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Insurance Pricing Discrimination and
Aristotelian Equality: An Application to
Annuity Pricing

David A. Cather



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NAIC Executive Office
444 North Capitol Street, NW
Suite 700
Washington, DC 20001
202.471.3990

NAIC Central Office
1100 Walnut Street
Suite 1500
Kansas City, MO 64106
816.842.3600

NAIC Capital Markets
& Investment Analysis Office
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Insurance Pricing Discrimination and Aristotelian Equality: An Application to Annuity Pricing

David A. Cather*

Abstract

International courts often apply the social justice standard of Aristotelian equality—treating like people alike and unlike people differently—to cases involving insurance pricing discrimination. This article examines whether the use of insurance pricing variables like gender and race results in discriminatory pricing categories consisting of heterogeneous policyowners, in violation of Aristotelian equality. This article applies this discrimination standard to the pricing of annuities, drawing from studies investigating the racial mortality crossover, findings that show that the mortality rate of Black Americans falls below the rate of White Americans at advanced ages. Based on the crossover literature, this study demonstrates how race-based annuity pricing would be discriminatory because it results in heterogeneous pricing within racial pricing categories, but that insurers can control for this heterogeneity by using the wider variety of annuity pricing data (e.g., medical history, diseases, and smoking) developed in the enhanced annuity submarket. The article demonstrates how the increased use of data analytics in insurance pricing to control for heterogeneity is consistent with Aristotelian equality.

* Clinical Professor of Risk Management, Department of Risk Management, Smeal College of Business, Pennsylvania State University; cather@psu.edu.

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Introduction

Questions related to insurance pricing discrimination have been examined in courtrooms across the globe, yielding divergent rulings on legal efforts to ban the use of questionable pricing variables in insurance risk classification systems. Based upon rulings from North America and the European Union (EU), this article examines how the legal arguments on each side of the discrimination question often focus on different statistical explanations to support their case. Representatives of the insurance industry often call for the continued use of such insurance pricing variables to support methodologies that accurately forecast expected losses, arguing that efforts to ban the use of suspect pricing variables can destabilize mean-based pricing and potentially disrupt the supply of insurance. Anti-discrimination voices often call for pricing policies that minimize heterogeneity within pricing categories,¹ cases in which policyowners classified within the same risk group based on existing risk classification pricing variables exhibit different risk characteristics. Such policies are consistent with the theory of social justice known as Aristotelian equality—i.e., treating like people alike and unlike people differently—which holds that insurance pricing is discriminatory if it charges the same premium to people with different risk characteristics.

To illustrate the natural tension between these two pricing arguments, this article examines a unique setting for discussing rulings pertaining to insurance discrimination: research on why the mortality rate for Black Americans crosses over and falls below the mortality rate for White Americans at advanced ages. The racial mortality crossover research suggests that race-based pricing would be discriminatory if it charged the same price for retirement annuities to all policyowners classified in a racial pricing category when in fact the policyowners in that category exhibit heterogeneous mortality outcomes. These concerns about heterogeneity are similar to those examined in a 2011 gender discrimination ruling by the European Court of Justice (ECJ), commonly known as the *Test-Achats* case.² Gender-based pricing of personal insurance products was banned by the ECJ in the *Test-Achats* ruling, and race-based pricing is prohibited by anti-discrimination laws in the EU and North America. As these bans suggest, systematic differences in protection across races and genders are key concerns for policymakers and insurers of annuities and other retirement products (Brown, 2002; Wettstein et al., 2021). This article explains how the ECJ based its ban of gender-based insurance pricing upon a call for Aristotelian equality, and then it applies the same legal standard to the ban of race-based pricing, focusing on the market for standard (also

1. For example, two Advocate Generals at the European Court of Justice based their discrimination arguments against gender-based insurance pricing on heterogeneity (Kokott, 2011; Sharpston, 2006), while Oxera (2010, 2011) issued reports on behalf of the Association of British Insurers that warned that such a pricing ban could disrupt the affected insurance markets. More details are provided in Section 3 below.

2. *Association Belge des Consommateurs Test-Achats ASBL & Others v Conseil des ministres. Case C-236/09*. March 2011.

known as simple) annuities. Insurance pricing based on race is inconsistent with Aristotelian equality—specifically by failing to charge “unlike people differently” —if policyowners grouped by race exhibit heterogeneous mortality experience, in keeping with the findings of the racial mortality crossover studies.

This article also discusses how efforts to ban the use of discriminatory pricing variables must be balanced against the potential costs that can result when the pricing change disrupts insurance markets that have protected policyowners for decades. Such disruptions can threaten the supply of important insurance protection to the public. Consequently, decisions to ban the use of an insurance pricing variable cannot be so restrictive as to limit consideration only for the parties in a legal case who are affected by the discrimination; they must also consider the potential impact on the broader number of policyowners who are currently protected in that existing insurance market. In this regard, discrimination bans are more feasible for all parties involved if a second-best substitute pricing variable can be used in place of the banned pricing variable, a condition that is increasingly feasible with recent advances in insurance data analytics.

This study contributes to the literature on insurance pricing discrimination in several ways. First, the study reaffirms the application of Aristotelian equality as a benchmark standard in insurance discrimination cases, demonstrating how race-based insurance pricing, like gender-based insurance pricing, adversely affects classes protected globally under federal and supra-national anti-discrimination statutes. More specifically, this study shows that the use of race in insurance pricing, like gender, is not appropriate because both banned variables serve as proxies for other risk classification variables that are better measures of insurance risk. Additionally, by synthesizing the results from research on the racial mortality crossover and applying them to annuity pricing, this article fills a gap in our understanding of racial discrimination in insurance pricing, as few studies of race-based pricing in insurance have been completed to date because insurers do not maintain information about the racial backgrounds of their customers (Federal Trade Commission, 2007). Finally, this study demonstrates that by encouraging the use of a wider variety of risk classification pricing variables, the application of Aristotelian equality as a standard of insurance discrimination is consistent with the growing use of data analytics in insurance pricing, potentially offering a theoretically stronger alternative to the current legal standards used to evaluate insurance discrimination.

This article consists of seven sections. Section 2 of this study describes how pricing heterogeneity in insurance risk classification systems can result in discriminatory insurance pricing. Section 3 describes the discrimination provisions found in state insurance codes. Section 4 explains how the ECJ found personal insurance risk classification systems discriminatory based upon an application of the concept of Aristotelian equality. Section 5 discusses how calls to ban discriminatory insurance pricing variables must be balanced against the costs of pricing disruptions in personal insurance markets. Section 6 measures the findings of the racial crossover studies against the standard of Aristotelian equality, demonstrating how substitute pricing variables for race are readily available and potentially better suited to annuity pricing, as shown by the pricing variables

incorporated in the risk classification systems used currently in enhanced annuity markets. The final section summarizes the key conclusions of this study.

Heterogeneity and Price Discrimination in Insurance Risk Classification Systems

Insurance pricing in a variety of personal insurance products—including life insurance, auto insurance, and, more recently, individual annuities—relies on insurance risk classification to sort policyowners into homogeneous pricing categories, charging all insureds within a pricing category a premium based on the group’s expected loss. When an insurer can gather a large number of insureds within a group, it can use the law of large numbers to estimate the expected loss within the group, with the accuracy of these estimates improving as the size of the risk pool increases.³ Many insurance risk classification systems have been developed and fine-tuned over decades of use, and insurers have accumulated a body of statistical evidence to demonstrate how the pricing variables used to set premiums are correlated to their insureds’ expected losses. Setting premiums based on an estimate of the insured policyowner’s expected loss, a practice known as mean-based or risk-based pricing (Powell, 2020), is economically efficient, as charging insufficient premiums creates incentives for higher-risk policyowners to engage in riskier activities (Harrington & Doerpinghaus, 1993; Tennyson, 2010).

Actuarial groups have developed professional standards of practice that are useful in evaluating the suitability of different types of insurance pricing variables in risk classification systems.⁴ These guidelines rate highly those pricing variables that are correlated with insured losses and exhibit statistical characteristics that enable insurers to separate applicants into different pricing categories with different expected losses.⁵ In addition, good pricing variables are generally not costly or

3. Insurers use the law of large numbers to accurately predict the mean loss of policyowners in a pricing category by reducing the standard deviation of the mean loss distribution. Assume that a large population of homogeneous policyowners suffers losses that are independently distributed, with a mean loss equal to μ and standard deviation equal to σ . The law of large numbers holds that as the number of policyowners in an insurance risk pool drawn from this population increases, estimates of the mean loss will become normally distributed, with the estimated value of the mean approaching μ and the standard deviation of the mean loss distribution measured as $\sigma/n^{0.5}$, where n equals the number of policyowners in the pool.

4. For example, see *Actuarial Standard of Practice No. 12: Risk Classification (for All Practice Areas)*, published by the American Association of Actuaries, at http://www.actuarialstandardsboard.org/wp-content/uploads/2014/07/asop012_101.pdf.

5. The ability to differentiate between policyowners based on risk characteristics and sort them into pricing categories with different expected losses is often described as statistical discrimination. Unlike the negative discrimination that results from unfair bias, statistical discrimination is legal, essential for accurate insurance pricing, and consistent with public policy as long as it satisfies legislative discrimination standards. (See Section 3.) Acknowledging the importance of the pricing mechanism that facilitates statistical discrimination, the Federal Trade

administratively cumbersome, thus enabling insurers to sort applicants into pricing categories relatively simply and inexpensively. Insurers must also consider whether the use of a pricing variable satisfies public policy norms, e.g., assuring that the resulting pricing scheme is consistent with the regulatory and legal standards of the industry. These characteristics generally support the statistical and administrative prerequisites that are necessary to use the law of large numbers to accurately forecast the expected loss of a risk pool in a cost-effective manner.

By contrast, when evaluating insurance pricing variables, some regulators have called for more stringent standards than those proposed in the actuarial standards of practice. For example, Shayer (1978) suggests that risk classification schemes are most equitable when policyowners are sorted into homogeneous pricing categories such that the expected losses of their own risk profiles fall very close to the mean loss in that risk pool, a call for homogeneity in insurance pricing that was further developed in Abraham (1985).⁶ A graphical representation of this idea is provided in Figure 1. The taller, thinner normal curve in the figure exhibits a homogenous risk pool, as all policyowners pay a premium based on an expected loss that is close to their own risk levels, as reflected on the X-axis by the horizontally narrow range of the normal distribution that is tightly bound around the mean. By contrast, the shorter, wider risk pool shown in Figure 1 is heterogeneous, as a policyowner's premium could be based on an expected loss that is very different from his or her true risk profile if his or her risk level falls at the extreme edges of that wider normal curve. As discussed below, concerns about heterogeneity among policyowners in a common insurance pricing category have become the focal point of legal rulings that have banned the use of a discriminatory pricing variable in the calculation of insurance prices.

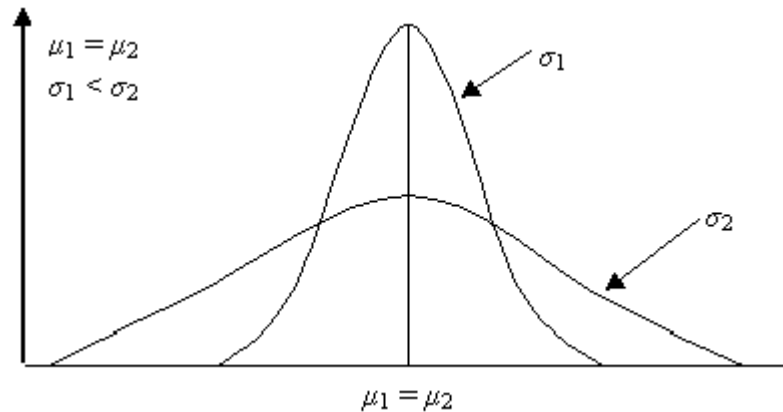
Heterogeneous risk pools can result if risk classification systems use insurance pricing variables that are weak proxy measures for risk characteristics that are better able to statistically discriminate between contiguous risk groups, but difficult or costly to measure. Heterogeneity can result in pricing inequities if wide loss distributions overlap across adjoining pricing categories. For example, in recent decades, regulators have questioned whether the use of gender in the pricing of mortality-based products like standard annuities (i.e., annuities underwritten based on age and gender) and life insurance results in heterogeneous risk pools. To demonstrate, Figure 2 compares the mortality experience between retirement-aged

Commission (2007) recognizes that the risk classification systems used by insurers to sort policyowners into pricing categories are trade secrets. To minimize the confusion between the two definitions of discrimination, this paper will use the term "discrimination" to refer to negative or unfair bias unless otherwise noted.

6. Like the *Actuarial Standard of Practice No. 12: Risk Classification (for All Practice Areas)*, the Shayer (1978) paper identifies desirable characteristics for pricing variables in insurance risk classification systems, but it analyzes the topic from a more regulatory perspective. The paper was written as a part of a broader overview of insurance regulation carried out by the Massachusetts Insurance Department. Although no longer in print, the full report is available through the Duke University Medical Center Library & Archives as part of Frank Sloan's circulating archival papers. The author thanks Duke University for providing access to the paper.

British males and females compiled by Curry and O’Connell (2004). The graph shows how mortality experience varies across age and gender, the primary pricing variables used in underwriting standard annuities (Fong, 2015). Curry and O’Connell (2004) note that there is little homogeneity in the mortality experience within each gender category, and this heterogeneity results in an overlap of mortality experience between male and females. They suggest that gender-based pricing may be serving as a poor substitute for other data that are better suited to categorize mortality risk (e.g., lifestyle or occupation), but more costly or difficult to measure.⁷

Figure 1:
Homogeneous Pricing Categories Are Tightly Distributed Around the Mean Loss; Heterogeneous Pricing Categories Are More Widely Distributed Along the X-Axis



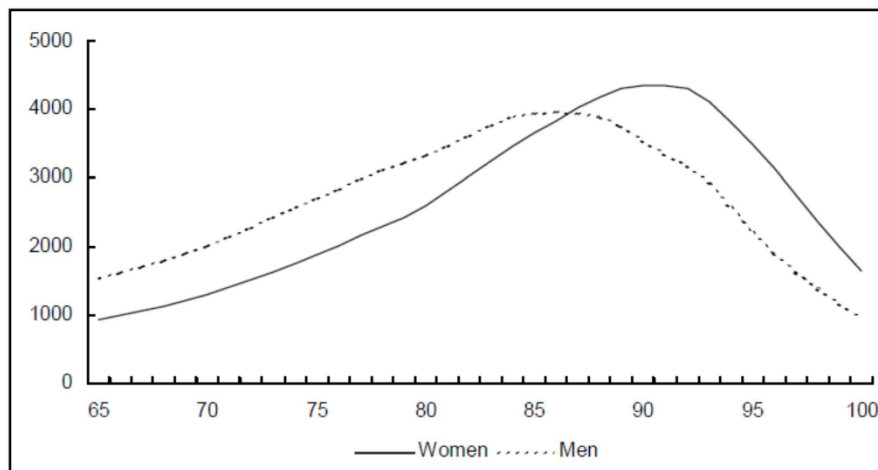
Note: Figure 1 shows normal density curves for two pricing categories with equal mean losses ($\mu_1 = \mu_2$ on the X-axis). Curve 1, the taller normal curve, tends to be less heterogeneous than Curve 2 because the standard deviation of the second curve is larger than the standard deviation for the first curve ($\sigma_1 < \sigma_2$). Figure 1 is adapted from Samwick (2021).

Heterogeneity among policyowners in a common insurance risk pool is especially problematic if it results from the use of an insurance pricing variable that is prohibited by anti-discrimination statutes. This can occur when new legislation bans the use of an insurance pricing variable that had not previously been prohibited. For example, gender-based insurance pricing was banned in the EU when the Charter of Fundamental Rights gained legal effect in 2009 even though gender was

7. For example, pricing based on gender may weakly control for the tendency for women to have healthier lifestyles than men (Kokott, 2011). But gender-based pricing alone is unable to equitably set prices for atypical men (e.g., men with healthy diets working in low-stress jobs) plotting on the far right of the curve for men in Figure 2 and women with unhealthy lifestyles plotting on the far left of the curve for women. The resulting heterogeneity in longevity experience, reflected by the overlap across genders in Figure 2, would be reduced if insurers could also effectively monitor and price based on underlying health factors, such as diet or stress.

commonly used as an insurance pricing variable leading up to 2009. California similarly banned gender-based pricing in auto insurance in 2020. In this setting, if individuals are charged a price based on the value of a questionable pricing variable that is incorrectly used to classify insurance applicants, they may pay too much for insurance protection when they in fact exhibit risk profiles deserving of lower prices. Or as former Advocate General of the EU Court of Justice Eleanor Sharpston⁸ succinctly summarized, “Unlawful discrimination occurs when criteria, which are not relevant, are relied upon to override those, which are relevant.”

Figure 2:
Heterogeneous Mortality, as Shown by the Mortality Overlap for Men and Women Aged 65



Note: Figure 2 shows the number of British men and women from a population of 100,000 aged 65 in 2004 who are expected to die at each subsequent age. See Curry and O’Connell (2004).

State Insurance Discrimination Standards

Insurance discrimination is a topic of globally shared legal concepts that are quickly evolving (Cather, 2020). Numerous countries have collectively developed an extensive legal framework to address insurance discrimination, with jurisdictions in North America and the EU taking different approaches to address the issue. This section begins by identifying the laws used among states in the U.S. to protect against discrimination, followed by discussion on how other countries have addressed the issue.

8. See paragraph 24 in Sharpston, E. (2006) Opinion of Advocate General Sharpston. Case C-227/04 Available at [https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:62004CC0227\(01\)](https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:62004CC0227(01)).

While public discussions on discrimination often focus on unfair bias, it is instead the issue of price discrimination that has historically played a dominant role in insurance pricing regulation. One of the earliest studies chronicling the regulation of insurance discrimination explains how concerns about price discrimination—defined by the author as “price differences which do not correspond to differences in cost or when there are cost differences which are not reflected in price differences” (Williams, 1957)—were the driving force in the drafting of the All-Industry Model Bill, the bill adopted by the National Association of Insurance Commissioners (NAIC) in 1946 in support of the state-based insurance regulatory scheme called for in the federal McCarran-Ferguson Act. Given the bill’s focus on setting prices based on costs, price discrimination becomes problematic if insurers are unable to set premiums based on the expected value of an applicant’s insured loss costs. As a result, included in this bill was the standard for rate regulation that is currently found in many states’ insurance codes: that rates should not be excessive, inadequate, nor unfairly discriminatory.

The states have enacted insurance codes to address insurance discrimination in two primary ways (Shapo, 2020; Stead, 2020). First, in keeping with the All-Industry Model Bill, state insurance codes include provisions that prohibit unfair insurance discrimination (Miller, 2009; Williams, 1957), provisions enacted in response to prior insurance insolvencies that resulted from excessive insurance rate cutting. These provisions hold that if two applicants with similar risk characteristics (e.g., the same expected loss) apply for insurance, it is discriminatory for insurers to treat one of the applicants in a preferential way by reducing his or her premium below the price for the other. Such provisions are consistent with section 5.A(3) of the NAIC *Property and Casualty Model Rating Law (#1775)*⁹ and Principle 4 of the Casualty Actuarial Society’s (CAS’) *Statement of Principles Regarding Property and Casualty Insurance Ratemaking*,¹⁰ standards calling for premium calculations to be based on the applicant’s expected level of insured losses and expenses.

In addition to and separate from unfair insurance discrimination provisions, most state legislatures have also adopted provisions that specifically identify certain risk classification categories—such as classification based on race, national origin, or religion—that cannot be used to set insurance prices (Avraham et al., 2014; Shapo, 2020; Stead, 2020). This second type of anti-discrimination provision creates “protected classes” of applicants from each of these categories that are protected from discriminatory pricing. Insurers are prohibited from using these factors in the pricing of insurance, even if they are correlated to expected losses. While these categories of protected classes are common across the U.S. (Avraham et al., 2014; Stead, 2020), some states’ legislatures have extended the list, with common additional categories including prohibitions on gender- or age-based discrimination (Tennyson, 2010).

9. <https://content.naic.org/sites/default/files/model-law-gdl-1775-property-casualty-rating-law.pdf>.

10. <https://www.casact.org/sites/default/files/2021-05/Statement-Of-Principles-Ratemaking.pdf>.

Beyond these two types of provisions found in state insurance codes, some groups (e.g., Center for Economic Justice, 2020) have called for a third approach to address insurance discrimination, disparate impact. Drawing from federal employment discrimination law from the early 1970s, disparate impact theory recognizes that pricing factors that are seemingly not related to protected classes can nonetheless have an adverse impact on protected classes. For example, in *Griggs v. Duke Power Co.*,¹¹ the case often recognized as the first in which the Supreme Court applied disparate impact theory, an employer was found responsible for employment discrimination because it required job applicants to pass a standardized intelligence test and to show that they graduated from high school, requirements that at face value seem unrelated to employment discrimination. Nonetheless, the court ruled that the education requirements were discriminatory because the required educational standards were not necessary for employees to satisfactorily fulfill their job responsibilities and because a high percentage of applicants in protected classes did not have sufficient education to satisfy these job requirements, thus resulting in the employer hiring a smaller percentage of workers from the protected class (Seiner, 2006).

In contrast to situations involving intentional discrimination, which are addressed separately as disparate treatment cases, disparate impact theory was developed for instances in which an employer unintentionally followed a policy that is facially neutral—i.e., outwardly fair in form, such as the high school graduation requirement noted above—but discriminatory in practice.¹² The courts apply a three-step process in disparate impact cases (Seiner, 2006; Stead, 2020). First, the plaintiff must show that the use of a facially neutral practice results in a discriminatory statistical difference between non-protected and protected classes. Second, as a counterbalance, if the facially neutral practice is shown by the plaintiff to discriminate against a protected class, the employer can defend itself by showing that the practice is job-related and consistent with business necessity. Finally, if the defendant demonstrates business necessity, the plaintiff can nonetheless prevail by showing that an alternative practice satisfies the defendant’s business needs without adversely affecting the protected class.

The U.S. Supreme Court has expanded the use of disparate impact theory as a discrimination methodology beyond its initial application, extending its use to discrimination cases related to the federal Age Discrimination in Employment Act and to housing discrimination cases through the federal Fair Housing Act (FHA) (Dane, 2014; Seiner, 2006; Stead, 2020). Because the Supreme Court has limited the adoption of disparate impact to these specific situations, there are legal questions about whether using disparate impact in state-regulated insurance discrimination cases is legally possible (Stead, 2020; Shapo, 2020). Moreover, some researchers

11. *Griggs v. Duke Power Co.*, 401 U.S.424 (1971).

12. Some researchers (e.g., Seiner, 2006) suggest that the development of disparate impact in the *Griggs v. Duke Power* case was not in fact unintentional, noting that the employer had a history of racially discriminatory hiring that may have prompted the courts to develop disparate impact theory to detect less obvious cases of discrimination.

and practitioners contend that the disparate impact methodology is poorly suited to insurance discrimination cases. For example, Frees and Huang (2021) warn that the use of disparate impact could complicate actuarial efforts to accurately set insurance prices because no definitive discussion about how to apply disparate impact methodology has been provided by the courts, such that cases that have used disparate impact theory to date often apply the methodology inconsistently. Miller (2009) further notes that the statistical evidence used to establish discrimination via disparate impact requires only for the plaintiff to show that the use of a pricing variable results in a statistical difference between non-protected and protected classes; these standards are inconsistent with state insurance codes if they fail to consider potential differences in insurance loss costs between the protected and non-protected classes. Because insurance premiums calculations are based on the expected loss of the applicant—the practice commonly known as risk-based pricing (Powell, 2020)—banning the use of essential insurance pricing variables due to discrimination concerns can result in failing to control for differences in insured loss costs between protected and non-protected classes. In turn, this can lead to insurers combining applicants with heterogeneous risk levels into common risk pools, thus potentially resulting in pricing inequities, inefficient insurance pricing (Tennyson, 2010), and adverse selection (Dahlby, 1983).

The use of disparate impact methodology in addressing insurance discrimination relies on federal legal precedents, with the Supreme Court extending the use of disparate impact theory to cases involving employment discrimination and housing discrimination through the FHA. As is noted in Kaersvang (2006), because insurance is an essential component in home mortgage lending and real estate transactions, the FHA has successfully argued that it has the authority to bring legal action on housing-related insurance discrimination cases. Cases challenging the use of credit-based insurance scores in auto insurance pricing have also attempted to use disparate impact theory (Miller, 2009). Recent commentary on insurance discrimination cases suggests that insurers may encounter an expanded use of the disparate impact methodology in the future. Schwarcz (2020) has called for expanded use of disparate impact theory to address insurance discrimination in civil rights actions. And in 2020, based on a document drafted by its Artificial Intelligence (EX) Working Group (since renamed as the Big Data and Artificial Intelligence (EX) Working Group), the NAIC adopted its Principles on Artificial Intelligence (AI). The document defines the guiding principles for AI actors in the insurance business and instructs insurers against using AI pricing variables if they result in proxy discrimination against protected classes, where the definition of “proxy discrimination” is viewed as another interpretation of discrimination based on disparate impact.¹³

13. The NAIC document on artificial intelligence is found at https://content.naic.org/sites/default/files/inline-files/AI%20principles%20as%20Adopted%20by%20the%20TF_0807.pdf. Although the term “proxy discrimination” was not defined in the document, Shapo (2020, p. 14) discusses how proxy discrimination may serve as an alternative reference to disparate impact. See Frees and Huang (2021) and Prince and Schwarcz (2020) for more in-depth discussion of the issue.

Aristotelian Equality & the EU Ban on Discriminatory Insurance Pricing

From a global perspective, North America has approached the issue of insurance discrimination against protected classes using legal standards that differ from the EU. For example, in addition to the U.S., the Supreme Court of Canada applied its own version of the disparate impact theory in a 2020 ruling on an insurance sex discrimination case related to employment compensation.¹⁴ In contrast, an alternative definition of formal justice is recognized in the EU's ECJ as the basis for fair insurance prices and discrimination. Known as Aristotelian equality, this standard of justice is the "requirement to treat comparable situations equally and non-comparable situations unequally" (Schmeiser et al., 2014). The first part of this definition is consistent with the states' unfair insurance discrimination laws that call for setting equal premiums for insurance applicants with similar expected losses. The last part of the definition of Aristotelian equality extends the concept of discrimination beyond mean- or risk-based pricing, however, by calling for applicants with dissimilar risk profiles to be charged different prices.¹⁵ In this context, classifying applicants with different risk characteristics into the same risk pool based on a discriminatory insurance pricing variable such as race or gender may be viewed as inequitable because it creates heterogeneous risk categories.

In 2011, the ECJ relied on the social justice theory of Aristotelian equality in the *Test-Achats* case. Its ruling banned the use of gender-based insurance pricing, given that gender is included as a protected class under Article 21 of the Charter of Fundamental Rights of the EU.¹⁶ From a legal perspective of insurance discrimination, the *Test-Achats* case was unique in that the insurance industry was using gender as an insurance pricing variable at the time that gender discrimination was prohibited by the Charter of Fundamental Rights. Like the Charter, similar

14. *Fraser v. Canada (Attorney General)*, 2020 SCC 28.

15. Aristotelian equality is consistent with Williams' definition of "price discrimination" quoted above. The first portion of the definition of Aristotelian equality is also consistent with the related concept of actuarially fair premiums, i.e., setting insurance premiums based on the insurer's expected loss. ("The actuary should select risk characteristics that are related to expected outcomes ... Rates within a risk classification system would be considered equitable if differences in rates reflect material differences in expected cost for risk characteristics. In the context of rates, the word fair is often used in place of the word equitable," see American Actuarial Association, op. cit., p. 3.) Additionally, although they discuss issues that are beyond this study's focus on Aristotelian equality and race-based pricing, some researchers (e.g., Cevolini and Esposito, 2020; McFall and Moor, 2018; Meyers and Van Hoyweghen, 2018; and Prince, 2017) are re-examining the concept of actuarial fairness within a broader context of risk classification using data analytics.

16. The Charter states, "Any discrimination based on any ground such as sex, race, colour, ethnic or social origin, genetic features, language, religion or belief, political or any other opinion, membership of a national minority, property, birth, disability, age or sexual orientation shall be prohibited." The Charter of Fundamental Rights gained legal effect in the EU in 2009. See <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:12012P/TXT>.

federal provisions creating protected classes are found in Canada and the U.S.¹⁷ The ECJ's application of Aristotelian equality in the *Test-Achats* case provides an alternative legal standard to those used in the U.S. to assess insurance discrimination. Moreover, by focusing on heterogeneity within an insurance risk pool, the use of Aristotelian equality can potentially avoid some of the shortcomings that critics attribute to disparate impact. If applied consistently with the discussion of Figure 1 above, Aristotelian equality may be used to account for the heterogeneity associated with insurance discrimination in a manner that considers differences in expected losses, addressing a key concern about using disparate impact theory in discrimination cases (Miller, 2009; Shapo, 2020). An application of Aristotelian equality is also well suited to an industry whose pricing practices are quickly changing due to data analytics, as the availability of new types of pricing variables has enabled innovative insurers to add and replace pricing variables in risk classification systems to reduce heterogeneity in risk pools (Cather, 2020).

In June 2009, the ECJ received a request for a ruling on a legal action filed by *Test-Achats*, a Belgian consumer union, who brought the action before the Court on behalf of a male applicant applying for life insurance. The life insurance applicant contended that gender-based life insurance pricing violated the anti-discrimination standards originally set in 2004 by the European Commission through Directive 2004/113/EC, known more commonly as the Gender Directive, which in turn was incorporated into the Charter of Fundamental Rights when it gained legal effect in 2009. In their detailed discussion of the *Test-Achats* case, Schmeiser et al. (2014) reported that shortly after the Gender Directive was enacted, the insurance industry obtained a derogation, or exemption, that allowed insurers to continue their practice of charging different premiums to males and females in insurance products if it was permitted by the member state in which that insurer operated. *Test-Achats* challenged the derogation on the grounds that it violated anti-discrimination statutes. The ECJ ruled in favor of *Test-Achats* on March 1, 2011, and thus required insurers to adopt unisex pricing for personal insurance products sold by insurers to consumers.

In her legal opinion for the *Test-Achats* case, Advocate General Juliane Kokott¹⁸ explained that gender-based pricing charged the same price to policyowners classified by gender, when in fact such pricing categories included consumers who exhibit a wide range of mortality outcomes, an example of heterogeneous insurance pricing categories. Kokott indicated that the wide range of mortality experience within a pricing category was inconsistent with Aristotelian equality, i.e., that the pricing practice did not charge unlike customers different

17. Title XII in the U.S. Civil Rights Act prohibits discrimination in employment (see <https://www.eeoc.gov/statutes/title-vii-civil-rights-act-1964>) in the U.S. The Charter of Rights and Freedoms (see <https://www.justice.gc.ca/eng/csj-sjc/rfc-dlc/ccrf-cddl/check/art15.html>) establishes similar rights in Canada. As was noted earlier, because insurance is regulated on a state- and province-level basis in the U.S. and Canada, insurance discrimination cases may also be subject to more localized human rights statutes in those jurisdictions.

18. See J. Kokott (2011) Opinion of Advocate General Kokott, available at <https://eur-lex.europa.eu/legal-content/GA/TXT/?uri=CELEX:62009CC0236>.

prices based on differences in their risk profiles. Kokott noted that such differences in risk levels could be attributable to “economic and social conditions as well as by the habits of each individual (for example, the kind and extent of the professional activity carried out, the family and social environment, eating habits, consumption of stimulant and/or drugs, leisure activities and sporting activities).”¹⁹ To the extent that males exhibit these unhealthy traits more than women, including gender as a pricing variable was an inexpensive proxy that insurers could use to indirectly measure these risk factors, recognizing that direct measurement of such health and socioeconomic characteristics within groups of men or women would otherwise be costly, difficult, and inexact.

In their analysis of the *Test-Achats* ruling, researchers (DeBaere and Goessens, 2012; Tobler, 2011) note that the decision built upon earlier employment discrimination rulings from the U.S. and the EU from the 1970s. At the center of these rulings was the argument that because women on average lived longer than men, employers often discriminated against women by charging women more than men for retirement annuities or reduced the benefits that women were eligible to receive from employment-sponsored retirement plans. For example, much of the legal analysis that followed the U.S. Supreme Court ruling in *City of LA v. Manhart*,²⁰ a watershed gender discrimination case, focused on the extensive overlap in mortality experience between retirement-age men and women.²¹ According to critics of gender-based insurance pricing, the mortality overlap reflected the fact that while gender-based pricing captured differences in mean prices across the sexes, the true factors explaining such heterogeneous pricing differences across genders—factors like poor diet, drug and alcohol abuse, and lack of exercise—in fact varied dramatically not only between genders, but also within gender-based pricing categories. Thus, it is less discriminatory to set premiums based on these heterogeneous health and lifestyle factors instead of on gender. As shown in Figure 2, the mortality overlap across genders would appear to continue today in Great Britain and presumably in other countries.

Legal efforts to ban the use of well-established pricing variables in insurance risk classification system often prompt considerable push-back from representatives of the insurance industry. Such was the case in the EU, as representatives of the insurance industry published position papers condemning the prohibition on gender-based pricing (Oxera, 2010, 2011). These papers indicated that banning the use of an insurance pricing variable that insurers have relied on for decades can inject pricing uncertainty in markets that no longer can use that variable. Such prohibitions can result in insurers being less able to differentiate between low- and high-risk

19. *Ibid.* paragraph 62.

20. *City of L.A. Dep’t of Water & Power v. Manhart*, 435 U.S. 702, 98 S. Ct. 1370, 55 L. Ed. 2d 657, 1978 U.S. LEXIS 23, 17 Fair Empl. Prac. Cas. (BNA) 395, 16 Empl. Prac. Dec. (CCH) P8250, 1 Employee Benefits Cas. (BNA) 1813 (Supreme Court of the United States April 25, 1978, Decided).

21. See, Brilmayer et al. (1980), Christiansen (1983), and Cummins et al. (1983). Christiansen includes one of the earliest figures graphing the longevity/mortality overlap across genders, similar to the overlap shown in Figure 2.

insurance applicants, an underwriting problem that results in reduced profitability to the extent that insurers are unable to screen out high-risks from the risk pools. In extreme cases, if insurers attempt to increase prices in a pricing category increasingly populated by high-risks, the resulting premiums may be higher than low-risk policyowners wish to pay, causing adverse selection, a market failure that can result in an even greater exodus of low-risk insurers from their risk pools.

Canada's Zurich Decision: Weighing Pricing Bans Against Market Disruptions

Avraham (2018) observes that concerns about discrimination must balance the societal benefits resulting from less discrimination against the potential cost that such pricing changes can have on insurance markets. Prohibitions on pricing variables should be undertaken cautiously and with an understanding that their full impact may lead to the loss of essential insurance protection for the public.²² The costs resulting from a ban on the use of an insurance pricing variable can range from a widespread shutdown of portions of the affected insurance market to more tempered modifications of pricing practices. Under the worst-case scenario, the court's decision to prohibit an insurance pricing variable can cause such pricing uncertainty that insurers dramatically reduce the supply of insurance in the affected marketplace.

By contrast, pricing prohibitions are much less disruptive if regulators can point to an alternative pricing variable that can serve as a substitute for the banned pricing variable. In this scenario, the cost of banning a pricing variable is not as likely to freeze insurance supply in the marketplace, although it may add costs to the risk classification process. Examples of such costs include the increased cost of gathering and incorporating the substitute pricing data into risk classification systems. Advancements in data analytics have recently made it increasingly cost-effective for insurers to develop alternative pricing variables.

An instructive example of a ruling that balanced the decision to ban a pricing variable against the resulting disruptive costs in the market is provided in the Canadian Supreme Court case *Zurich v. Ontario*.²³ The case involved a male driver who challenged as discriminatory the use of gender-based pricing in auto insurance. The courts agreed that the use of gender-based pricing variables was in violation of discrimination statutes in Ontario, the province in which the case was filed. However, the court was reluctant to ban the use of gender in pricing for fear of

22. In the case of *Test-Achats*, the legal opinion by the AG offered little discussion on how banning the use of gender-based pricing could disrupt insurance markets after the ban. Kokott (2011) offers an explanation in paragraph 68, noting that none of the parties in the case submitted arguments that unisex pricing could seriously endanger the financial equilibrium of private insurance systems.

23. *Zurich Insurance Co. v. Ontario (Human Rights Commission)*, [1992] 2 S.C.R. 321.

disrupting the market for private passenger auto (PPA) insurance. Instead, the Court concluded that the insurance industry should be granted a period of time to develop an alternative pricing variable to replace the use of gender in auto insurance risk classification systems. The ruling thus recognized that the potential cost of interfering with the normal functioning of the insurance risk classification systems was significant, whereas the cost involved in making an incremental change—finding a substitute pricing variable for gender—was less likely to dramatically disrupt the market.

Research chronicling how regulatory prohibitions of personal insurance risk classification variables have led to market disruptions has generally focused on bans on auto insurance pricing variables. In one of the earliest empirical examples of adverse selection resulting from regulatory pricing prohibitions, Dahlby (1983) reports that after regulators banned the use of gender-based auto pricing in Alberta, women purchased significantly less physical damage insurance coverage on their vehicles because the unisex premium was much higher. A 2020 ban on gender-based auto insurance pricing in California echoes Alberta's experience, as the state's insurance commissioner has publicly reported that the ban will result in younger women drivers paying more than men for auto insurance.²⁴ Worrall (2001) also reports that in response to criticism that a risk-based territorial auto insurance pricing plan was racially discriminatory because it charged higher premiums to drivers living in urban areas, New Jersey regulators replaced that portion of the risk classification system with one that capped the maximum premium that could be charged in urban areas, contributing to a decades-long auto insurance crisis that drove most private auto insurers out of the market. Unlike auto insurance, there generally are no compulsory insurance requirements for mortality-based insurance products in the U.S. Consequently, reported instances of market disruption in these product areas resulting from prohibitions of pricing variables are less common. Daniels (1990) reports on one highly publicized exception, however, discussing the reduction in life insurance underwriting that occurred around the time that the NAIC deliberated on banning the use of several types of controversial underwriting data (e.g., questions about sexual preference or screening for HIV infection) during the AIDS crisis.

Skeptics may question whether the *Zurich* ruling was effective, as the insurance industry did not provide a substitute variable for gender-based pricing within the original time frame set by the Court. Indeed, an alternative pricing variable for gender has not been proposed by the industry since the ruling.²⁵ Nonetheless, the pragmatism demonstrated in the *Zurich* decision is useful for regulators and the courts to consider when balancing the social cost of discrimination against the disruptive effects that can result from a ban on the use of an insurance pricing variable. Allowing sufficient time for the industry to test and adopt a substitute for

24. See p. 14 at <https://consumerfed.org/wp-content/uploads/2019/01/california-department-of-insurance-research.pdf>. (Retrieved Sept. 10, 2021).

25. British Columbia, Saskatchewan, and Manitoba do not use gender in auto insurance pricing, but the rest of Canada does.

the banned pricing variable reduces the likelihood of a more widespread disruption of the affected insurance markets.

Applying Aristotelian Equality Standards to Annuity Pricing

This section considers an application of Aristotelian equality to the risk classification process used to set prices in the personal annuity markets. Like the earlier discussion on gender-based pricing, it reaffirms how another insurance pricing factor typically prohibited by anti-discrimination statutes—pricing based on an applicant's race—is discriminatory in that it results in heterogeneous pricing that violates the legal standards of Aristotelian equality. Equally important, it demonstrates how recent research on the racial mortality crossover identifies useful alternative pricing variables that effectively measure the underlying heterogeneity across racial categories, consistent with the spirit of Canada's *Zurich* ruling. Two aspects of this market make it an especially timely case study.

First, although personal annuities have traditionally been priced with minimal insurance under-writing, based only on the applicant's age and sex, the last decade has witnessed greater interest in developing more extensive risk classification systems for these products. Much of this interest is related to the development of enhanced (also known as substandard or medically underwritten) annuity products to impaired applicants who provide evidence to insurers about having health issues that often lead to an earlier death in the hopes of obtaining higher annuity payments while alive (Fong, 2015; Gatzert and Klotzki, 2015). In addition, some countries have considered the adoption of mandatory annuitization statutes to stabilize retirement income across retirees and reduce dependence on social insurance programs, with the United Kingdom (UK) mandating annuitization in the late 1990s through the mid-2010s. As these enhanced annuity pricing protocols have been developed, insurers have focused on identifying pricing variables that are useful in accounting for different levels of longevity risk among annuity applicants.

Second, studies indicate that mortality rates vary significantly across Americans of different races, with Black Americans generally experiencing higher rates of mortality over their lifetimes when compared to other races. Assuming such mortality trends hold true for the personal annuity markets, Black annuitants would in theory receive higher monthly payments than non-Black annuitants because insurers would pay them annuity payments on average for a shorter period of time. To complicate matters, however, numerous studies have reported that among people who have reached retirement age, the mortality rates of White Americans cross over and become higher than those of Black Americans. The age at which the crossover occurs varies across studies, with studies indicating that it generally occurs at ages in the mid-80s (Masters, 2012). Researchers have studied the Black/White mortality crossover for more than two decades, yielding potentially useful information about annuity pricing.

Surprisingly, while many insurance practitioners assume that race-based insurance pricing is illegal throughout the U.S., there is at best only general statutory support for that assumption. In their review of state insurance discrimination laws, Avraham et al. (2014) found that only about half the states expressly ban race-based pricing, with most of the remaining states having less definitive restrictions on such pricing. To be clear, concerns about a potentially negative public response would undoubtedly convince insurers that it would not be publicly acceptable business practice to publicly condone race-based insurance pricing, even if it were possible to provide more generous benefits to risk groups with shorter life expectancies. Using racial data in insurance underwriting is also banned by many countries' anti-discrimination statutes, including those found throughout North America and the EU. Moreover, such pricing would not measure well against the standard of Aristotelian equality due to heterogeneity across racial categories, as reflected by the findings of the mortality crossover research discussed below.

The Federal Trade Commission (2007) reports that there are few studies of racial differences across insurance pricing categories because insurers do not keep data on the racial backgrounds of their customers. The crossover studies help to fill this knowledge gap by including variables in their models to test for differences across racial categories, thus offering useful information about differences in mortality within and across these groups. To the extent that such mortality experience holds true in insurance pricing, the crossover literature also suggests some parallels between the mortality data classified by race and by gender. Gender and race were pricing variables that early insurers could collect easily and inexpensively that roughly proxied differences in expected losses across insurance policyowners. However, if measured against the standard of Aristotelian equality, it is the heterogeneity of mortality experience within these pricing groups that poses an issue today. Like gender, the mortality crossover research demonstrates that people classified by race exhibit heterogeneous mortality experience, thus indicating that race-based pricing would be discriminatory because it fails to charge different premiums to people exhibiting different levels of risk.

Based on the crossover studies, researchers have offered a variety of explanations for the heterogeneity in mortality across Black and White Americans. Lynch et al. (2003) and Masters (2012) note that the two leading explanations for the crossover are poor data quality and population heterogeneity, with the latter corresponding to heterogeneity related to frailty effects, socioeconomic status (as measured by education), and lifestyle choices. A summary of some of the leading explanations for the mortality crossover is provided below.

Data Limitations

In his paper on demographic mortality patterns among retirees, Brown (2002) provides one of the first discussions of the mortality crossover in the annuity and retirement insurance literature. He indicates that early research on the topic focused on whether the crossover could be explained by inaccurate mortality data maintained by the Social Security Administration (SSA) pertaining to the age at

death of the some of the oldest Black beneficiaries in the SSA databases. Research by Preston et al. (1996) reported that when Black death certificate age-at-death data was cross-checked against U.S. census data and SSA databases, a significant number of deaths were incorrect, in part because some of the deceased had intentionally overstated their ages in earlier years (e.g., to become eligible for government programs). By contrast, to confirm that the crossover was not attributable to inaccurate age data, Kestenbaum (1992) corrected for errors in both Black and White mortality differentials using SSA and Medicare data on beneficiaries at and over age 85, concluding that White mortality rates cross above Black mortality rates at ages 86 for men and 88 for women based on 1987 data. Subsequent studies indicate that the age that the crossover occurs is drifting upward over time (Lynch et al., 2003; Masters, 2012). Given these data issues, an open research question is whether the crossover will continue to exist in future years when older Americans with presumably more reliable age data enter into the 80s and early 90s age categories.

Frailty Effects

A leading explanation for the mortality crossover assumes that health levels are heterogeneous across individuals, such that American racial subpopulations initially consist of both frail and robust people. Focusing on the frail, researchers (e.g., House et al., 1994; Johnson, 2000; Lynch et al., 2003; Preston et al., 1998) posit that older Black Americans who have survived challenging mortality conditions—e.g., surviving despite limited medical resources and greater exposure to life-threatening issues—make up a higher percentage of the survivors in their age categories because the frail members of their group died at younger ages. Conversely, assuming that older White Americans have generally had better access to health care during their lifetimes, a higher percentage of the frail members in this group live to older ages, thus increasing the mortality rate for older Whites above that for older Black Americans. These findings suggest that insurers can improve annuity pricing accuracy by including measures of medical history, such as incidence of fatal diseases, into their underwriting process to better differentiate between the robust and the frail. Recent studies have yielded similar but more finely tuned results. For example, by adding variables controlling for age cohorts into his model,²⁶ Masters (2012) found significant differences in mortality across the cohorts, with the racial crossover diminishing except among the oldest cohorts, aged 80, 85, and 90.

26. The cohorts control for longitudinal differences in mortality, capturing factors that decrease mortality (e.g., vaccines, antibiotics, and declines in smoking) and increase mortality (e.g., increased stress from work/life imbalance, higher divorce rates, and poor diet and nutrition) over time.

Socioeconomic Status, As Measured by Years of Education

An alternative view on mortality heterogeneity focuses on the differences in socioeconomic status between older Black and White Americans (e.g., see Masters et al., 2012; Sautter et al., 2012), showing that the mortality crossover can be explained in part by establishing the relationship between mortality rates and education, a metric commonly used to measure socioeconomic status. This literature suggests that old-age mortality effects can be explained by the number of years of formal education attained by the annuitant. For example, using models that classify education levels into three categories (less than a high school education, high school education, and more than a high school education), Masters et al. (2012) note that higher education levels were associated with significantly lower mortality for Black men and for both White women and men. Moreover, they report that differences in old-age mortality attributable to different educational levels are larger for preventable causes of death—i.e., causes that more educated older people can take steps to avoid—than for mortality risk considering all causes of death. Fong (2015) similarly notes that the inclusion of variables measuring years of education in mortality models attenuates the effect of race on mortality.

Lifestyle Pricing Variables

Statistical models used in studies of the racial mortality crossover often include control variables related to a person's lifestyle that correlate to mortality. Two of these variables, body mass index (BMI) scores and smoking, are useful in explaining racial differences in mortality. Although the inclusion of BMI scores in mortality models is often used as a control variable for the incidence of obesity in the U.S., low measures of BMI are often more useful as a measure of underweight conditions, which are associated with underlying diseases (Dupree et al., 2006; Yang and Lee, 2009). Smoking is generally associated with elevated mortality rates (Dupree et al., 2006; Johnson, 2000). Yang and Lee (2009) report that variables testing for differences between Black and White Americans' health are statistically significant when the BMI and smoking control variables are not included in their models, but that race is not significant in models that include the two control variables. This indicates that the lifestyle control variables are necessary to account for differences across and within racial categories. Looking beyond lifestyle variables that are strictly related to health, Dupree et al. (2006) also report that participation in religious activities is related to the mortality crossover, as younger Black Americans who are active in their church are more likely to survive to old age, thus diminishing the effects of frailty.

Comparisons with Annuity Pricing

The ECJ based its ruling in the *Test-Achats* case upon Aristotelian equality to explain that insurance pricing based on gender, a protected class listed in the Charter

of Fundamental Rights, was discriminatory because people priced by gender exhibit different risk characteristics from others sorted into their risk pools. Based on the same legal argument, this section has shown that the findings from the mortality crossover studies indicate that race-based pricing is similarly discriminatory, as race-based pricing categories do not by themselves account for the heterogeneous risk characteristics found within and across pricing categories. Given that the research on the mortality crossover follows a path similar to that used in risk-based pricing in insurance—i.e., accounting for heterogeneity in risk groups by developing more detailed models that incorporate additional variables correlated with risk factors—thus leading to more accurate insurance pricing based on the expected losses of the resulting subgroups, it is useful to compare the results from the crossover studies to the risk classification methods currently used by enhanced annuity insurers.

While insurers have traditionally priced standard annuities using only age and gender, the ECJ has criticized such age/sex underwriting as overly heterogeneous. In contrast, the evolution of the enhanced annuity market²⁷ has prompted some insurers to increase the number of pricing variables in enhanced annuity risk classification systems (Gatzert and Klotzki, 2015). The pricing variables added to traditional age/sex annuity pricing mirror the results from the crossover studies. Consistent with the frailty studies, enhanced annuity insurers include data on medical history and fatal diseases into pricing, with some insurers also offering enhanced benefits to smokers (Gatzert and Klotzki, 2015; Wuppermann, 2017). In addition to these variables, Brown and McDaid (2003) identify a broader list of potential enhanced annuity pricing variables, including participation in religious activities, years of education, and BMI, consistent with the crossover literature.²⁸ In a study assessing how the inclusion of potential additional pricing variables improves annuity underwriting performance, Fong (2015) reports that diabetes is the single pricing variable that, when added to traditional standard annuity risk classification schemes based only on age and gender, yields the greatest improvement in mortality prediction based on the adjusted R-squared values in her hazard models, followed in ranked order by lung disease, heart disease, psychiatric condition, and years of education. In short, advancements in enhanced annuity underwriting have incorporated additional pricing variables that are consistent with the research on the racial mortality crossover, reflecting efforts to reduce heterogeneity and attract low-risk annuitants with more generous benefits.

27. Gatzert and Klotzki (2015) report that enhanced annuities accounted for 28% of all sold annuity policies in the UK in 2014 but suffered declining popularity after the country repealed its mandatory annuitization requirement in 2015. Enhanced annuities are a niche product in most other countries without mandatory annuitization. Enhanced annuities have generally accounted for no more than 10% of the immediate annuity market in the U.S. *Ibid.* Gatzert and Klotzki (2015) also report that German insurers are concerned about enhanced annuities cannibalizing their existing book of annuity business, causing them to not actively compete in the enhanced annuity submarket.

28. The full list of potential pricing variables identified by Brown and McDaid includes age, gender, race, education, income, occupation, marital status, religion, health behavior, smoking, alcohol intake, and obesity (BMI).

On balance, based on a comparison of the crossover mortality literature (studies that specifically include race in their analysis) and enhanced annuity pricing (pricing decisions by insurers that legally cannot consider race), there is consistent support for bans on race-based insurance pricing. Based on Aristotelian equality, race-based insurance pricing would be discriminatory if it charged people classified into common racial categories the same price when they exhibit dissimilar risk characteristics. On the other hand, the expanded number of pricing variables included in risk classification systems used in the newer enhanced annuity markets are increasingly consistent with the discrimination benchmark of Aristotelian equality, as these systems calculate premiums more granularly, based on the wider variety of underlying risk characteristics that differ across and within race-based pricing categories.

Conclusion

Discussions of regulatory and legal efforts to ban the use of discriminatory insurance pricing variables often overlook the role of heterogeneity within insurance pricing categories. This study demonstrates how the use of insurance pricing variables like race and gender that are banned in anti-discrimination statutes in the EU and North America can be criticized for violating pricing standards set by Aristotelian equality, i.e., charging a common premium to policyowners who exhibit different underlying risk profiles. Drawing from global court rulings on insurance discrimination, this study provides a balanced approach to the insurance discrimination discussion by recognizing that decisions to ban pricing variables must also consider the potential costs related to the disruption of functioning insurance markets. As suggested in Canada's *Zurich* decision, bans are less likely to disrupt markets if useful substitute pricing variables are available, which is increasingly likely in this era of data analytics.

The purpose of this research was three-fold. First, this article discusses how legal rulings on insurance price discrimination generally focus on statistical considerations pertaining to insurance risk classification systems that are sometimes overlooked in the actuarial discussions on the topic. Specifically, actuarial standards of practice generally focus on pricing methodologies that support mean-based pricing through the use of the law of large numbers. By contrast, such practices can be criticized for charging the same premium to all policyowners in a risk pool when in fact the policyowners have different risk profiles, thus calling for different prices. Regulators and judges are especially likely to object to risk classification schemes that use a pricing variable that is prohibited by anti-discrimination statutes when the use of that pricing variable results in pricing heterogeneity,²⁹ i.e., when

29. The Aristotelian equality standard used by the ECJ in the *Test-Achats* insurance discrimination case focused on gender-based pricing. It remains to be seen if the court will apply the same standard for other banned pricing variables that are used in insurance pricing—the most

policyowners pay the same price because they are classified within a common risk pool when in fact the policyowners in that pool have different risk characteristics. Such pricing practices are inconsistent with the legal applications of Aristotelian equality because they charge the same premium to policyowners with different risk profiles.

Second, regulatory and court decisions to ban the use of an insurance pricing variable should be carefully considered if such decisions are so potentially disruptive that insurers cannot continue to provide essential protection to their customers. As the Canadian Supreme Court ruled in *Zurich*, a preferred alternative is for regulators to provide insurers a sufficient period of time to identify and begin to use a substitute pricing variable before prohibiting the use of a pricing variable. In this regard, calls to discontinue the use of a discriminatory pricing variable should be weighed against the cost of disrupting the insurance markets; bans of pricing variables may not be advisable if the insurance market will be badly compromised or if a suitable substitute pricing variable is not readily available. Fortunately, recent trends in insurance data analytics have made it increasingly cost-feasible for insurers to develop a variety of substitute pricing variables.

The final portion of this study has examined how the concept of Aristotelian equality can be applied in support of prohibitions of race-based pricing in the personal annuity market. Research on the racial mortality crossover indicates that using race as an insurance pricing variable would likely create pricing categories that include heterogeneous policyowners. Fortunately, insurers can control for such heterogeneity by basing the price of annuities not only on age and gender, but also on additional pricing variables like medical history, socioeconomic, and lifestyle measures. Thus, insurers that use an increased number of pricing variables in enhanced annuity risk classification are better equipped to set prices in a manner that reflects the true risk profiles of their annuity customers.

obvious being age—but listed as a protected class in the Charter. See Kelly and Nielsen (2006) for further discussion on appropriateness of age in insurance pricing.

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Cummins, J. David and Richard A. Derrig, eds., 1989. *Financial Models of Insurance Solvency*, Norwell, Mass.: Kluwer Academic Publishers.

Manders, John M., Therese M. Vaughan and Robert H. Myers, Jr., 1994. “Insurance Regulation in the Public Interest: Where Do We Go from Here?” *Journal of Insurance Regulation*, 12: 285.

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“Spreading Disaster Risk,” 1994. *Business Insurance*, Feb. 28, p. 1.

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