Lower Insurance Premiums by Getting Monitored*, USA TODAY (Mar. 14, 2011, 10:23 PM), <http://www.usatoday.com/money/autos/2011-03-14-Progressive-electronic-check-system.htm> (discussing such a program implemented by Progressive Insurance).

⁶⁸ Later, we explain that under certain assumptions low-skill or low-risk injurers will self-personalize under a uniform standard of care, i.e., take a low level of care and pay damages. See *infra* Section II.A.3. Insurance coverage would not change injurers' incentive to self-personalize.

⁶⁹ For a theoretical analysis of the role of subgroups in negligence law and their relation to objective and subjective standards, see Bernstein, *supra* note 35.

Only higher but not lower skills, knowledge, and experience are taken into account in setting the standards of care. Hence, while tort law seems open to the idea of personalization of standards of care, its progress thus far in that direction has been, at best, partial and inconsistent.

II

THE EFFICIENCY OF PERSONALIZED STANDARDS

Part I presented the law of negligence as a system of uniform standards. Some pockets of personalization are recognized, but they are the exception, not the rule. We now turn to the core of the Article—the normative comparison between uniform and personalized standards. In this Part, our yardstick is efficiency. Later, in Part III, we analyze personalization from both corrective and distributive justice perspectives. Our analysis in this Part compares uniform and personalized standards along several dimensions: the efficiency of the levels of care and levels of activity of injurers, the efficiency of victims' care, and the effect on injurers' *ex ante* investments in reducing their harmfulness. Along each of these dimensions, we examine the two types of personalization—skill-based and risk-based—and demonstrate their centrality to any analysis of personalization.

Throughout this Part, we present our claims through analysis of a simple numerical example. Most of the insights arising from this example are general. When necessary, we expand the analytical framework beyond the simple setting.

A. *Levels of Care*

Assume that injurers can each take precautions that reduce the probability of accident, but not its magnitude. Suppose, for simplicity, that these individuals interact with potential victims and may cause a harm of \$100 to a victim. The effectiveness of precautions for a “representative” injurer is shown in Table 1.

TABLE 1

<i>Level of Care</i>	<i>Cost of Care</i>	<i>Probability of Harm</i>	<i>Expected Social Cost</i>
Low	\$6	22%	\$28
Medium	\$16	10%	\$26*
High	\$26	2%	\$28

* Lowest social cost.

Looking at the “Expected Social Cost” column in Table 1, we see that the lowest social cost is realized when the injurer takes “medium” care. Without more information on the specific competence of each potential injurer, the optimal uniform standard of care should be “medium,” imposing an average cost of \$16 on all potential injurers. The expected social cost would be \$26.

But now suppose that injurers are heterogeneous and that the numbers in Table 1 are merely averages. Assume that the court has reliable information about idiosyncratic traits of the injurer-defendant, and that this information fits one of two categories. The first category is information on the “skill” that the injurer has in reducing risks—how costly it is for the injurer to meet each level of care in Table 1. The second category is information about the riskiness of each injurer—the likelihood at any precaution level that the harm would happen. Let’s examine what the best use of such information is.

1. *Skill-Based Personalization*

The simplest way to capture the idea that injurers have different risk-reduction skills is to vary the cost they have to incur in order to reach each of the three discrete levels of care—low, medium, and high. More skilled injurers can achieve the same reduction in risk as unskilled injurers by spending less on care.⁷⁰ For example, some drivers are more competent in operating sophisticated technical equipment and therefore can more effectively reduce risks with such equipment; some doctors are more experienced than other doctors and therefore can more quickly and cheaply diagnose certain patients. It is possible, of course, that the same injurer would be skillful with one type of precaution and unskillful with another type of precaution. That should affect her choices not only as to the level of care with a certain precaution, but also as to the specific type of precaution she takes. Personalization, in other words, is both qualitative as well as quantitative. In our analysis below, for simplicity, we focus only on the quantitative aspect: For any particular type of precaution, how should the level be set across different injurers?

We can assume that there is a spectrum of skill, ranging between the highest- and lowest-skilled injurers. Relative to the representative injurer depicted in Table 1, the highest-skilled injurer can spend 50% less at each level of care to obtain the same risk reduction, whereas

⁷⁰ Schwartz illustrates this point by presenting a graph which compares the marginal cost curve of taking care for a blind person alongside a similar graph for a sighted person. The ensuing conclusion is that as the former bears higher costs for each level of care, it is efficient for him to take less care. See Schwartz, *supra* note 19, at 243. For a different graphical illustration of this argument, see Korsmo, *supra* note 22, at 309–10.

the lowest-skilled injurer must spend 50% more at each level of care. Table 2 summarizes the precaution choices for these two extreme types of injurers (which we label “skilled” and “unskilled”).

TABLE 2

Level of Care	Cost of Care		Probability of Harm	Expected Social Cost	
	Skilled	Unskilled		Skilled	Unskilled
Low	\$3	\$9	22%	\$25	\$31*
Medium	\$8	\$24	10%	\$18	\$34
High	\$13	\$39	2%	\$15*	\$41

*Lowest social costs.

Notice that the average of skilled and unskilled injurers yields exactly the representative injurer depicted in Table 1. If the standard is set uniformly for all injurers irrespective of their skill—what we call a uniform standard regime—the most efficient level would be “medium,” and the social cost would be \$26. But society can do better. If the standard is set in a personalized manner, it would vary across injurer types. Looking at the “Expected Social Cost” dual columns in Table 2, we see the lowest cost is obtained when the skilled injurer takes “high” care and the unskilled injurer takes “low” care.⁷¹ Instead of requiring all injurers to take “medium” care, as prescribed under the uniform standard regime, the law can differentiate the standard of care according to the skill of the injurers and reduce the expected social costs. If, for example, there are equal numbers of skilled and unskilled injurers, the expected social cost will be \$23 (the average of \$15 and \$31, the lowest attainable social costs for skilled and unskilled injurers, respectively)—lower than under a uniform standard regime (\$26).⁷²

⁷¹ It is assumed, for now, that under the uniform standard regime the low-skilled injurer abides by the medium standard of care. This assumption will be revisited, and the resulting discussion refined, below. See *infra* Section II.A.3.

⁷² More generally, if injurers’ skill varies along a continuum, anywhere between the +50% and -50% range (all relative to the representative injurer depicted in Table 1) there is a threshold of care cost above which an injurer’s standard of care should be scaled down to “low,” and another threshold of care cost below which an injurer’s standard of care should be scaled up to “high.” To determine the thresholds, we look for multiples of the cost of care, *a* and *b*, such that low care and high care become more efficient than medium care:

$$(1 + a)6 + 0.22 \times 100 < (1 + a)16 + 0.10 \times 100;$$

$$(1 + b)26 + 0.02 \times 100 < (1 + b)16 + 0.10 \times 100.$$

This yields *a* > 20% and *b* < -20%. When the skill level of the injurer is sufficiently low that the cost of taking each level of care rises by more than 20% or more relative to the average injurer, the standard of care should be adjusted downwards; and when the skill is

It is possible that the standards injurers face could be further refined, applying more than two high/low adjustments. Following the same logic, this would generate even greater precaution efficiency. The practical implementation burdens of such continuous personalization will be discussed in Part IV.

The observation that skill-based personalization is more efficient than a uniform standard is wholly intuitive. It pays to impose higher burdens on the more competent actors to take advantage of their greater productivity. Thus, the driver who is more competent in operating sophisticated technical equipment should probably use it, while the less competent driver perhaps should not.⁷³ Similarly, the experienced doctor who can diagnose a patient in minutes, but who failed to do so, should be considered negligent, while a less experienced doctor, who needs much more time to diagnose a patient and failed to do so, perhaps should not be considered negligent (assuming, in both cases, that the doctor has a small amount of time to invest in each patient because of a sudden overload of work).

But a less intuitive aspect is the effect of personalized standards on the overall costs imposed on differently skilled injurers. Personalized standards, although imposing more differentiated *levels* of care, impose less differentiated *costs* of care on the various types of injurers. Under uniform standards, the skilled and unskilled injurers have to take the same level of care (“medium”), but they bear differentiated costs of \$8 and \$24, respectively, to satisfy it. Under personalized standards, they have to take different levels of care. The skilled injurer has to take “high” care but can do so relatively cheaply and incurs a cost of \$13. The unskilled injurer has to take “low” care but in a relatively expensive manner and incurs a cost of \$9. This illustrates a general point: Skill-based personalization counteracts people’s unequal skills, offsetting the high cost of compliance with scaled-down standards.⁷⁴

sufficiently high that the cost of taking each level of care falls by more than 20% or more relative to the average injurer, the standard of care should be adjusted upwards.

⁷³ Korsmo criticizes the concept that unskilled injurers should take less care, ergo act in a less prudent fashion. This theoretically sound notion, he argues, may lead to absurd results. See Korsmo, *supra* note 22, at 316–17 (“The assumptions of the Standard Model actually suggest that unskilled drivers should be allowed to drive faster than skilled drivers. They suggest that unskilled drivers should be allowed to engage in more distractions than the skilled. . . . Something is evidently amiss with the Standard Model, when translated into actual legal prescriptions.”).

⁷⁴ For further discussion of this last point, see *infra* Section III.B.1.

2. Risk-Based Personalization

Assume now that injurer types vary according to a different attribute: the riskiness of their conduct. For the same level of care, “safe” injurers create lower risk than “risky” injurers. For example, some drivers create higher risks on the road, even when driving at the same speed, because they have poor instincts or inferior driving abilities relative to other drivers; some doctors create higher risks in performing medical procedures, even when they use the same tools and procedures, because they are less experienced and knowledgeable than other doctors. Note that experience and knowledge in some occasions, and for some tools and procedures, might affect skillfulness, as we demonstrated in the previous section, but in other occasions, and for some other tools and procedures, might affect riskiness. Thus, when injurers lack experience or knowledge with respect to a *certain precaution*, they should often be required to meet lower standards of care with respect to that specific precaution. That lack of experience or knowledge, however—namely, the low skill in taking certain precautions—makes these injurers more risky and requires them to take other alternative precautions, as we explain below.⁷⁵

Again, we assume that injurers’ riskiness is distributed randomly, anywhere on a continuum between safe and risky. Specifically, relative to the representative injurer, safe injurers impose a risk that is 50% lower, whereas risky injurers impose a risk 50% higher.⁷⁶ Table 3 summarizes the care choices for the safest and for the most risky injurers.

⁷⁵ See *infra* text accompanying notes 77–79.

⁷⁶ It should be noted that variation according to risk of harm could be captured also as variation according to cost of care. If care is defined as the cost to achieve a given reduction in the probability of accident, then the two attributes—skill and riskiness—would be synonymous. Thus, presenting the case of personalization according to risk of harm does not add a new theoretical insight, but merely replicates the effect described in the case of personalization according to cost of care. It is present here, nevertheless, in order to set the stage for the legal applications. The mathematical similarities between the two forms of variations have been noted in previous writings on the topic. See SHAVELL, *supra* note 17, at 73 (“[R]eference will be made, for simplicity, only to differences in parties’ cost of taking care, although what will be said will plainly bear equally on differences in the effectiveness of their exercise of care.”); Korsmo, *supra* note 22, at 292 (“From a purely mathematical perspective, the distinction between the two scenarios is, indeed, seemingly inconsequential.”). Korsmo nevertheless devotes a significant portion of his article to an analysis of the differences between the two variations, and suggests a method for determining which one should be applied. See *id.* at 319–37.

TABLE 3

Level of Care	Cost of Care		Probability of Harm	Expected Social Cost	
	Safe	Risky		Safe	Risky
Low	\$6	11%	33%	\$17*	\$39
Medium	\$16	5%	15%	\$21	\$31
High	\$26	1%	3%	\$27	\$29*

* Lowest social costs.

Notice again that the average of safe and risky injurers yields exactly the representative injurer depicted in Table 1. But the optimal personalized standards are different than the uniform standard. The lowest social cost is obtained when safe injurers take “low” care and risky injurers take “high” care.⁷⁷ Relative to the most efficient uniform standard (“medium”), social costs are reduced. If, for example, injurers are either safe or risky with equal likelihood, the expected social cost under a personalized standards regime will be \$23 (the average of \$17 and \$29)—lower than under a uniform standards regime (\$26).

Notice, also, that in terms of the distribution of burdens, we get an opposite effect to the one we saw under skill-based personalization. Risk-based personalized standards impose *more* differentiated costs on the different types of injurers than uniform standards. Under uniform standards, the safe and risky types bear the same cost of \$16 to meet the “medium” standard of care. Under personalized standards, they have to bear costs of \$6 and \$26, respectively.⁷⁸

The main result arising from Table 3—that injurers who create lower risks should take lower care—is intuitive.⁷⁹ It pays to impose higher burdens on the more risky actors since any additional burden

⁷⁷ More generally, if injurers’ riskiness varies anywhere between the +50% and -50% range, there is a threshold of riskiness above which the injurer’s standard of care should be scaled up to “high,” and another threshold of riskiness below which the injurer’s standard of care should be scaled down to “low.” To determine the thresholds, we look for multiples of the probability of harm, s and t , such that low care and high care become more efficient than medium care:

$$6 + (1 + s)0.22 \times 100 < 16 + (1 + s)0.10 \times 100;$$

$$26 + (1 + t)0.02 \times 100 < 16 + (1 + t)0.10 \times 100.$$

This yields $s < -0.167$ and $t > 0.25$. When the probability of harm at every level of care is scaled down by more than 16.7% or more relative to the representative injurer, the standard of care should be adjusted downwards; and when the probability of harm is scaled up by more than at least 25%, the standard of care should be adjusted upwards.

⁷⁸ For further discussion of this last point, see *infra* Section III.B.1.

⁷⁹ Korsmo illustrates this point by presenting a graph showing the accident costs for each level of care for both the skilled and unskilled injurers. As the former’s costs are lower, they intersect with the ascending precaution costs at an earlier stage, leading to the conclusion that skilled injurers should take less care. See Korsmo, *supra* note 22, at 323–24.

would produce more risk reduction for the high-risk actor than for the low-risk actor. Thus, the high-risk driver with the poor instincts should take more care than the driver with the sharper instincts. Similarly, the high-risk doctor with less experience and knowledge should take more care than the more experienced and knowledgeable doctor.

Our conclusion, that the less experienced and knowledgeable doctor or driver should take more care, does not contradict the previous claim that such doctor, being less skillful, should take less care. There are two ways to reconcile these conflicting findings. The first is by recognizing that care and precautions have multiple dimensions, and thus the conflicting conclusions apply to different dimensions of care. A doctor should take a low level of the type of precautions that she is unskillful in deploying. That, in turn, makes her relatively riskier and justifies imposing upon her a higher level of care with respect to other precautions. The second way to reconcile the conflicting findings is to view them as “all else equal” effects, each pulling in a different direction. The overall net effect would then be the combination of the two forces. If, for example, only one type of precaution is available, a driver who is both riskier and low skill may in the end be required to take either a higher or lower level of care, depending on which effect dominates. It is therefore possible that despite the low skill in applying this single-dimensional precaution, the high-risk driver may be required after all to take a higher level of care.

3. *Self-Personalization*

The reason uniform standards are not as efficient as personalized standards is the incentive they provide injurers to abide even by inefficient standards of care. Injurers have this incentive because of what is known as the “discontinuity” feature of negligence law: that the failure to meet the standard—even a small margin of departure—would give rise to full liability for the entire harm suffered by the victim.⁸⁰ Thus, even when injurers recognize the standard to be inefficiently tailored to their skill or riskiness, as the uniform standard would often be, they nevertheless abide by it and incur inefficient precaution costs, to avoid the even greater lump sum liability.

There is, however, an important caveat to this “discontinuity” feature. If failure to meet the standard of care results only in *incre-*

⁸⁰ This discontinuity and its behavioral consequences were originally explained by Robert D. Cooter. Robert D. Cooter, *Economic Analysis of Punitive Damages*, 56 S. CAL. L. REV. 79, 80–89 (1982). Cooter later explained that this discontinuity is due to incomplete information available to the courts or the probabilistic nature of the causal connection. Robert D. Cooter, *Punitive Damages for Deterrence: When and How Much?*, 40 ALA. L. REV. 1143, 1155 (1989).

mental liability—only for the additional harm due to the gap between actual care and the legal standard of care—the incentive to abide by an inefficient standard of care is attenuated. An injurer might prefer to disregard the standard and assume such incremental liability. Such an injurer would take efficient care and pay a little extra in liability.⁸¹ Accordingly, the distortion arising from uniform standards is not as large as our analysis above stated, and the benefit of shifting to personalized standards is correspondingly smaller.⁸² Nevertheless, and despite the self-correcting mechanism of injurers ignoring inefficient uniform standards, we now show that such self-correction will not always occur and therefore personalized standards continue to have a systematic efficiency advantage.

Consider, first, skill-based variation among injurers. We saw that skill-based personalized standards would require unskilled injurers to take “low” care and the high-skilled injurers to take “high” care, and we argued that these are improvements relative to the “medium” care that all injurers take under the uniform standards regime. But would injurers indeed abide by the “medium” care standard under a uniform standards regime?

Not necessarily. To be sure, skilled injurers would. For them, the “medium” care standard is a boon. It is cheaper than the more efficient “high” care personalized standard. The skilled injurers would be delighted to qualify for a liability safe harbor by investing *less* than efficiently. But unskilled injurers would have a different incentive. They would choose to disregard the inefficiently burdensome “medium” standard, even if this means that they would be found liable. Returning to Table 2, the unskilled injurers, taking the efficient “low” level of care at a cost of \$9 would create some exposure to liability. But not for all harms: They would be liable only for harms

⁸¹ Mark Grady and Marcel Kahan have demonstrated that the discontinuity of liability, as well as the risk of burdening the negligent injurer with liability for more than the harm he caused, completely disappears when causation rules are properly applied so that the injurer is liable only for those harms that would not have been created had he behaved reasonably. Mark F. Grady, *A New Positive Economic Theory of Negligence*, 92 *YALE L.J.* 799, 812–13 (1983); Marcel Kahan, *Causation and Incentives to Take Care Under the Negligence Rule*, 18 *J. LEGAL STUD.* 427, 428–29 (1989).

⁸² Landes and Posner were the first to note that under a uniform standard of care rule, injurers with very high costs of taking care would not comply with the uniform standard but choose instead the standard of care which is efficient for them. LANDES & POSNER, *supra* note 16, at 125. Schwartz furthers this notion by dividing the group of high-cost injurers who choose not to comply with the uniform standard into two subgroups: one which chooses to engage in the activity and one which refrains from doing so, as the benefits it derives are exceeded by costs of care and costs of harm. Schwartz, *supra* note 19, at 249–50. This result is viewed by Schwartz as an advantage for the uniform standard over the subjective one, as it creates “self-enforcing incentives for optimal behavior in deciding whether to engage in the activity.” *Id.*

that are due to the difference between taking “low” and “medium” care. Since the shift from “medium” to “low” raises the expected harm from \$10 to \$22, the expected liability of the unskilled injurers who ignore the “medium” standard and take “low” care is only \$12 (the difference between \$22 and \$10) and not \$22 (as we previously assumed). For them, taking “low” care at a cost of \$9 and incurring the expected liability of \$12, for a total cost of \$21, is cheaper than incurring no liability by satisfying the “medium” care standard at a cost of \$24.

Here, the advantage of personalized standards is diminished because some unskilled injurers would be self-driven to take the efficient care level, even under a uniform standard. This is a general observation: Any time the idiosyncratic cost of care to injurers is high enough to justify a lower personalized standard, this injurer would also have the incentive to ignore the uniform standard and take a lower level of care. In other words, the unskilled injurer would always *self-personalize*.⁸³ The advantage of personalized standards is then solely due to their effect on the upper side of the distribution of injurers—the skilled injurers—who otherwise are happy to satisfy a uniform standard, what is for them inefficiently low care.

The same one-sided self-personalization occurs in the case of risk-based variations across injurers. Once we relax our assumption that injurers abide by the standard of care, and instead assume that injurers do what is less costly for them and that they bear incremental liability (no “discontinuity”), then, again, some injurers will ignore the inefficient uniform standard—they will self-personalize and behave efficiently. Specifically, safe injurers will ignore what is for them an inefficiently high uniform standard. Taking the personally efficient “low” care, at a cost of \$6, and bearing the expected liability of \$6 (the difference between the actual expected harm of \$11 and the expected harm of \$5 that would have resulted had he abided by the required “medium” standard of care) is less costly for the safe injurer than incurring no liability by satisfying the “medium” care standard at a cost of \$16.⁸⁴ Here, too, the advantage of personalized standards

⁸³ More generally, in the numerical example of Table 2, unskilled injurers have an incentive to self-personalize if: $(1 + a)6 + (0.22 - 0.10) \times 100 < (1 + a)16$. Thus, anytime unskilled injurers have a cost that is more than 20% higher than the representative injurer, they would self-personalize and take “low” care. This, recall, is also the cost threshold that justifies a reduction of the standard of care from “medium” to “low.” We can conclude that the incentive to self-personalize for the unskilled occurs if and only if it is efficient.

⁸⁴ In a similar fashion, Korsmo argues that under the variation in which injurers differ by riskiness, it is the less risky injurer who would find it too costly to adhere to the reasonable person standard and would therefore abide by her lower subjective standard, thereby creating a “pocket” of strict liability. See Korsmo, *supra* note 22, at 327–29.

arises only from their effect on risky injurers. These risky types would be content to meet the “medium” level of care required under the uniform standards regime, rather than the costlier “high” level of care under a personalized regime. Personalization corrects this distortion.

4. Summary

We examined the efficiency of shifting from uniform to personalized standards in environments in which injurers vary across two harm-relevant dimensions: skill in taking precautions and underlying propensity to impose risks. There are other dimensions along which standards can be differentiated (for example, the magnitude of harm), but the discussion above already demonstrates several basic insights that apply to all cases. First, differentiating the standards can improve incentives for care. If information is available about the different risks and prevention costs, and if injurers can anticipate the differentiated standards they face, personalized standards are more efficient than average standards.

Second, the examples above draw out some basic principles in the design of personalized standards. Should injurers who impose a higher expected harm face stiffer standards? Upon first reflection, one might intuitively conjecture that such harmful injurers should always be confronted with higher standards of care. The analysis shows, however, that this intuition is only partially valid. We saw that risky injurers—who impose higher probabilities of accidents at each level of care relative to safe injurers—should indeed face higher standards of care. But we also saw an effect in the opposite direction: Unskilled injurers—who impose a greater risk because they are less effective in taking care and can only achieve accident prevention at higher cost—should face *lower*, not higher, personalized standards relative to the skilled injurers. Skilled injurers are less harmful but should nevertheless face higher standards of care due to their relative effectiveness.

We also saw that personalized standards impose a different cost of compliance on different types of injurers. Here, too, it might be conjectured that the distribution of burdens would exhibit more variance under a personalized standards regime. But, again, this is not always so. When injurers vary in their costs of care (skilled versus unskilled), personalized standards can reduce, rather than increase, the disparity in the burdens of compliance.

Finally, we examined the incentives of injurers to self-personalize—a type of self-selection that might occur even under uniform standards, and might lead injurers to take differentiated levels of care notwithstanding the crude, uniform legal standard. This would happen only if we assume continuity—rather than discontinuity—of

liability, namely, if we assume that failure to take the required level of care exposes the injurer only to the incremental losses caused by this failure, and not others. In this environment of self-personalization, personalized standards continue to be more efficient, but solely due to their effect in *increasing* the burden of care upon some injurers.

B. *Levels of Activity*

A standard result in the economic analysis of negligence law is the activity-level distortion. When injurers conform to the standard of care they bear only some of the full social cost of their activity (they bear the cost of care but not the residual expected harm) and therefore engage in excessive levels of activity.⁸⁵ In this section we ask how the activity-level distortion would be affected by personalized standards of care. We make two distinct observations. First, personalizing the standard of care according to skill (but not risks) could further distort, rather than improve, injurers' activity levels. Second, we identify a novel regime that combines both personalized and uniform standards, which improves *both* care and activity levels.

1. *Improving or Distorting Levels of Activity*

We saw in Section II.A above that the standard of care would generally be higher the more skilled and risky the injurers are, exceeding the average uniform standard for the upper half of the population of injurers. How would that affect their levels of activity?

Raising the standard of care for some injurers reduces their activity-level distortion, while lowering it for others exacerbates this distortion. In the example in Table 2, raising the standard for skilled injurers from "medium" to "high" raises their cost of care from \$8 to \$13. At "medium" care, the negative externality from their activity was \$10 (the expected harm which they do not have to bear). At "high" care, the negative externality is only \$2. Since it is this negative externality that drives the activity-level distortion, shrinking it from an absolute magnitude of \$10 to \$2 reduces the distortion.

While standards are raised for skilled injurers, they are lowered for the unskilled types, from "medium" to "low" care. Here, the activity-level distortion is aggravated. At "medium" care the negative externality from the activity of the unskilled injurers was \$10. At "low" care, it was \$22. As the externality rises from an absolute magnitude of \$10 to \$22, the distortion grows.

Thus, under skill-based personalization, the unskilled are led to engage in more undesirable activity, while the skilled are led to

⁸⁵ SHAVELL, *supra* note 17, at 23–24.

engage in less. Commentators have long noticed one side of this result—the increasingly inefficient activity levels by the unskilled—and invoked it as a primary argument against personalization.⁸⁶ If people who cannot take effective care were only required to meet their low personalized standard, others would be imperiled by the greater risk they impose. The neighbors of the unskilled injurer, says Holmes, “accordingly require him, at his proper peril, to come up to their standard, and the courts which they establish decline to take his personal equation into account.”⁸⁷ But what they have not noticed is the other side of the coin: the increasingly efficient activity levels by the skilled injurer.

Still, in normal circumstances, the added inefficient risks posed by the unskilled due to personalization more than offsets the improved activity levels of skilled injurers.⁸⁸ The reason is subtle. The activity distortion is due to the expected harm that a standard-abiding injurer does not bear. The more care an injurer takes, the lower this expected harm, but the marginal reduction has a diminishing property. When the unskilled injurer shifts from the uniform standard to the personalized low care, the increase in expected harm is greater in absolute value than the decrease that occurs when the skilled injurer shifts from the uniform to the personalized high care. As a result, the overall distortion of activity under skill-based personalized standards increases.

But this is not the case under risk-based personalization. Here, safe injurers take lower care and thus engage in more inefficient activity (in our example in Table 3, they now create uncompensated expected harm to victims of \$11, up from \$5 under uniform standards). But risky injurers take higher care and engage in less inefficient activity (\$3 of uncompensated external harm, down from \$15). Because, all else equal, risky injurers create larger harms, the effect of curbing their activity level more than offsets the increase in activity by the safe injurers. As a result, the overall distortion of activity under risk-based personalized standards decreases. Here, the desirable effect

⁸⁶ See, e.g., LANDES & POSNER, *supra* note 16, at 126 (arguing that when a uniform standard of care, as opposed to an individualized standard of care, is applied to a child, who is unable to attain a high level of care, his parents are incentivized to prevent him from driving); Schwartz, *supra* note 19, at 246 (“A rule that only requires the injurer to take what is for her optimal care while engaging in the activity cannot achieve the optimal result. Under such a rule, some injurers who should not engage in the activity will nevertheless do so.”).

⁸⁷ HOLMES, *supra* note 1, at 108.

⁸⁸ This was the case in our numerical example: The increased externality for the unskilled injurer was \$12, and the reduced externality for the skilled injurer was only \$8.

of personalization on activity levels adds to their effect on care levels to bolster the efficiency of the regime.

2. *Activity Levels with Self-Personalization*

We concluded that personalized standards have a mixed effect on activity levels. Relative to uniform standards, they produce two effects. On the upside, personalized standards reduce the distortion in activity levels for injurers who now face higher standards (skilled or risky injurers). On the downside, they worsen the distortion for injurers who now face lower standards (unskilled or safe injurers). We now argue that the downside is actually smaller than what the analysis above suggested.

Return to the environment in which injurers may self-personalize. We showed in Section II.A.3 that under a uniform standard regime, in which liability is only for harm caused by untaken care (“continuous” liability), it would be rational for unskilled or safe injurers to *ignore* the uniform standard (“medium”) and take instead the personally efficient care (“low”). In this setting, personalized standards have a smaller distorting effect on activity levels. To see this, consider the case of risk-based personalization. Under uniform standards, the safe injurer’s activity level would depend on whether he self-personalizes. If he doesn’t—if he abides by the uniform standard—he takes “medium” care, he is not found liable, and thus incurs a private cost of \$16, and imposes an uncompensated expected harm of \$5. If, instead, the injurer does self-personalize and takes “low” care, he is found liable for the incremental harms that would have been prevented had he taken “medium” care, and thus incurs a private cost of \$12 (\$6 cost of “low” care plus \$6 expected liability), and imposes an uncompensated expected harm of \$5. This illustrates a general pattern: Self-personalization does *not* affect the size of the uncompensated harm the injurer inflicts on victims (\$5 either way), but it does reduce the private cost of activity to the injurer. As a result, with self-personalization, safe injurers (those whose private benefit is between \$12 and \$16) engage in a higher activity level and inflict the externality.⁸⁹

Thus, once we allow for the possibility of self-personalization under uniform standards, activity level is higher than we initially calculated. This should be obvious—the only reason the injurer self-personalizes is to reduce the private cost of activity. This means that moving to a regime of personalized standards imposes a smaller

⁸⁹ The same analysis shows that with self-personalization, more unskillful injurers engage in the activity and inflict the externality than without self-personalization.

increase in the activity level of safe and unskilled injurers than we otherwise calculated. The activity-level downside of personalization is thus smaller.

3. *A Hybrid Regime*

Personalized standards have a downside: They bring about an increase in the activity level of some injurers. Indeed, it is this concern that led commentators to conclude that a uniform standards regime is superior.⁹⁰ We now argue that this concern should not trump categorically the case for personalized standards. A personalized standards regime can be designed to apply only when it does *not* distort activity levels. We show that an unambiguous improvement in both care and activity can be obtained if personalization is done selectively.

Consider a “hybrid” regime in which each type of injurer faces a standard that is the greater of the pure personalized standard and the one-size-fits-all uniform standard. Personalization, in other words, can only operate to *increase*, but not to decrease, the standard of care. In the case of skill-based personalization (the example in Table 2), skilled injurers face the “high” standard (the higher among {high, medium})—the optimal personalized and the optimal uniform standards), whereas unskilled injurers face the “medium” standard (the higher among {low, medium}). Under this hybrid regime, skilled injurers would take more efficient care and activity levels than they would under a pure uniform standards regime; and unskilled injurers would take the same care and activity levels as they would under a uniform standard regime. This regime is generally better than uniform standards, due to the improvement in care and activity by the skilled type. The same logic applies to the case of risk-based standardization: Under the hybrid regime, the risky injurer will be required to meet a high standard, while the safe injurer will be required to adhere to a medium standard.

C. *Victim Care*

In this section we examine how personalization of injurers’ standards of care affects the efficiency of victim precaution. We assume, for the purpose of this discussion, that victims are homogeneous. To be sure, victims vary in many ways as well, which could also justify personalization of standards of contributory care. The question in this section, however, is different. Does the case for personalization of *injurers’* standards depend on its effect on victims’ behavior?

⁹⁰ SHAVELL, *supra* note 17, at 91.

If a victim can adjust her own level of care to the personalized standard and the idiosyncratic conduct of each injurer, the case for personalizing injurers' standards of care would only be bolstered. Such injurer-only personalization would improve not only injurers' behavior, but also victims'. For example, if pedestrians can adjust their precautions to the different dangers that different drivers facing different standards of care impose, a law that sets personalized standards for drivers would induce pedestrians to vary their precautions efficiently. Facing skilled injurers who take more care, victims would adjust their care downwards and save some unnecessary precautions.

But what if victims have to set their level of care without observing the personalized standards and behavior by injurers? What if, when a car is approaching, the pedestrian cannot observe the skill and the standard of care of the specific driver? Victims may observe the distribution of injurers, and take a uniform level of contributory care that best responds to this distribution of risk. In this setting, personalized injurer standards pose a challenge. Rather than facing injurers who all take uniform care, victims now interact with injurers who take varying levels of care. It might be thought, then, that in the personalized standards environment, victims would have a more difficult optimization problem to solve—how to respond to a volatile care environment. For example, what care should a pedestrian crossing a busy intersection take, now that cars travel at different personalized speeds? Given this difficulty, the concern is that victims might “play it safe” and take high uniform care. If so, victims' care would be *more costly*. The analysis below shows that these concerns are not generally valid.

1. *Skill-Based Personalization*

We saw in Table 2 that under a uniform standard and in the absence of self-personalization, all injurers would take a medium level of care (costing \$8 and \$24 to the skilled and unskilled, respectively), and the residual risk of harm facing the victim would be 10%. We also saw that under a personalized standards regime, the skilled injurer would be asked to take high care (costing \$13), leaving a residual risk of 2%; and the unskilled injurer would be asked to take low care (costing \$9), leaving a residual risk of 22%.

Under a uniform standard regime, then, the victim faces the same risk regardless of the injurer's type—here, a 10% probability of accident. Under a personalized standard regime for injurers, the victim faces a variance of risks—here, either 2% or 22%. In which setting will the victim's care be more effective?

Assuming that injurer and victim care are strategic substitutes (more care by one party makes it optimal to take less care by the other), as the injurer's skill increases, the victim's optimal care decreases. The skilled injurer leaves a residual risk of only 2%, so there is less value to additional precaution by the victim than when the injurer is unskilled and the residual risk is 22%. But if the victim's care cannot be tailored (either because the victim cannot know which injurer he faces or because precautions are "lumpy" and cannot be varied across injurers), it is possible that the overall contribution of the victim to accident prevention would be diminished. Relative to the case of uniform standards, where all injurers impose on the victim a 10% risk of uncompensated accidents, the victim will now seek the most efficient response to an environment that contains injurers of both high risks (22% chance of harm) and low risks (2%). In this environment, it may well pay off for the victim, especially the risk-averse type, to take more care relative to the uniform injurer standard case. Such added care is a waste vis-à-vis the high-skill injurers, but it is all the more valuable vis-à-vis the low-skill injurers who expose the victim to a high risk of uncompensated accident. For example, if different cars on the road drive at different personalized speeds and pose differential risks, a potential victim's care would necessarily be too high against slow-driving cars and too low against fast-driving cars. It might be optimal for victims in such an erratic environment to react primarily to the subset of low-skill injurers (who create high uncompensated risk), notwithstanding the redundancy of such effort in relation to the high-skill injurers.⁹¹

Note, however, that even if victims' care is less efficient under a personalized standards regime, the overall effect on bilateral care under a personalized standards regime cannot be less efficient. We saw that personalized standards unambiguously improve the efficiency of injurers' care. Under a personalized standards regime that takes victim care into account in designing injurers' standards, it's always possible to achieve the outcome of uniform standards, by unifying the different types of injurers' standard of care. Thus, if the costs of per-

⁹¹ This observation does not change if injurers self-personalize under a uniform standard regime. We showed that under uniform standards, low-skill injurers self-personalize and take the socially optimal low level of care (because saving in precaution costs outweighs the cost of liability they expect to incur by failing to meet the uniform standard). See *supra* Section II.A.3. Accordingly, low-skill injurers behave the same under either a personalized or a uniform standards regime, and impose the same high risk of accident upon victims. With self-personalization, low-skill injurers end up incurring some liability, which reduces the incentive of victims to take care. Nevertheless, with or without self-personalization, a uniform standard regime imposes on victims a uniform risk of uncompensated accident (in our example, 10% risk of \$100 in harm).

sonalized standards on victims' care are higher than the benefits of personalized standards on injurers' care, efficiency would require that all injurers stick to a uniform standard. After all, the presence of victims and their care is a crucial factor in *efficiently* personalizing the standards of care, as well as in *whether* to personalize them. It is also possible that given the tradeoff of personalization and victims' care, personalization would be done partially. Thus, if personalization, without taking into account victims' care, requires that given their skillfulness some drivers will impose a risk of 30% and the others a risk of 50%, given victims' care, personalization might end up with the former drivers being allowed to impose a risk of 35%, and the others a risk of 40%.

2. *Risk-Based Personalization*

Victims' care would be unambiguously more efficient under a regime that personalizes injurers' standards of care according to the risk they pose. We saw that under a uniform standard all injurers would take a medium level of care, but would impose different risks: 5% versus 15% residual probability of harm by the safe and risky types, respectively. We also saw that under a personalized standards regime, the safe injurer would be asked to take low care, leaving a residual risk of 11%; and the risky injurer would be asked to take high care, leaving a residual risk of 3%.

Here, the effect of personalized injurer standards over victims' care is unambiguous and desirable. Despite the fact that different injurers are asked to take different personalized care levels, victims overall face a less disperse distribution of risk. Under uniform injurer standards, victims faced actors who cause either 5% or 15% probability of harm, whereas under personalized injurer standards the probabilities of harm are both lower and less dispersed (11% and 3%). Since the efficiency of victim care depends on the residual probability of harm, personalized standards allow victims to confront a less erratic distribution of such probabilities. As injurers are induced to behave in a way that compensates for their different risks, victims take more efficient care.

D. Ex Ante Investment in Improving Private Characteristics

Personalized standards reflect injurers' observable idiosyncratic properties—individual traits that affect their ability to reduce the risk of accidents. How do these traits form? The analysis so far assumed that people vary exogenously, and that the law merely observes—but does not influence—the development of personal traits. In this section

we relax this assumption. We assume instead that traits are determined by investments that people make: Drivers could improve their skills, for example, by taking driving classes and training;⁹² doctors could also improve their skills, for example, by reading more professional materials and participating in more conferences;⁹³ employers can acquire more sophisticated tools and train their personnel to reach higher skill or pose lower risk to outsiders.

We ask whether such investments would be affected by personalized negligence law. Specifically, we address a powerful objection to personalized standards—that they undermine injurers' incentives to improve. If injurers anticipate that such investments would in turn raise the precaution burdens imposed upon them, their incentives to make the investments would weaken.⁹⁴ They might even be incentivized to take action to diminish, rather than improve, their harm-reduction traits. For example, if personalization indeed hurts incentives to acquire skill, a firm might prefer employing less skillful employees for risky activities (like driving), thus reducing their expenditures on care.

1. Skill-Based Personalization

High skill warrants a high standard of care. We saw in Table 2 that under a personalized standard regime, the unskilled injurer would face a “low” standard (at a cost of \$9) whereas the skilled injurer would face a “high” standard (at a cost of \$13). Imagine that each injurer begins as unskilled, but that prior to interaction with the victim

⁹² See, e.g., Lisa Dorn & David Barker, *The Effects of Driver Training on Simulated Driving Performance*, 37 ACCIDENT ANALYSIS & PREVENTION 63, 68 (2005) (“It would appear that professional driver training affects simulated driving performance with trained drivers demonstrating a potentially safer driving style than untrained drivers.”); Robert B. Isler et al., *Effects of Higher-Order Driving Skill Training on Young, Inexperienced Drivers' On-Road Driving Performance*, 43 ACCIDENT ANALYSIS & PREVENTION 1818, 1820–25 (2011) (showing that young, inexperienced drivers who receive training aimed at improving skills such as situational awareness and hazard anticipation perform significantly better at driving-related simulations).

⁹³ See, e.g., Dave Davis et al., *Impact of Formal Continuing Medical Education: Do Conferences, Workshops, Rounds, and Other Traditional Continuing Education Activities Change Physician Behavior or Health Care Outcomes?*, 282 J. AM. MED. ASS'N 867, 867 (1999) (analyzing previous studies concerning CME (continuing medical education) and concluding that there is some evidence that interactive, as opposed to didactic, CME sessions can effect changes in professional practice and, on occasion, in health care outcomes).

⁹⁴ Schwartz, *supra* note 19, at 254–57 (arguing that while a personalized standard would yield optimal investments in the ability to take care if courts were to measure said expenditure and take it into account, in a more feasible scenario where ex ante investments in skill are disregarded, injurers would not have a high enough incentive to do so and would underinvest in the ability to avoid harm to victims).

the injurer could become skilled by spending a lump sum cost of k . At what levels of k would it be socially desirable to spend it? At what levels would it be in the private interest of the injurer to make this investment?

a. Personalized Standards

Social optimum. If the injurer remains unskilled, the optimal level of personalized care would be “low” and the resulting social cost of his activity would be \$31. If, instead, the injurer becomes skilled, the optimal level of care would be “high” and the social cost would be \$15. Thus, the social gain from investment in skill is $\$31 - \$15 = \$16$. It is socially desirable to make the investment in skill if $k < \$16$.

Private incentives. The unskilled injurer faces a cost of care of \$9, whereas the skilled injurer faces a cost of care of \$13. Here, investing in becoming skilled is privately undesirable: Not only does the injurer enjoy none of the savings such investment yields socially, but he is saddled with a higher cost of compliance. This is a general problem. The injurer’s investment in skill improvement reduces his cost of taking care—a social benefit that is also a private benefit. But it also leads to an upward adjustment of the level of care—another social benefit but one that creates a private loss. This suggests that not enough investment in human capital would be made, and that—as conjectured above—skill-based personalized standards undermine ex ante investment. Relatedly, firms might prefer employing less skillful employees.⁹⁵

b. Uniform Standards with Full Compliance

Social optimum. Since the standard of care does not change for those who become skilled, and assuming that injurers comply with the optimal uniform standard (“medium”), the social value of the investment is the reduced cost of compliance with the uniform standard, from \$24 to \$8. The investment should be made if $k < \$16$.

Private incentive. Under a uniform standard with full compliance, the injurer who invests in skill recoups the entire social saving, reducing her cost of compliance from \$24 to \$8. Here, investment would be optimal. Since there is no accompanying increase in the standard, there is no divergence between the private and social incentive to invest.⁹⁶

⁹⁵ See *supra* text accompanying note 94.

⁹⁶ If injurers self-personalize, it is socially desirable to make an investment under uniform standards if $k < 13$, since the unskilled injurer takes “low” care and imposes a social cost of \$31, whereas the skilled injurer takes “medium” care and imposes a social cost of \$18. The private incentive is the same—make the investment in skill if $k < 13$.

This analysis demonstrates a robust observation. Skill-based personalization destroys the incentives to invest in improved skills. Under a uniform standards regime, investment is optimal because the investing injurer captures the entire social surplus from the improved skill. In contrast, under a skill-based personalized standards regime, the injurer does not enjoy the full social surplus from the investment in reducing the cost of care, and may even be worse off.

To be sure, the problem of distorted ex ante investment under a personalized standards regime can be resolved if courts could monitor such investment. If a court has enough information to set standards that reflect, not existing skills, but optimally acquired skills, injurers would be prompted to make the optimal investment. If, for example, a doctor could not invoke his low skill in defense against malpractice and would instead be held to the optimally acquired skill, personalization would clearly outperform a uniform standard. But the information burden is high: It is not enough for the court to set a standard based on optimal hypothetical skill across the entire population. For this to be a personalized standards regime, the optimally invested skill would then have to vary by the idiosyncratic investment traits of each injurer.⁹⁷

2. Risk-Based Personalization

High risk warrants a high standard of care. We saw in Table 3 that under a personalized standard regime, the risky injurer would face a “high” standard (at a cost of \$26), whereas the safe injurer would face a “low” standard (at a cost of \$6). Imagine that in the absence of ex ante investment, the injurer would be the risky type, and that it would take an investment of k to become a safe type. At what levels of k would it be socially desirable to spend k ? What if the investment of k were privately undertaken?

a. Personalized Standards

Social optimum. If the injurer remains risky, the lowest social cost of his activity when he takes “high” care is \$29. If, instead, the injurer invests in becoming safe, the lowest social cost, when he takes “low”

Without the investment, the unskilled injurer self-personalizes to “low” care and faces a cost of care of \$9 and liability of \$12, for a total private cost of \$21, whereas the skilled injurer takes “medium” care and incurs a cost of \$8. Here, too, investment is generally optimal. While the level of care does increase with improved skill, the injurer enjoys the entire social benefit—a lower cost of care and the net reduction in expected harm.

⁹⁷ As to the *supra* concern that firms would prefer hiring low-skilled employees for risky activities, *see supra* text accompanying note 94, this concern would be avoided if the standard of care would be personalized according to the *reasonable* hiring policy of the firm, which is very hard to define given the many variables involved.

care, is \$17. Thus, the social gain from the investment is $\$29 - \$17 = \$12$. It is worth making the investment in safety if $k < \$12$.

Private incentive. The risky injurer faces the cost of “high” care of \$26, whereas the safe injurer faces the cost of “low” care of \$6. The injurer would make the investment if $k < \$20$. Here, investing in safety is privately desirable. In fact, the private value of the investment is greater than the social value, suggesting that too much investment would be made.

The example exposes one side of a general problem of inefficient investment, although the direction of the distortion may go either way (too much or too little investment). The private value of lowering one’s riskiness is the reduced cost of complying with the lower personalized standard. But the social value contains an additional component beyond the reduction in the cost of care: the change in expected harm. This change in the expected harm is due to two factors. First, the expected harm goes down because, all else equal, the safe injurer poses a lower probability of accident. Second, the expected harm goes up because the safe injurer takes lower care. In the example, the second effect was stronger than the first, and so the expected harm caused by the safe injurer *increased* relative to that of the risky injurer (from \$3 to \$11). This is why the private incentive to invest was too high. But in other situations, the first effect could be stronger than the second, in which case there is an additional social benefit to the investment that is not captured by the injurer, and the incentive to invest in safety under a personalized standards regime would be too small.

b. Uniform Standards with Full Compliance

Social optimum. Since the standard of care does not change for those who invest in becoming safer, and assuming that all injurers comply with the optimal uniform standard (“medium”), the social value of investment is the ensuing reduction in the probability of harm at the uniform level of care, from 15% to 5% (and the expected harm from \$15 to \$5). It is worth making the investment if $k < \$10$.

Private incentive. Under a uniform standard with full compliance, the injurer who invests in becoming safer receives no benefit, as she would have to continue and comply with the same standard at the same cost. Accordingly, investments that are socially desirable are not made. Injurers may gain other benefits from becoming less risky, which are not captured in the example, such as the reduction of self-

risks. Still, the point remains: Uniform standards generate too little investment.⁹⁸

In comparison to personalized standards, the investment under a uniform standards regime would be unambiguously lower. The reason, as we just saw, is that personalization allows the investing injurer to capture some benefits of his investment.⁹⁹

E. Summary

We compared two types of personalization—skill-based and risk-based—along four dimensions: care, activity, victim’s contributory care, and ex ante investment. The main themes that emerged are the following:

1. Personalization improves injurers’ level of care.
2. The main distortions that personalization may cause are three: excessive activity levels, costlier victim care, and weak incentives to invest ex ante.
3. The activity-level distortion applies to the unskilled and safe injurers, and it is due to the lower personalized standards they face. It does not apply to skilled and risky injurers; for them, personalization reduces the activity-level distortion that is otherwise ingrained in a uniform standard negligence regime. Accordingly, a one-sided application of the personalization regime—increasing the standards of care for the skilled and risky injurers but providing no reduction for the

⁹⁸ The same is true for uniform standards with self-personalization. Here, a safe injurer ignores the uniform standard, takes “low” care, and imposes a social cost of \$17, whereas a risky injurer meets the uniform standard and imposes a social cost of \$31. Thus, it is socially desirable for the injurer to make the investment to become safe if $k < \$14$. The private incentive is small. The injurer who invests in becoming safe enjoys a reduction of private cost from \$16 (the cost of meeting the “medium” standard of care) to \$12 (the cost of meeting the “low” standard of care, \$6, plus the expected incremental liability of \$6). Thus, the injurer would make the investment if $k < \$4$. Another way to explain this distortion—too little incentive to invest ex ante in reducing one’s riskiness—is by recognizing some positive social value of the investment, which the injurer cannot appropriate. If the injurer does not invest in becoming safe, he takes “medium” care and pays zero damages. If, instead, he does invest, he self-personalizes, takes “low” care, and pays some damages. The investment creates a benefit for the victim, in the form of some expected damages. Since the injurer does not internalize this benefit, his investment is too low. Consequently, injurers have deficient incentives to become safe.

⁹⁹ At the same time, we cannot rule out the nagging possibility that the overinvestment problem of personalized standards might be worse than the underinvestment problem of uniform standards. In the example, if $k < \$12$, the investment is efficient but would only be made under a personalized standards regime. If $\$12 < k < \20 the investment is inefficient but would still be made under a personalized standards regime. In this case, the overall cost of accidents, inclusive of the cost of the ex ante investment, would be higher and less efficient under a personalized standards regime. And, finally, if $k > \$20$, the investment would not be made under either regime, injurers would remain risky, and there will be no difference between the two regimes.

unskilled and safe—would unambiguously improve injurers’ activity level.

4. The victim care distortion applies only to skill-based personalization and is due to the increased variance in risks that victims face. Risk-based personalization, by contrast, reduces this variance and may improve the efficiency of victim care. Therefore, a personalization regime based solely on risks would unambiguously decrease victim costs of care.

5. The ex ante investment distortion applies mainly to skill-based personalization; with risk-based personalization, injurers typically have more efficient incentives to invest in decreasing their riskiness than under a uniform standard regime. Here, too, a personalization regime based solely on risks would unambiguously improve injurers’ incentives to invest in reducing their harmfulness.

6. The gap in incentives between a personalized standard regime and a uniform standard regime narrows once self-personalization under a uniform standard regime takes place. Specifically, the gap narrows with respect to the incentives of the unskilled and safe (who self-personalize under a uniform standard), but not with respect to the skilled and risky (who do not self-personalize).

Table 4 summarizes our main conclusions (naturally, not all nuances are captured by the table). Each of the four columns is a different regime, distinguished by the type of personalization (skill versus risk) and the direction of standard adjustment (upward versus downward). A “+” sign means that the specific personalized standards regime is more efficient along that aspect than uniform standards.

TABLE 4: EFFICIENCY EFFECTS OF PERSONALIZATION

	<i>Skilled: up</i>	<i>Unskilled: down</i>	<i>Risky: up</i>	<i>Safe: down</i>
1. Level of Care	+	+*	+	+*
2. Activity Level	+	–	+	–
3. Victim Care	–	–	+	+
4. Ex Ante Investments	–	–	+	+

* Under the assumption of self-personalization, personalization has no effect compared to a uniform standard.

III JUSTICE CONSIDERATIONS

The analysis in Part II identified the incentive effects of a personalized negligence regime and evaluated them along the total welfare metric. While the overall effect is ambiguous, we nevertheless identi-

fied several clear advantages to personalized standards, suggesting that in a large set of circumstances it is a superior regime. The Article does not end here, however, because two additional aspects need to be considered. One is a feasibility aspect: Do courts have the institutional capacity to implement personalized standards? This will be taken up in Part IV below. The other is a normative aspect that often plays a central role in evaluating tort law doctrines—whether the rule is just. We offer in this Part a preliminary analysis of the justice considerations that might be relevant to the personalization of negligence law.

A. *Corrective Justice*

Corrective justice imposes primary duties on actors to refrain from injuring others, and to repair injuries that were caused by the violation of the primary duties.¹⁰⁰ It mandates that the negligent injurer should compensate the victim for her losses if, by his wrongdoing, he infringed on his duty not to harm the victim (or to create unreasonable risk of harm), and thus violated the equality between the parties.¹⁰¹ Compensation is aimed at rectifying the injustice done by the wrongdoer to the victim.¹⁰²

Under a prominent corrective justice account, what constitutes an unreasonable risk created by the injurer toward the victim has to be determined without regard to the burden of reducing the risks on the injurer.¹⁰³ Being negligent is not merely failing to take cost-justified care (as it is in economic analysis of negligence, under the Hand

¹⁰⁰ *Theories of the Common Law of Torts*, STAN. ENCYCLOPEDIA PHIL., (Sept. 22, 2003) <http://plato.stanford.edu/entries/tort-theories>.

¹⁰¹ See ARISTOTLE, *THE NICOMACHEAN ETHICS 77–78* (David Ross trans., Oxford Univ. Press 2009).

¹⁰² See JULES L. COLEMAN, *RISKS AND WRONGS* 367–69 (1992) (justifying liability for negligence under corrective justice framework); ERNEST J. WEINRIB, *THE IDEA OF PRIVATE LAW* 145–70 (1995) (discussing negligence law under corrective justice theory). In recent years, John Goldberg and Benjamin Zipursky have argued that tort law's goal is to allow a remedy for victims of wrongdoing, rather than restoring them to the position they would have been in but for the wrongdoing. See John C.P. Goldberg, *The Constitutional Status of Tort Law: Due Process and the Right to a Law for the Redress of Wrongs*, 115 YALE L.J. 524 (2005) (advocating for recognition of right that empowers individuals to seek redress against persons who have wronged them); John C.P. Goldberg & Benjamin C. Zipursky, *Unrealized Torts*, 88 VA. L. REV. 1625, 1643 (2002) (arguing that some avenue of recourse other than private violence must be made available to victim); Benjamin C. Zipursky, *Civil Recourse, Not Corrective Justice*, 91 GEO. L.J. 695 (2003) (arguing that the tort system requires injurer to cover injury of specific party and entitles that party to recover for specific injury from defendant); Benjamin C. Zipursky, *Rights, Wrongs, and Recourse in the Law of Torts*, 51 VAND. L. REV. 1, 82–90 (1998) (arguing wronged plaintiff is only entitled to use civil legal system to exact compensation from defendant).

¹⁰³ See WEINRIB, *supra* note 102, at 147–52 (contrasting American approach, which compares risk and cost of precautions in order to determine what constitutes reasonable

formula). Rather, and regardless of the cost, the injurer's duty has to comport with a reasonable conception of liberty and security for the victim.¹⁰⁴ In this light, a party may be held negligent even if the cost of untaken care is too high under a cost-benefit analysis.

If one accepts the irrelevance-of-cost premise, then skill-based personalization would seem to conflict with corrective justice. An injurer's skill, as we defined it above, is primarily a measure of his burden in reducing risks—the very factor this conception of corrective justice rejects. An actor with relatively low skill should not be permitted to satisfy a more lenient standard, and conversely, an actor with above-average skills should not face a higher standard.

We do not accept this irrelevance-of-cost premise. As argued by one of us previously, even under a corrective justice account, negligence and unreasonable risks could not be meaningfully defined without considering the burden of care imposed upon the injurer.¹⁰⁵ If a technological shock made it ten times cheaper to administer some care measure, doesn't the victim's interest in security entitle her to expect an increase in the amount of care used to protect her? In fact, it is hard to see why the corrective justice account would oppose a personalized *increase* in the standards of care. Even if *injurers* should not be allowed to argue that because of their low skills the "average" burden of care is too heavy for them and should be reduced, *victims* should be allowed to argue that because of the injurer's high skills the "average" burden of care is too lenient and has to be increased.¹⁰⁶

Finally, while the case for skill-based personalization might conflict with some conceptions of corrective justice, the case for risk-

care, and English approach, which ignores cost of precautions altogether in formulating proper standard of care).

¹⁰⁴ See Jules L. Coleman, *Legal Theory and Practice*, 83 GEO. L.J. 2579, 2603–04 (1995) (arguing that objective standard of care comports with reasonable conception of liberty and security); Jared Marshall, *On the Idea of Understanding Weinrib: Weinrib and Keating on Bipolarity, Duty, and the Nature of Negligence*, 19 S. CAL. INTERDISC. L.J. 385, 398 (2010) (describing how objective standard of reasonable care reflects equal status of parties). *But see* Jeffrey J. Rachlinski, *Misunderstanding Ability, Misallocating Responsibility*, 68 BROOK. L. REV. 1055, 1057 (2003) (arguing that subjective standard of care comports with corrective justice rationales and that "[b]y comparing the conduct of ordinary people to that of an idealized superhero, the law allocates fault where none exists and labels reasonable conduct as unreasonable").

¹⁰⁵ See Ariel Porat, *Questioning the Idea of Correlativity in Weinrib's Theory of Corrective Justice*, 2 THEORETICAL INQUIRIES L. 161, 167 (2001) (arguing that one cannot characterize risk as reasonable or unreasonable without considering burden of care).

¹⁰⁶ This counterargument can be derived from the justification for ignoring the injurer's burden of care. As Weinrib put it, the injurer should not be allowed to unilaterally draw the line between his and the victim's rights. WEINRIB, *supra* note 102, at 152. This justification does not necessarily imply that the injurer with high skills should not do *more* than the injurer with average skill to protect the victim's rights.

based personalization would only be bolstered by this normative framework. The focus on the duty not to expose victims to unreasonable risk means that injurers whose conduct imposes relatively high risk should do more to reduce it than injurers whose same conduct imposes a lower risk. Otherwise, if both are held to the same standard, they would expose victims to different levels of risk. Indeed, we saw in Part II that risk-based personalization reduces the variance of risks created by injurers.¹⁰⁷ Personalized standards therefore reduce to what should be considered an anomaly under the corrective justice account—that some victims are presented with greater uncompensated harms than others.

B. *Distributive Justice*

Personalization has distributive consequences. First, by treating different injurers differently, it raises questions of distributive justice across injurers. Indeed, we saw that personalization may increase or decrease the variance in costs of care borne by injurers. Such unequal allocation of the burden of care among similarly situated injurers might be considered unjust, violating the requirement to treat like cases alike.¹⁰⁸ But is it? Are injurers *similarly situated* if they have different skills or create different risks? We address this question in Subsection 1 below.

Second, personalization of standards of care changes the allocation of accident costs between injurers and victims, trading victim harm for injurer care. Low skill injurers, for example, are asked to take less care even though this might result in higher harm. While justified under cost benefit analysis, does this result conform to principles of distributive justice? Can precautions and harm be treated on equal footing? Should the goal of preventing harms be treated with priority over saving in precautions?¹⁰⁹ These questions are the topic of Subsection 2 below.

¹⁰⁷ See *supra* Section II.C. Indeed, it might even happen—as we have demonstrated—that personalization could make the risks created by the more risky injurer lower than those created by the less risky one.

¹⁰⁸ See TSACHI KEREN-PAZ, TORTS, EGALITARIANISM AND DISTRIBUTIVE JUSTICE 5–7 (2007) (explaining that distributive justice theory is based on formulation of proportion between participants regarding their possession of criteria for distribution and arguing that it is seemingly unjust to impose different standards of care on two similarly situated injurers). For a different argument stating that a subjective standard of care can promote distributive goals, see Kyle Logue & Ronen Avraham, *Redistributing Optimally: Of Tax Rules, Legal Rules, and Insurance*, 56 TAX L. REV. 157, 238 (2003).

¹⁰⁹ See Gregory C. Keating, *Pricelessness and Life: An Essay for Guido Calabresi*, 64 MD. L. REV. 159, 178–80 (2005) [hereinafter Keating, *Pricelessness*] (stating that legal rules cannot trade severe injuries for trivial precautions borne by others); see also Dilan A. Esper & Gregory C. Keating, *Putting “Duty” in Its Place: A Reply to Professors Goldberg*

1. Among Injurers

Personalization replaces a uniform one-size-fits-all standard with a scheme that has higher variance. Engaged in the same conduct, different injurers are asked to meet different standards. But the distributive impact of this greater variance of standards depends on how it affects the distribution of *burdens*.

Consider, first, skill-based personalization, which requires more skilled injurers to take more care. The skilled injurers have to meet more burdensome standards, but at the same time they are able to meet any standard at a lower private cost. (This, recall, is the very definition of injurer skill: more impact for any \$1 of care). Under a uniform standard regime, both the skilled and unskilled injurers are required to take the same level of care, requiring the unskilled injurers to spend more than the skilled injurers. Raising the standard for the skilled injurers and lowering it for the unskilled injurers counteracts this unequal cost-burden and contributes to a more equal allocation of burdens.

This argument may seem to hold greater merit when skills are distributed exogenously and are uncontrolled by injurers, as in the case of inherited physical and cognitive abilities that are determined by nature. There is some unfairness in the distribution of endowments and it is offset by graduated duties. But what if skills are acquired by injurers through deliberate investment in human capital and precaution aids, as examined in Section II.D above? Should high-skill injurers be denied the cost saving they worked hard to acquire? Should noninvesting low-skill injurers be rewarded with a lower standard and lower burden? A possible defense of personalization even along the dimension of deliberately acquired skills would focus on overall progressivity of social policy. Often, individual skills—even if acquired by deliberate investment—are also correlated with other privileges and advantages in society at large. If skilled people are on average better off, if they are more likely to tap into socially funded opportunities, if social institutions allow them disproportionate access to the opportunities to invest in skill and to benefit from their acquisition—then an offsetting burden to meet heightened standards would

and Zipursky, 41 LOY. L.A. L. REV. 1225, 1248–49 (2008) (arguing that “[s]acrificing an urgent interest—the interest in avoiding premature death or devastating injury—for the sake of trivial gains to others cannot be justified”); Gregory C. Keating, *Reasonableness and Rationality in Negligence Theory*, 48 STAN. L. REV. 311, 355 (1996) (stating that “the harm threatened by accidental injury and death is generally disproportionate to the harm threatened by increased precaution costs”).

not violate an overall scheme of distributive justice and may well improve it.¹¹⁰

The picture is exactly the opposite when we evaluate the fairness of risk-based personalization. Recall that with such personalization there is more—not less—variance in costs of care than under a uniform standard regime. Is this variance justified by distributive justice considerations? Is it justified that the risky injurers would be required to spend more in reducing risks? As with variance in skills, to answer this question it is important to know the reason for the variance in riskiness. If risks are the manifestation of natural characteristics, then greater variance in costs of care due to personalization would not be supported by distributive justice. All the more so if uncontrollable riskiness is correlated with lower overall wealth or wellbeing.¹¹¹ If, instead, injurers are able to reduce their risks by investing money, time, and efforts, rewarding such investors with lower care burdens is appropriate. In this case, the greater variance in the costs of care achieved through risk-based personalization would be justified. But again, the picture might flip when the distribution of advantages and burdens is viewed more broadly. As with acquired skills, it is possible that those who were able to reduce their riskiness have also managed to systematically recoup more advantages and benefits across various social activities, and are better off overall. Granting them yet another advantage—lower standards of care—would violate distributive justice.

2. *Victims Versus Injurers*

So far we have discussed distributive effects among injurers. Now we turn to victims: Are the effects of personalization on victims justified by conceptions of distributive justice? Is victims' safety compromised and placed at an inferior normative status relative to injurers' attributes?¹¹²

As we have seen, personalization raises the standard of care for skilled and risky injurers. At the same time it decreases the standard of care for unskilled and safe injurers. Victims of some injurers are therefore safer, whereas victims of other injurers are less safe. Still, as long as victims are equally likely to face all types of injurers, the greater efficiency of personalized standards suggests that the overall

¹¹⁰ See Seidelson, *supra* note 41, at 44–45 (explaining why subjective standard of care is also justified according to distributive justice principles).

¹¹¹ Also, risky people may be injured more often, and pay higher insurance due to injurers' reliance on experience rating in determining premiums. Norberg, *supra* note 9.

¹¹² See Keating, *Pricelessness*, *supra* note 109, at 179–80 (arguing that victim's severe injuries should not be tradable for injurer's abilities to take precautions).

shifting of losses to victims—namely, only those losses that injurers are unfit to prevent—conforms to the distributive goals of tort law.¹¹³

We cannot, however, make the stronger claim—that under personalization victims face overall fewer risks and uncompensated losses. Skilled and risky injurers take more care and reduce risks, but unskilled and safe injurers take less care and increase risks, relative to uniform standards. This ambiguity remains even if under uniform standards injurers self-personalize. Recall that under uniform standards, unskilled and safe injurers may choose to ignore the standard, take lower (and more efficient) care, and bear negligence liability. Compared to a personalized standards regime, under a uniform standard with self-personalization victims incur two conflicting effects. On the downside, they receive less care from the skilled or risky injurers. On the upside, they receive full compensation from the unskilled and safe injurers who self-personalize and are found to be negligent. It is impossible to determine unambiguously which effect dominates.

As a caveat, it is possible to apply a partial personalization regime that would also make victims unambiguously better off, and thus not conflict with a victim-oriented fairness baseline. Clearly, victims would be better off if personalization is applied asymmetrically, raising the standard of care only for the skilled and risky, and preserving the uniform average standard for the rest. They would enjoy higher safety due to higher care taken by some injurers, without the downside of lower safety (or lower compensations) otherwise.

IV

BROADENING PERSONALIZATION

We now turn to a more pragmatic question: Is it realistic to expect courts to implement personalized standards, and for people to correctly anticipate these burdens? Our discussion so far showed that personalization—if done correctly—can provide efficiency and fairness gains which current law does not realize. But does it create informational burdens too heavy for the legal system to bear? Can courts do what has become common practice in many industries and utilize more fine data to set personalized standards of care? If so, how far should personalization go?

In this Part, we argue that any personal information that is feasible for courts to reliably collect and for individual actors to reliably foresee should be factored into personalized standards. This includes information about individual characteristics, including physical,

¹¹³ See Logue & Avraham, *supra* note 108, at 237–38 (arguing that subjective standard of care may conform to distributive justice principles).

genetic, cognitive, and emotional, as well as information about individual resources and past experience. The information could be collected through standard “low-intensity” methods such as past records, observable traits, tests, and screens. The information could also be collected through “high-intensity” methods such as Big Data and machine-learning prediction methods. While the feasibility of some of these methods may still be limited by technological and legal constraints, our goal is to demonstrate the enormous potential that nonpersonalized negligence law is threatening to leave untapped.

As the amount of relevant information may be large and growing, the implementation of personalized standards is limited by several constraints. First, courts may be only partially able to translate personalized data into individual standards, lacking the actuarial expertise to make the fine-tuned, continuous adjustments. This problem can be solved, we argue, by a regime of qualitative step-adjustments in the standards—similar to the sentencing guidelines approach in criminal law. Second, personalized standards can have the desirable deterrent effect only to the extent that actors can anticipate them. Calibrating the standards too finely along a continuous range could create uncertainty among actors, which itself distorts care choices.¹¹⁴ We argue, perhaps counterintuitively, that it often would be easier for injurers to anticipate personalized standards than uniform ones, because they know more about their own characteristics than about the general distribution of characteristics in society.

Some of the evidentiary proposals presented in this Part may strike readers as a fantasy. They create a different model of information acquisition by courts than the traditional rules of evidence and civil procedure. We nevertheless present these ideas as a benchmark for discussion. Our argument, in a nutshell, is that if procedural and ethical rigidities can be overcome, the law could make advances similar to ones made in areas like medicine, insurance, marketing, or education. There is a large potential for improving the deterrent effect of

¹¹⁴ See John E. Calfee & Richard Craswell, *Some Effects of Uncertainty on Compliance with Legal Standards*, 70 VA. L. REV. 965, 966 (1984) (analyzing inefficient effects of uncertain legal standards). Calfee and Craswell have further developed their analysis in later articles. See Richard Craswell & John E. Calfee, *Deterrence and Uncertain Legal Standards*, 2 J.L. ECON. & ORG. 279, 280 (1986) (formalizing and extending analysis of authors' prior work on inefficient effects of uncertain legal standards while focusing on three factors—the shape of the uncertainty in the law, the costs and benefits created by the activity, and the penalty structure for violating the law—that determine which incentives are likely to dominate in an uncertain legal system); see also Omri Ben-Shahar, *Should Products Liability Be Based on Hindsight?*, 14 J.L. ECON. & ORG. 325, 325 (1998) (exploring ramifications of determining product liability in hindsight and noting uncertainty effects that it creates upon manufacturers).

negligence law, without sacrificing (and perhaps also promoting) important notions of corrective and distributive justice.

A. *Procedures for Implementing Personalized Standards*

The first question any personalization regime has to address is the degree of granularity. A more granular regime distinguishes individuals more finely and adjusts the standards based on more factors, sensitive to more kinds of information. At the extreme, the most granular regime requires courts to tailor the standard of care for each injurer along a continuum, shifting it up or down in response to every bit of individualized information (the “continuum mode” of personalization).

Choosing the optimal granularity of a personalized standards regime is a problem of information costs. First, it might be costly for courts to collect the information necessary to tailor different standards of care for each and every injurer. It is cheaper and easier for courts to avoid the information-rich inquiry of personalized standards and implement a one-size-fits-all uniform standard. Even if personal information is collected and presented at trial, there are limits to courts’ abilities to process the available data and translate it accurately into adjustments of the standard of care (and even more so when jurors are involved). This requires actuarial expertise that courts often lack.

Second, like courts, injurers facing personalized standards need to take into account personal traits when trying to anticipate and perform their duties of care and understand how courts would require them to behave. Is it realistic to expect injurers to make such informed assessments? Can they adapt their behaviors to the standard of care they are required to meet under the continuous mode? Are uniform standards easier to anticipate?

It might seem, intuitively, that the information problems faced by courts and by injurers in a personalized standards regime are similar. Since, by definition, personalized standards rely on more richly tuned and finely partitioned information, they inflict on all participants in the regime, including courts (*ex post*) and injurers (*ex ante*), a more daunting informational task. But upon further reflection we claim that this conjecture is false. In fact, it is easier for injurers to anticipate what is reasonable *for them*, given their personal characteristics, than to extrapolate what is reasonable for the average person in society. We know our riskiness and skill better than we know the societal distributions of these traits, and we can act intuitively upon this self-knowledge. True, people may learn or infer the uniform societal standards without having to know the exact distributions over the entire

society by observing past cases and by following societal norms. But in a regime that relies on ex post standards (which, unlike ex ante rules, do not articulate bright-line commands) such learning of what the uniform standard requires is slow and imperfect. Personalized standards, by contrast, require no learning, as much as they harness information injurers already have about themselves.¹¹⁵

The problem for injurers is that while they may have a good sense of what individually optimal behavior is, given their idiosyncratic traits, they still need to anticipate the personalized standards that an imperfect court would impose on them. Even if courts set personalized standards that are unbiased, their tailoring would have some degree of inaccuracy (random errors). Having to anticipate such imperfect tailoring of personalized standards, injurers' informational burden would be compounded.

To overcome some of the information costs that courts face, and to help injurers predict how standards would be personalized, we propose two procedural refinements to a personalized standards regime: (1) gradual personalization and (2) presumptions.

Gradual Personalization. A continuous mode of personalization—under which every bit of personalized information can shift the standard incrementally—would likely involve excessive information costs. It would be too costly for courts to implement case by case, and too costly for injurers to anticipate the patterns of courts' judgments.

To reduce these information problems, personalized standards may be set along a scheme of discrete qualitative steps—what we call “gradual personalization.” According to this scheme, courts would have to choose among a limited number of standards—for example, a three-step scheme of high, medium, and low—and pigeon-hole injurers into these groups. Gradual personalization is similar to a sentencing guidelines scheme that provides qualitative step-like adjustments to judgments based on case-specific characteristics, but stops short of the continuous mode. For example, while drivers' skills and riskiness may vary along a continuum, justifying driving their cars at a different speed under similar circumstances of the road and traffic, the gradual personalization scheme would require them to drive at low,

¹¹⁵ This is not always the case. New drivers, for example, might be unaware of their skills, and learning, by observing the uniform standards applied to all, might sometimes be a better option than adapting their behaviors to their perceived subjective skills. There is also the risk that actors, under a personalized standard regime, would be “over-optimistic” about their abilities, and that might distort their incentives, encouraging them to create too high risks. That problem, however might distort incentives also under a uniform standard regime. Furthermore, risk aversion might counteract overoptimism under a personalized standard regime.

medium, or high speeds. Thus, at similar situations, one driver would be expected to drive no more than fifteen miles per hour, another driver up to twenty miles per hour, while a third driver would be allowed to reach twenty-five miles per hour.

Gradual personalization would certainly be an improvement compared to the current uniform standards rule. It is more practical and easy to implement than a pure personalization rule. And the degree of granularity (the number of steps) would depend on the variance of personal attributes and the costs for courts of making finer personal determinations, and for injurers of anticipating these partitions.

*Presumptions.*¹¹⁶ The information cost burden on courts can be reduced by a scheme that elicits private information from injurer defendants (and does not rely on utilization of Big Data). Consider, first, a simple presumption that injurers are average skilled.¹¹⁷ Unless information is presented to rebut this presumption, courts would set the uniform midlevel standard of care. The injurer-defendant may present evidence to rebut the presumption.¹¹⁸ Assume that courts have no upfront information, but can tell if the information provided by the litigants is credible. Low-skill injurers would have the incentive to produce such evidence to the court and reveal their true type, so as to enjoy a more forgiving standard. The problem, of course, is that high-skill injurers would not. Some evidence regarding the high skill of a particular defendant may be obtained by the plaintiff through discovery and presented to court; and sometimes courts would be able to infer, from defendant's silence, that she is the high-skill type. But such information would unravel only partially, and the separation of types would not be perfect.

To improve the incentives to provide courts with the defendants' private information, imagine instead a more strategic design of the presumption. Consider a presumption of high skill: If there is no additional information, the standard of care is set at the very high level, reflecting the optimal care for the most skilled injurer. This presumption, too, can be rebutted by evidence the injurer produces. Now, however, all injurers along the spectrum of skill (other than those at the very top) would have the incentive to reveal themselves—to demonstrate that the standard is unrealistically demanding in their

¹¹⁶ We are grateful to Michael Trebilcock for suggesting that this procedure be examined.

¹¹⁷ Similar analysis would apply to evidence regarding the riskiness of the individual injurer.

¹¹⁸ The victim-plaintiff may present evidence too, but it would largely be based on information obtained through discovery from the defendant.

particular circumstances. With more complete unraveling of private information, courts end up with as much information as injurers privately possess.

Using such a presumption is not cost free. Some defendants would face the dilemma of whether to reveal medical, psychological, or other sensitive information. Revealing information relating to various kinds of low skill might have adverse consequences elsewhere, for example in the workplace. Still, it is quite common for tort *plaintiffs* to reveal sensitive information, for example pertaining to medical conditions. In the same way that a plaintiff should consider whether to reveal private information for the purpose of expanding tort liability and recovery, defendants would elect whether to reveal private information to qualify for a lower standard of care.

B. Which Personal Information?

Another aspect of accuracy, apart from granularity as discussed above, addresses the types of information a personalized standards regime incorporates. It seeks to distinguish people according to their tendencies to create risks and their capabilities to prevent them. But which information should be drawn upon? Which individual characteristics should be the basis for personalized negligence law?

Our discussion in this section is intended to begin charting the informational potential that personalized standards could unleash. This includes physical and genetic information about people as well as personality information including cognitive skills and emotional aspects. It could be learnt either from general data and statistics relating to the injurer's attributes such as age, gender, education, and profession, or from personal information collected directly through medical, physical, or psychological tests and from past behavior that resembles the behavior in question. It could also be inferred from past behavior that is *different* from the behavior in question but could reveal capabilities which are relevant to the assessment of the behavior in question.

The information relevant to setting personalized standards can be collected through traditional methods such as public records or examination scores, but it could also be collected from large digital databases—Big Data. The term Big Data refers to databases with enormous quantities of information.¹¹⁹ Data mining—the process of

¹¹⁹ See Liane Colonna, *A Taxonomy and Classification of Data Mining*, 16 SMU SCI. & TECH. L. REV. 309, 329–31 (2013) (defining Big Data and explaining how data mining works); Porat & Strahilevitz, *supra* note 11, at 1435–36 (discussing usage of Big Data and explaining how it can be used for personalizing default rules).

discovering human behavior patterns in these large-scale databases—allows predictions of future behavior across many dimensions. Big Data analysis can predict various risks, personal characteristics, preferences, and many other aspects relevant in the determination of optimal legal standards.

1. *Physical Characteristics*

Different people impose different risks on others based on their physical characteristics. For example, a short driver might create higher risks than tall drivers toward both other drivers and pedestrians, because she might only have a narrow vision of the road;¹²⁰ drivers with impaired vision are likely to impose higher risks on others;¹²¹ and the same is true with respect to drivers who have hearing difficulties.¹²² Higher risks might justify demanding more precautions from the actor creating the risks.

Research conducted in the field of system design of planes and automobiles indicates a relationship between certain human traits and the capabilities to perform a certain task. For example, research conducted by J. E. Korteling showed—quite unsurprisingly—that older drivers (sixty-one to seventy-three years old) and drivers with brain injury history have significantly longer reaction time than younger drivers (twenty-one to forty-three years old).¹²³ Age is also a significant factor in predicting drivers' ability to avoid lane crossing¹²⁴ and

¹²⁰ See DOBBS, *supra* note 2, § 119, at 283 n.10 (citing *Mahan v. State*, 191 A. 575, 580 (Md. 1937) (holding that driver whose short stature imposed limitations on her vision is expected to exercise “greater watchfulness” to avoid injuring others)). A few car manufacturers, being aware of short drivers' visibility problem, offer some models for shorter people. See Jerry Kronenberg, *5 Best Cars for Short Drivers*, THE STREET (Sept. 20, 2013), www.yahoo.com/autos/s/5-best-cars-for-short-drivers-213753032.html; Christina Rogers, *Better Cars for Short and Tall Drivers*, WALL STREET J. (Oct. 9, 2013, 7:10 PM), www.wsj.com/articles/SB10001424052702304626104579123411103492676.

¹²¹ See Karlene Ball et al., *Visual Attention Problems as a Predictor of Vehicle Crashes in Older Drivers*, 34 INVESTIGATIVE OPHTHALMOLOGY & VISUAL SCI. 3110, 3118 (1993) (showing that older drivers with severe sensitivity loss in both eyes have twice the number of crashes than older drivers with normal visual field sensitivity).

¹²² See Louise Hickson et al., *Hearing Impairment Affects Older People's Ability to Drive in the Presence of Distracters*, 58 J. AM. GERIATRICS SOC'Y 1097, 1101–12 (2010) (showing that people with moderate to severe hearing impairment had significantly poorer driving performance in presence of distracters than those with normal or mild hearing impairment).

¹²³ See J.E. Korteling, *Perception-Response Speed and Driving Capabilities of Brain-Damaged and Older Drivers*, 32 HUM. FACTORS 95 (1990) (describing experiments regarding reaction-time tasks and driving tasks that were conducted to identify variables that may be sensitive to the effects of aging).

¹²⁴ See Janet P. Szyk et al., *Relative Effects of Age and Compromised Vision on Driving Performance*, 37 HUM. FACTORS 430, 430–36 (1995) (describing experiment held in order to determine effects of age and compromised vision on driving skills).

their braking response time.¹²⁵ In our example in the Introduction, a sixty-five-year-old man probably imposes higher risk on others than the average driver, and his reaction time is probably longer than that of the average driver. The higher risk would optimally require him to drive slower, while the longer reaction time might justify relaxing the “reaction time standard.”

2. *Cognitive and Emotional Characteristics*

Risk creation is also linked to mental and cognitive capabilities and traits. For example, a driver with high spatial awareness can better avoid dangerous situations and should face an elevated standard that would prompt her to utilize more of her skill.¹²⁶ Human traits such as impulsivity, risk taking, and sensation seeking increase the likelihood of a person to engage in dangerous activities, thereby imposing risks on others.¹²⁷ Therefore, a sensation-seeking doctor might be more prone to appraise risks as lower than a low-sensation-seeking doctor. We might want to require the former doctor—or his employer—to take extra precautions before making crucial decisions involving risk estimation.

A conscientious person tends to be more organized and prefer planned rather than spontaneous behavior.¹²⁸ This tendency has a clear implication for the way different people perform their tasks and the precautions they could take to reduce risks. It might be reasonable to have different demands and expectations from actors who tend to be planners (and may be more responsible, organized, and reliable)¹²⁹ and from actors who are spontaneous. Those demands and expectations might change across activities. Sometimes we might demand that actors who are less organized take more precautions to decrease risks

¹²⁵ See *id.* at 435 (showing that older groups had poorer driving-related skills than younger groups on simulator missions).

¹²⁶ See K. WOCHINGER & D. BOEHM-DAVIS, U.S. DEP'T OF TRANSP., *THE EFFECTS OF AGE, SPATIAL ABILITY, AND NAVIGATIONAL INFORMATION ON NAVIGATIONAL PERFORMANCE* (1995) (showing that navigational ability, which is linked to car accidents' involvement, declines with age due to decrements in spatial ability and perceptual speed).

¹²⁷ See Marvin Zuckerman & D. Michael Kuhlman, *Personality and Risk-Taking: Common Biosocial Factors*, 68 J. PERSONALITY 999, 1000 (2000) (explaining that some personality traits, such as sensation seeking, are relevant to risk-taking inclination).

¹²⁸ See Daniele Quercia et al., *Our Twitter Profiles, Our Selves: Predicting Personality with Twitter*, in 2011 IEEE INTERNATIONAL CONFERENCE ON PRIVACY, SECURITY, RISK AND TRUST AND IEEE INTERNATIONAL CONFERENCE ON SOCIAL COMPUTING 180, 180 (2011) (analyzing relationship between personality and different types of Twitter users).

¹²⁹ See Jennifer Golbeck et al., *Predicting Personality with Social Media*, in THE 29TH ANNUAL CHI CONFERENCE ON HUMAN FACTORS IN COMPUTING SYSTEMS 253, 254 (2011) (presenting method of predicting human personality through information available in Facebook profiles).

(in the case of doctors, for example), while sometimes the less organized and more spontaneous actors might be the ones more capable to react to unexpected circumstances (say, unexpected risks in the road) and that might affect the standard of care most suitable for them.

Reaction time while performing a dangerous task depends, we saw, on physical aspects, but also on psychological factors such as fatigue, aging, history of brain damage, and use of drugs.¹³⁰ A surgeon who suffers from sleep deprivation is likely to impose a higher risk to patients than other surgeons. Also, when the time of performing a task increases—such as when the operation on a patient becomes longer—the surgeon’s fatigue increases, resulting in significant increase in reaction time and in risk to patients.¹³¹ This might justify an increase in the standard of care from doctors who suffer from sleep deprivation, for example by requiring them to take longer breaks in extended shifts, or if this is impossible, requiring them to take more precautions as the operation progresses. And, conversely, when taking a break or taking other precautions is impractical, it might be justified to relax—rather than elevate—the standard of care. As urgency rises and care becomes costlier, the optimal level should correspondingly adjust.

Big Data can be a reliable source for learning about injurers’ cognitive skills and intelligence, sometimes more so than direct exams, because it is not as manipulable (people may underperform on exams if high scores raise their burden of care). For example, according to some studies, intelligence and cognitive abilities can be predicted to a high degree of accuracy based on records of users’ “likes” on Facebook. One study found that strong predictors of high intelligence included “likes” to the Facebook pages for “Thunderstorms,” “The Colbert Report,” “Science,” and “Curly Fries,” and that low intelligence correlated with “likes” to the pages for “Sephora,” “I Love Being A Mom,” “Harley Davidson,” and “Lady Antebellum.”¹³² Similarly, a person’s level of education can be inferred by analyzing search terms and web pages accessed by her,¹³³ although in most

¹³⁰ VALERIE J. GAWRON, *HUMAN PERFORMANCE MEASURES HANDBOOK* 41 (2000).

¹³¹ See Wayne C. Harris et al., *Performance, Workload, and Fatigue Changes Associated with Automation*, 5 *INT’L J. AVIATION PSYCHOL.* 169, 176–85 (1995) (discussing influence of workload and fatigue in multitask environment).

¹³² Michal Kosinski et al., *Private Traits and Attributes Are Predictable from Digital Records of Human Behavior*, 110 *PROC. NAT’L ACAD. SCI. U.S.* 5802, 5804 (2013).

¹³³ See Dan Murray & Kevan Durrell, *Inferring Demographic Attributes of Anonymous Internet Users*, in *WEB USAGE ANALYSIS AND USER PROFILING* 7, 14–18 (Brij Masand & Myra Spiliopoulou eds., 2000) (showing that demographic facts such as gender, age, income, marital status, and level of education can be inferred through usage information analysis).

cases, for personalizing the standard of care, the level of education can be more easily learned from direct resources. Or, there is some evidence that users with different personalities prefer different website categories. For example, people with a tendency to be well-organized prefer websites such as kodak.com, education.com, exct.net, ecnext.com, and ecollege.com.¹³⁴ The tendency of a person to be well-organized could be a consideration in setting a personalized standard of care for him.¹³⁵ Big Data analysis can also help courts identify risk-taking inclination, which could be essential for setting a personalized standard of care. Thus, one study has found that tendency towards risky driving is correlated with risky financial behaviors.¹³⁶ Knowing how people invest might tell us also how they drive.

Of course, not every behavioral study published in a social science journal should budge the standard of care. Many findings are preliminary and perhaps questionable. The point we stress is the power of statistical analysis of Big Data to pick up factors that, if confidently identified, can tell us a significant amount about people's riskiness and their skill in accident prevention.

Another type of information relevant to the determination of standards of care is behavioral genetics information. It connects mental and cognitive abilities and hormonal and neurological influences.¹³⁷ Emerging developments in brain imaging technology enable better understanding of human behavior. One such development is MRI testing, and its complement fMRI (functional magnetic resonance imaging), which allows examination of the way the brain works during the performance of particular tasks.¹³⁸ The MRI tests measure changes in blood oxygenation levels in order to identify

¹³⁴ Michal Kosinski et al., *Personality and Website Choice* (June 22, 2012) (unpublished manuscript), http://research.microsoft.com/en-us/um/people/pkohli/papers/kskbg_acmweb_sci_2012.pdf.

¹³⁵ As we argued earlier in this section, it might be reasonable to demand that less organized actors take more precautions in order to decrease the risks they create.

¹³⁶ See Edward R. Morrison et al., *Health Shocks and Household Financial Fragility: Evidence from Automobile Crashes and Consumer Bankruptcy Filings 3* (Coase-Sandor Inst. for Law & Econ., Working Paper No. 655 2013), https://www.researchgate.net/publication/251315742_Health_Shocks_and_Household_Financial_Fragility_Evidence_from_Auto_mobile_Crashes_and_Consumer_Bankruptcy (explaining that persistent financial distress may encourage risky behavior).

¹³⁷ See Robert Plomin & Avshalom Caspi, *Behavioral Genetics and Personality*, in HANDBOOK OF PERSONALITY 251, 261–67 (Lawrence A. Pervin & Oliver P. John eds., 2d ed. 1999) (providing overview of research on contribution of genes to personality).

¹³⁸ See Jean Macchiaroli Eggen & Eric J. Laury, *Toward a Neuroscience Model of Tort Law: How Functional Neuroimaging Will Transform Tort Doctrine*, 13 COLUM. SCI. & TECH. L. REV. 235, 240–41 (2012) (explaining fMRI technique).

which regions of the brain work during a specific task.¹³⁹ Although MRI images require substantial interpretation, they are considered valuable in demonstrating cognitive processes and have in fact been proposed as a tool in tort cases, and some uses of this technique in criminal cases has already begun.¹⁴⁰ MRI tests, and neuroscience more generally, could inform the court as to how to define the standard of care in a more concrete and nuanced manner than currently done.¹⁴¹

Specifically, some research has shown a correlation between impulsivity, emotional reactions, and violent behaviors on the one hand, and specific activity in several areas in the brain on the other.¹⁴² It has shown a significant neurological basis of aggressive and violent behaviors.¹⁴³ Once a defendant undergoes MRI or fMRI tests, the findings can be used by courts for personalizing the standard of care. Thus, if those tests point to the defendant's impulsiveness and aggressiveness, courts might make the proper adjustment in the standard of care.

3. Past Behaviors

We distinguish between *similar* past behaviors and *different* past behaviors. *Similar* past behaviors can often be a good proxy for the defendant's abilities and tendencies regarding risk creation and precaution taking. Thus, a driver's record of traffic violations could be used to personalize her standard of care.¹⁴⁴ Information about a doctor's past malpractice behavior might also be used by the court in

¹³⁹ Owen D. Jones et al., *Brain Imaging for Legal Thinkers: A Guide for the Perplexed*, 2009 STAN. TECH. L. REV. 81, 84–85.

¹⁴⁰ See Eggen & Laury, *supra* note 138, at 249–52 (describing various cases, mainly criminal, in which fMRI has been used in courts).

¹⁴¹ See Patricia Smith Churchland, *Moral Decision-Making and the Brain*, in NEUROETHICS 3, 10–14 (Judy Illes ed., 2006) (arguing that fMRI can be used in order to identify neurobiological differences between voluntary and involuntary action).

¹⁴² See Adrian Raine & Yaling Yang, *Neural Foundations to Moral Reasoning and Antisocial Behavior*, 1 SOC. COGNITIVE & AFFECTIVE NEUROSCIENCE 203, 205 (2006) (summarizing brain imaging studies conducted on antisocial, violent, and psychopathic groups).

¹⁴³ See Jana L. Bufkin & Vickie R. Luttrell, *Neuroimaging Studies of Aggressive and Violent Behavior: Current Findings and Implications for Criminology and Criminal Justice*, 6 TRAUMA VIOLENCE & ABUSE 176, 179–84 (2005) (discussing neuroimaging studies that demonstrated abnormal brain activity in aggressive and violent offenders).

¹⁴⁴ See Colonna, *supra* note 119, at 360 (showing that data mining can be used to track past traffic violations).

personalizing the standard of care.¹⁴⁵ On many occasions, this kind of information is available through official records.¹⁴⁶

More problematic is the usage of information about *different* past behaviors of the defendant and learning from these about her capabilities as a potential wrongdoer. As we have explained, in the era of Big Data it is no longer difficult to collect information about the defendant's past behavior as a consumer, driver, employee, patient, student, and in many other capacities. As we have demonstrated, this past behavior might be associated with specific capabilities and traits which are relevant to the process of personalizing the standard of care.

Using past behavior as a predictor of risk and as a factor in determining the optimal precaution is a hallmark of insurance actuarialism—a practice known as experience rating. Every driver is familiar with the increase in insurance premium after an accident. This technique—personalizing the premium charged to each policyholder based on past behavior—is founded on the same tailored-treatment logic as personalized standards of care. In the insurance context, the use of Big Data and high-intensity information models is their bread and butter. Auto insurers, for example, invite policyholders to install data recording devices in their cars, which transmit information to insurers about driving habits, risk taking, and the competence of the driver—information that is then factored into the personalized pricing of the auto insurance policy.¹⁴⁷ While courts cannot base judgments on similarly installed recorders of conduct, they can tap into any available resource of personal information to observe past behavior and adjust the standard accordingly.

4. Resources

Another source of information, often readily available, is about people's resources. It is sometimes argued that the wealth of the injurer should be factored into the design of negligence standards, perhaps because high-resource injurers can more easily afford greater

¹⁴⁵ See *Public Use Data File*, NAT'L PRAC. DATA BANK, www.npdb.hrsa.gov/resources/publicData.jsp (last updated Feb. 2016) (containing selected variables from medical sources concerning physicians, dentists, and other licensed health care practitioners).

¹⁴⁶ See Colonna, *supra* note 119, at 358 (discussing huge amounts of data that law enforcement agencies acquire through Big Data records); Porat & Strahilevitz, *supra* note 11, at 1437 (explaining how companies use publicly available data as well as proprietary data to gauge customer preferences).

¹⁴⁷ See Brad Tuttle, *Big Data Is My Copilot: Auto Insurers Push Devices that Track Driving Habits*, TIME (Aug. 6, 2013), <http://business.time.com/2013/08/06/big-data-is-my-copilot-auto-insurers-push-devices-that-track-driving-habits/> (reporting on new Big Data devices that help insurers profile their customers' driving habits).

expenditures on care.¹⁴⁸ Inasmuch as such wealth-based standards are aimed at improving wealth distribution in society, income taxes and fiscal policies are thought to be superior tools, in the sense that they achieve redistribution more efficiently and comprehensively.¹⁴⁹ It might be thought, for example, that a small rural hospital should not be held to the same standards of medical care as a large city hospital, because the smaller facility cannot afford and should not be asked to make the same level of expenditure in advanced medical equipment. The small hospital may well face a lower standard of medical care, but not because of “affordability” or wealth. Rather, because it treats smaller populations, the value of investment in some devices is lower and insufficient to justify the costs.

CONCLUSION

This Article examined the justifications for a new type of negligence law—abandoning the objective reasonable person standard and adopting instead a personalized subjective standard of care. It identified several important efficiency advantages to the selective adoption of personalized standards, and argued that tort law’s other possible objectives, including corrective and distributive justice, would also be served.

Our analysis reveals that personalization could be made in two dimensions: the skill dimension and the risk dimension. Indeed, the efficiency considerations (level of care, activity level, victim care, and ex ante investment) as well as the justice considerations (corrective and distributive justice) often vary depending on whether personalization is made according to the skill or according to the risk dimension, and also whether it is done to increase or decrease the standard of care relative to the uniform standard. Table 5 summarizes all the considerations, according to the skill-risk and increase-decrease (up-down) dimensions.

¹⁴⁸ See, e.g., Arlen, *supra* note 57, at 421–23 (arguing that care expenditures impose lesser burden on the rich and thus can be raised more than on the poor).

¹⁴⁹ See Louis Kaplow & Steven Shavell, *Why the Legal System Is Less Efficient than the Income Tax in Redistributing Income*, 23 J. LEGAL STUD. 667, 667–69 (1994) (arguing that tax policies are more efficient than legal regulation in achieving distributive goals).

TABLE 5: EFFECTS OF PERSONALIZATION

	<i>Skilled: up</i>	<i>Unskilled: down</i>	<i>Risky: up</i>	<i>Safe: down</i>
A. Efficiency				
1. Level of Care	+	+*	+	+*
2. Activity Level	+	-	+	-
3. Victim Care	-	-	+	+
4. Ex Ante Investments	-	-	+	+
B. Corrective Justice	+**	-	+	+
C. Distributive Justice				
1. Among Injurers	+***	+***	-***	-***
2. Injurers vs. Victims	+	-	+	-

* Under the assumption of self-personalization, personalization has no effect compared to a uniform standard.

** Corrective justice might require the skilled injurer to do more than average, but would not allow the unskilled injurer to do less than average.

*** This conclusion might change if skills/safeness are deliberately acquired.

As the table indicates, the most favorable case for personalization is increasing the standard of care for risky injurers. It might raise some distributive justice concerns, especially if riskiness is exogenously determined. Increasing the standard of care for skilled injurers also has many more pros than cons, although it does raise concerns about potential victims’ level of care, and might also create inefficient incentives to invest in improving one’s skills. As we have explained, however, in the process of personalization, victim’s care should be considered, and this might limit the extent of personalization.¹⁵⁰ And the ex ante investment problem could be attenuated if personalization takes into account the optimal investment that the injurer should make in improving his skills.¹⁵¹

Personalization requires enormous amounts of information and much expertise in applying it, and we argued that advances in information technology could put the legal system on the path to such information-rich procedures. Even if the legal system lags behind other institutions in Big Data advances, we argued that in the short run using a gradual mode of personalization—by applying several discrete steps within the standard of care—is relatively easy to implement.

Like any other use of Big Data, privacy concerns might slow down the personalization of the standard of care. We believe they should not. One such concern is that the usage of Big Data in courts

¹⁵⁰ See *supra* text accompanying note 91.

¹⁵¹ See *supra* text accompanying note 96.

would encourage further collection of sensitive information, which may be used to infringe people's privacy. But data about human characteristics has yielded enormous returns and will continue to be collected and used for commercial purposes, so there is no reason to assume that the further use of it by courts for a public purpose would have any significant effect on its already-occurring collection.¹⁵² Another concern is that Big Data and fMRI tests would infringe on the privacy of the particular injurers sued in court since it exposes personal characteristics. There are ways to protect people from embarrassing revelations and restrict their use to trials without abandoning the entire project. And it would be in the interest of many injurers to voluntarily subject themselves to such screening, if they expect the findings to reduce their personalized standards of care. Such voluntary submission to screening would thus occur along the familiar unraveling dynamic,¹⁵³ because those injurers who refused to cooperate in tailoring the standard of care would be suspected by courts of being injurers for whom a high standard of care is appropriate.

This paper studies personalization of negligence law, but there is no reason to stop there. One of us previously suggested personalization of other areas of law—disclosures and default rules.¹⁵⁴ We can also think of personalized regulatory standards, personalized penalties, and a host of applications of the idea of personalized standards beyond the realm of tort law. Personalization is the trajectory of many other social and private institutions, like insurance, medicine, education, employment, product design, and advertising. In all these areas, personalization has yielded substantial progress, even if some of its risks have to be monitored and regulated. In the same way that personalized medicine can save lives and avoid inefficient uniform treatments, personalized safety standards can reduce the social costs of accidents. How long will negligence law resist this enormous value of information?

¹⁵² See Porat & Strahilevitz, *supra* note 11, at 1467–69 (noting tradeoff between privacy and personalization and contending that following industry's lead in making consumers aware of benefits of personalization may engender greater willingness to share).

¹⁵³ See DOUGLAS G. BAIRD ET AL., *GAME THEORY AND THE LAW* 2, 89–90 (1994) (defining game theory concept of “unraveling” as “situations in which the ability of people to draw inferences from silence leads to the revelation of information”).

¹⁵⁴ See Porat & Strahilevitz, *supra* note 11, at 1417–21, 1470–76 (proposing use of Big Data to personalize default terms in contracts and wills and to target disclosures based on relevance to recipient).