

# Challenges and Opportunities with Rethinking Fairness Metrics for Life Insurance Processes: An Actuarial Perspective

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## An Actuarial Perspective

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# Challenges and Opportunities with Rethinking Fairness Metrics for Life Insurance Processes

## An Actuarial Perspective

### Introduction

Precept 1 of the actuarial [Code of Professional Conduct](#) calls upon actuaries to act “honestly, with integrity and competence, and in a manner to fulfill the profession’s responsibility to the public...” Precept 7 of the same Code expects actuaries to act “fairly.”<sup>1,2</sup> However, the *Code of Professional Conduct* does not define these terms.

Within the actuarial and insurance industries, there has been much discussion and effort aimed toward rethinking whether processes involved in the development and management of life and other insurance products are fair. Regulators, actuaries, other insurance industry professionals, academics, consumers, advocates and others have varying perspectives on concepts of fairness in this context—sometimes widely varying perspectives. One thing is clear: defining fairness for life insurance processes is complex and challenging as well as subjective.

The Society of Actuaries Research Institute submits to the public discourse this summary of the challenges and complexities involved in trying to define fairness for life insurance processes in the United States. The insurance industry is well regulated, with regulations focused on two objectives: financial solvency of insurance companies and fair treatment of policyholders and claimants.<sup>3</sup> The U.S. legal framework offers specific legal definitions for insurance that one might consider definitions of fairness. This report intends to objectively inform readers about broader issues with respect to fairness in the context of processes involved in developing and managing life insurance, especially risk classification, *without offering specific solutions or engaging in legal or political debate*. Understanding these challenges and complexities is a prerequisite for defining fairness in a life insurance context, which is necessary prior to defining adequate fairness metrics. It also presents opportunities for rethinking fairness in life insurance processes.

The content of this report is the result of multiple interviews by the author with an advisory panel of actuaries who have been deeply involved in questions of fairness in life insurance from an actuarial perspective, and they want life insurance processes and the results of those processes to be fair. This report summarizes the concepts and considerations that the author and advisory panel have collectively studied in that context. Contents of this report are limited to actuarial perspectives within a financial

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<sup>1</sup> Society of Actuaries, 2001, *Code of Professional Conduct*, Society of Actuaries, <https://www.soa.org/about/governance/about-code-of-professional-conduct/>.

<sup>2</sup> The *Code of Professional Conduct* Precept 1, Annotation 1–2 prohibits violating or evading statutes, regulations, judicial decisions and other statements that have legally binding authority.

<sup>3</sup> National Association of Insurance Commissioners and The Center for Insurance Policy and Research, 2011, “State Insurance Regulation,” [https://content.naic.org/sites/default/files/inline-files/topics\\_white\\_paper\\_hist\\_ins\\_reg.pdf](https://content.naic.org/sites/default/files/inline-files/topics_white_paper_hist_ins_reg.pdf).

system where life insurance is typically a for-profit enterprise, i.e., the current U.S. financial system. Arguments for or against the current financial system are beyond the scope of this report.

*The author and advisory panel agree that the contents of this report reflect many if not most of the major actuarial points of view on issues associated with fairness in the development and management of life insurance. Any opinions or conclusions expressed or implied in this report are those that author or advisory panel have heard or seen expressed and do not represent any official position or opinion of the author, the advisory panel, the advisory panel's employers, the Society of Actuaries, the Society of Actuaries Research Institute, or Society of Actuaries members.*

## The Definition of “Fairness” is Subjective

As noted in the Introduction, the intent of this discussion is to objectively outline many of the challenges, considerations and nuances involved when thinking about fairness in the context of life insurance in the U.S., not to offer definitions of fairness that might be appropriate for a life insurance context.

To determine whether something is fair, one needs a definition of “fair” to evaluate against. Consider these definitions of “fair” from common, open access online American English language dictionaries:

- Merriam-Webster Dictionary: “marked by impartiality and honesty: free from self-interest, prejudice, or favoritism.”<sup>4</sup>
- Cambridge Dictionary: “treating someone in a way that is right or reasonable, or treating a group of people equally and not allowing personal opinions to influence your judgment.”<sup>5</sup>

While these definitions differ somewhat, they are vague and do not provide specific guidance as to how to measure fairness and thus leave open the potential inclusion of personal or societal blind spots, beliefs or perspectives, rather than based only on facts. As actuaries consider the challenges and opportunities with rethinking fairness in the context of life insurance processes, these dictionary definitions offer little help; actuaries need a more technical and precise definition.

Actuaries may be more accustomed to working with more objective, less open-ended definitions. Indeed, the Society of Actuaries begins a history of its background with a John Ruskin quote that has been thought of as a motto of actuaries, “The work of science is to substitute facts for appearances and demonstrations for impressions.”<sup>6</sup> Nonetheless, some advisory panel members consider actuarial work to be a cross between science and art. The challenge of defining fairness in the context of life insurance processes puts the Ruskin quote to the test. Rethinking fairness in life insurance processes presents opportunities to develop definitions that are clearer, more technical and precise, and that will hold up to scrutiny from both analytical and subjective perspectives.

### ONE SIZE DOES NOT FIT ALL

Defining “fair” so that life insurance processes and their results can be evaluated for fairness requires measuring, or quantifying, a subjective concept. When thinking about where to begin, it becomes apparent

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<sup>4</sup> Merriam-Webster.com, Dictionary, s.v. “fair,” accessed 2023 August 18, <https://www.merriam-webster.com/dictionary/fair>.

<sup>5</sup> Cambridge Dictionary, s.v. “fair,” accessed 2023 August 18, <https://dictionary.cambridge.org/us/dictionary/english/fair>.

<sup>6</sup> Society of Actuaries, “Historical Background,” accessed 2023 August 18, <https://www.soa.org/about/historical-background/>, John Ruskin, 1853, The Stones of Venice—Volume III.

that a single definition of fairness will likely not suffice, in part because fairness concepts often depend on perspective. This report discusses several general perspectives for fairness in the context of life insurance.

One could argue that every decision—no matter how small—involved in developing, rating, pricing and marketing any product, including life insurance products, presents an opportunity to exercise fairness or unfairness. This suggests that there may be definitions of fairness or unfairness that are more or less helpful, depending on the context. How one thinks about these concepts of fairness in the context of life insurance also depends on several factors, including:

- Product life cycle setting
- Perspective
- Shifting societal attitudes
- Definition precision
- Technology

Each of these factors is explored below.

### **INSURANCE LIFE CYCLE SETTING**

Fairness definitions for life insurance processes likely depend on the process's purpose, which is influenced by the insurance life cycle in which the process operates. Hence, different phases of the insurance life cycle may call for different fairness definitions. For example, evaluating fairness in processes for choosing a target audience for marketing life insurance likely involves some considerations that do not apply when looking at fairness in claims management or fraud detection. Choosing a target market influences who is likely to learn about and potentially buy a life insurance product—it has a great impact on who believes they have access to a product. It is also a decision that is largely invisible to people outside the target market.

Claims administration, on the other hand, affects only the beneficiaries of the people who had chosen to buy the insurance. In addition, the beneficiaries who potentially believe they have been treated unfairly have a clearer pathway for addressing their concerns that may be visible and impactful. These differing dynamics may lend themselves to different considerations when defining fairness.

### **PERSPECTIVE**

Understanding perspective in the context of fairness in life insurance processes is about understanding to whom a process or result is fair or unfair. When considered alone, competing perspectives may have competing definitions of fairness.

In a for-profit, competitive economic environment, individual consumers decide the value of a good or service relative to the price. To illustrate the general business concept, consider purchasing airline tickets. A fully refundable first-class ticket costs more than economy-class seats. In addition to refundability, first-class seats are likely to be wider, have more legroom, in the front of the plane, and include complimentary meals and other benefits that are not available to economy-class passengers, at least not without an additional fee. Airlines often have multiple ticket classes, each with their own price tag and accompanying benefits or lack thereof. When purchasing an airline ticket, consumers decide whether the benefits that accompany higher price tags are worth the value.

Now suppose that the higher-priced airline tickets partially subsidize the lower-priced tickets, resulting in airline travel being more financially accessible to more people. Is it fair or unfair that people who choose to

buy first-class tickets and reap the accompanying benefits subsidize the tickets of people buying economy-class seats?

Consider further an exceptionally tall or large passenger who cannot fit into the lower-priced economy seats. To fit into a seat, the passenger must buy a more costly ticket for a larger seat, and the costliest ticket may include additional benefits that are of little interest to the passenger. Is it fair or unfair that the passenger is forced to buy a more costly seat? Would it be fair or unfair to require the airline to sell the large passenger a large seat at an economy-seat price? Would it be fair to require the airline to make all the seats the same size, so the large passenger would not be forced to pay more than other passengers, when doing so would mean fewer seats to sell on the plane, which means the average seat price would need to increase?

Now shift to life insurance. Like buying airline tickets, buying life insurance is voluntary. Is it fair or unfair to require an insurance company to sell insurance to higher-risk consumers at lower-risk prices? Is it fair or unfair for policyholders who live in one locale to subsidize those who live in another locale? Is it fair or unfair for policyholders from a demographic group that are less likely to die an early death by violent means to subsidize those from a demographic group who are more likely to die an early death by violent means?

Responses to each of these questions may depend one's perspective, or "fair to whom?". A subsequent section in this report discusses extensively topics related to "fair to whom?" in the context of life insurance.

### SHIFTING SOCIETAL ATTITUDES

As previously noted, what is considered fair is subjective and to some extent—perhaps to a great extent—a reflection of societal sentiment. Thus, what is considered fair is temporal by nature and needs to be revisited from time to time.

Whole life insurance presents challenges with topics of fairness that are not a concern with one-year term life insurance. One-year term life insurance is purchased annually and provides a pre-defined benefit amount if the insured dies within the pre-defined benefit period (i.e., one year). Whole life insurance provides a pre-defined benefit amount if the insured dies at any time from the time of purchase through the remainder of the insured's life. Societal attitudes that shape the structure and pricing of a whole life policy purchased may shift dramatically between the purchase date and the date the insured passes away. If a whole life insurance policy was considered fair, let's say 30 years ago, but no longer conforms to contemporary ideas about fairness, is it still fair?

Life insurance rates may increase or decrease for any number of reasons that are unrelated to shifting societal attitudes. How do such changes play into questions of fairness? For example, historically increasing longevity may cause life insurance rates to drop, assuming all other things are equal. Thus, a 60-year-old who purchased whole life insurance 20 years ago at age 40 has enjoyed the transfer of financial risk associated with early death to the insurance carrier for the past 20 years. A current 40-year-old who buys whole life insurance may pay a lower price now than the 40-year-old would have paid 20 years ago because people are generally living longer now than they did 20 years ago. Do increases in longevity, as evidenced by data, make rates that were set 20 years ago unfair because policyholders who purchased life insurance then do not enjoy the lower rates available now for potential new policyholders?

Two additional questions to consider when thinking about fairness in the context of life insurance:

- How do changes in societal attitudes differ from changes in factual data?
- How are changes in factual data related to changes in societal attitudes?

## DEFINITION PRECISION

The precision of definition matters, in part because it affects outcomes of fairness evaluation. For example, when evaluating for fairness across races or ethnicity, the definitions for race and ethnicity that are used to classify people can significantly affect results and are critical to understanding the results. Some of the considerations at play include:

- In a diverse society where marriage across races or ethnicities is common, assigning people to a single race or ethnicity may be problematic. In addition, as people study their genealogy, they may learn of ancestors who are of a different race or ethnicity than they had previously considered themselves and begin to identify themselves by as ancestor's race or ethnicity.
- Self-reporting versus assignment or estimation of race or ethnicity: individuals may consider themselves a different race or ethnicity than society at large would assign them.

## TECHNOLOGY

Various definitions of fairness, degrees of definition precision and/or approaches for evaluating fairness may lead to differing evaluation outcomes. In addition, technology considerations and limitations, which can be extensive, can significantly impact outcomes. Much literature is available on the topic, including the following Society of Actuaries Research Institute papers: [Ethical Use of Artificial Intelligence for Actuaries](#) and [Avoiding Unfair Bias in Insurance Applications of AI Models](#).<sup>7</sup> Technology considerations and limitations include data availability and its quality limitations, a subject on which much has also been written. Further discussion of technology considerations and limitations is beyond the scope of this paper.

## Focus on Risk Classification

As noted above, definitions of fairness for life insurance processes depend on the insurance life cycle setting, among other things. Defining fairness for all life insurance processes is a worthy endeavor. However, the topic of fairness with respect to risk classification is much more complex and nuanced, as well as less understood, than fairness with respect to other life insurance processes. The process of defining risk classes according to similar expected cost of claims within a given time period is a deeply actuarial topic. For those reasons, the remainder of this discussion will focus on risk classification.

Fairness with respect to risk classification in life insurance is complex and nuanced and may not be well understood by the general public.

## PURPOSE OF LIFE INSURANCE

Buying private-sector life insurance in the U.S. is optional. The U.S. has social insurance, other government programs and social services which aim to alleviate the financial risks of surviving at a subsistence level. To purchase life insurance is to buy supplemental protection for one's survivors against the risk of potentially devastating financial losses in the event of one's death.

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<sup>7</sup> N. Raden, 2019 September, *Ethical Use of Artificial Intelligence for Actuaries*, Society of Actuaries, <https://www.soa.org/resources/research-reports/2019/ethical-artificial-intelligence/> and L. Smith, et al, 2022 August, *Avoiding Unfair Bias in Insurance Applications of AI Models*, Society of Actuaries, <https://www.soa.org/resources/research-reports/2022/avoid-unfair-bias-ai/>.



Life insurance works by pooling risk; that is, spreading the potential burden of loss among a large group of individuals within a risk class. As an illustration, consider, for example, a hypothetical term insurance policy that pays a benefit of \$100,000 to anyone in the insured group who dies within a year. The insured group, comprised of policyholders, is divided into a discrete set of risk classes. Every policyholder in a given risk class pays the same amount of money (premium) at the start of the year because their expected claims are the same. Throughout the year, all policyholders in the risk class enjoy the same transfer of financial risk associated with death within the year, but only some of them will die within the year. At the end of the year, the premiums of surviving policyholders within a given risk class have funded the benefits of the policyholders within that same risk class who died.

At the core of risk classification is estimating the value of future claims. For life insurance, the value of future claims depends on both the benefit amount, which is known, and when death will occur, which is unknown. Time of death for an individual is not only unknown, but also wildly unpredictable. An individual could die at their age of life expectancy, but more likely they will die either earlier or later—perhaps much earlier or much later. Risk classification is the basis for estimating the value of future claims as well as a means for managing the uncertainty of cost.

In essence, defining fairness in life insurance risk classification boils down to defining the conditions under which it is fair for one group of individuals who buy life insurance to be pooled together because they have

Defining fairness in risk classification boils down to defining the conditions under which it is fair to differentiate between people.

homogenous risk that lead to the same expected claims costs based on probabilities. Within the pool or risk class, actual deaths will occur at different, random times. The policyholders within a risk class—who had the same expected claims costs at the beginning of the policy—pooled their risk so they could all enjoy the same benefit: the transfer of financial risk associated with early death to the insurance company.

#### ECONOMIC UTILITY OF LIFE INSURANCE TO SOCIETY

In a voluntary system, there may be limits on the degree of subsidy that the system will support. Risk classification is a means of pooling similar risks within groups and limiting subsidization of risk across groups. Insurers group policyholders with similar expected costs into the same risk class and charge them premium rates based on the insurer's best estimate of expected costs. The intent is to pool together risks that are random and avoid pooling known risk differentials.

For illustration, consider a hypothetical risk class comprised of ten individuals with the same characteristics and age who have had the same type of terminal cancer for the same length of time. Although they have the same average expected future lifetime (life expectancy), their actual deaths are likely to occur at ten different times, but the average of those expected time is the expected time that is used in the estimated cost of claims. However, to include cancer-free individuals of the same age and characteristics in this risk class would introduce individuals with a different (i.e., higher) life expectancy into the risk class. As a result, the new estimated cost of claims for the combined group would be somewhere between the original estimated cost of claims and the estimated cost of claims for the cancer-free group alone; the cancer-free individuals will subsidize the individuals with cancer.

In a voluntary system, departing from risk classification and its associated rating (the calculation of relative risk associated within a risk class) that estimates the expected costs may undermine the sustainability of the system or negatively impact the number of individuals willing to participate in it. Either of these potential outcomes could reduce the economic utility of life insurance to society.

Consider a life insurance example from history. During the 19th century, one could join an assessment life insurance society that would pay a small benefit upon the death of a member. Members were assessed a monthly payment that was not reflective of the expected cost of benefit and was less than the cost of purchasing life insurance from a traditional insurer. Consequently, assessment life insurance became much more popular than traditional life insurance. However, by the turn of the 20th century, most of the assessment societies had failed. Those that survived reorganized as traditional life insurance companies or modified their methods to resemble traditional life insurance companies.<sup>8</sup>

Evaluating the fairness of risk classification includes evaluating whether a particular risk classification process or practice supports the purpose of the product and enhances its economic utility to society.

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## Context for Parity

Risk classification consists of two distinct phases:

1. Determining the number of risk classes to be created, which involves balancing the considerations of risk grouping with marketing, operational and administrative constraints.
2. Determining the criteria by which an applicant will be assigned to a risk class based on one or more characteristics, behaviors, or choices. For life insurance, those characteristics, behaviors or choices tend to fall into one of three groups:
  - a. Behaviors or choices that people can fully control,
  - b. Characteristics of people that are outside of their control and
  - c. Characteristics, behaviors, or choices that are not fully within a person's control.

### CHARACTERISTICS OUTSIDE OF A PERSON'S CONTROL

On life insurance risk classification, one initial sentiment may be that differentiating people based on characteristics that are outside of an individual's control may not be fair.<sup>9</sup> Some examples of characteristics outside of a person's control include biological sex,<sup>10</sup> age and genetics, including race and ethnicity. Some of these characteristics may be associated with clear differences in mortality rates—which may be common knowledge by the public—and are grounded in actuarial principles that have been generally accepted as sound. For example, it is well understood that all other things being equal, an older person has a greater

<sup>8</sup> Miles M. Dawson, 1905 Sep., "Assessment Life Insurance", *The Annals of the American Academy of Political and Social Science*, Vol. 26, Insurance, pp. 120–127, <https://www.jstor.org/stable/1011009>.

<sup>9</sup> In this context, "fair" is loosely defined as treating someone in a way that is right, similar to the Cambridge Dictionary definition.

<sup>10</sup> This paper uses "sex" in a biological context, referring to the reproductive organs a person is born with.

### Illustrative Example A: 10-Year Age Difference

Two applicants for one-year term life insurance have similar underwriting information except they are 10 years different in age. Assume the mortality rate for the older person is 3 times that of the younger applicant, and the younger applicant's mortality-based premium is \$50. Also assume that premium loads, including commissions, are 30% and expenses are \$20 per policy:

$$\text{Premium} = \frac{\text{Mortality Premium} + \text{Expenses}}{1 - \text{Premium Load}}$$

$$\text{Younger Premium} = \frac{\$50 + \$20}{1 - .30} = \$100$$

$$\text{Older Premium} = \frac{(\$50 \times 3) + \$20}{1 - .30} = \$243$$

chance than a younger person of dying in the next year. Age is not a result of a decision; it is outside of a person's control.

Suppose there are two life insurance applicants with similar underwriting information except they are 10 years different in age, and the insurance company uses a mortality table that predicts higher death rates for the older applicant, hence higher expected claims costs, but otherwise the two policies will be consistently priced. Higher expected claims cost for the older applicant is statistically valid and credible based on analysis of mortality data from millions of lives across centuries. Would it be fair to the older applicant to charge a higher rate just because he or she is older? Would it be fair to the younger applicant not to charge the older applicant a higher rate?

Another example that is generally understood by the public is mortality differences by sex. Centuries of analyses by many different sources have found clear differences in mortality rates based on sex, and it is common knowledge that in the 21st century, life expectancy for females is generally greater than that for males. Future research may enhance the ability to distinguish between biological and behavioral attributes that could reduce the life expectancy gap between males and females. In the U.S., life insurance is typically priced differently for males and females. However, the European Union has required sex-neutral insurance pricing since late 2012.<sup>11</sup> However, the potential for adverse selection introduces a significant likelihood of outcomes that may be considered more objectionable. Adverse selection is discussed in a later section of this report.

### BEHAVIORS OR CHOICES FULLY WITHIN A PERSON'S CONTROL

Behaviors or choices that are fully within a person's control include whether to engage in dangerous leisure activities, such as rock climbing without safety equipment, parachuting and cliff diving, to name a few.

Smoking is another example of a behavior or choice that has generally been considered fully within a person's control (not considering the effect of nicotine addiction). All other things being equal from a mortality risk perspective, most people who do not engage in such activities would not want to pay the same price for life insurance as someone who regularly engages in them.

<sup>11</sup> EC-European Commission, 2012, "Guidelines on the application of Council Directive 2004/113/EC to insurance, in the light of the judgment of the Court of Justice of the European Union in Case C-236/09 (Test-Achats) C-11/1," <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2012:011:0001:0011:en:PDF> .

With respect to behaviors or choices that are fully within a person's control, questions of fairness in risk classification are typically limited to the strength of association between the behavior or choice and the resulting increased or decreased risk level, rather than whether to include the behavior or choice as a factor in risk classification.

#### **Illustrative Example B: Smoker and Nonsmoker**

Two applicants for one-year term life insurance have similar underwriting information except one is a smoker and the other is not. Assume the information from Illustrative Example A for the younger applicant and that mortality rates for smokers are double those of non-smokers.

$$\text{Nonsmoker Premium} = \frac{\$50 + \$20}{1 - .30} = \$100$$

$$\text{Smoker Premium} = \frac{(\$50 \times 2) + \$20}{1 - .30} = \$171$$

### **CHARACTERISTICS, BEHAVIORS, OR CHOICES NOT FULLY WITHIN A PERSON'S CONTROL**

Whether or how to reflect in life insurance risk classification the characteristics, behaviors and choices that are outside of a person's control is less than straightforward. Even more complex is discerning whether characteristics, behaviors and choices are outside of a person's control, and therefore whether or how to reflect them in life insurance risk classification. Consider a few hypothetical situations that illustrate some of the complexities:

- In a city that is highly segregated, most neighborhoods tend to be comprised primarily of residents of the same race, ethnicity, or nationality. Are households in this city fully in control of where they choose to live?
- Income is known to be inversely related to mortality rates in the U.S.<sup>12</sup> In the U.S. income is known to be unequally distributed across races and ethnicities<sup>13</sup> and to be correlated with parental income,<sup>14</sup> both of which imply that income may not be a result of choices fully within a person's control.
- Research shows that drug or alcohol addiction changes the brain, and it is possible, but difficult to return the brain to a normal state. The effects of addiction on the brain are independent of the manner in which an addiction begins (e.g., taking opioids as prescribed or illicitly).<sup>15</sup> Are the behaviors associated with this person's opioid addiction within their control? Could the risk of addiction be linked to a protected class status?

<sup>12</sup> R Chetty, M Stepner, S Abraham, S Lin, B Scuderi, N Turner, A Bergeron, D Cutler, "The Association Between Income and Life Expectancy in the United States, 2001-2014," JAMA. 2016 Apr 26;315(16):1750-66. doi: 10.1001/jama.2016.4226. Erratum in: JAMA. 2017 Jan 3;317(1):90. PMID: 27063997; PMCID: PMC4866586, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4866586/>.

<sup>13</sup> David Waddington, 2021 September 14, "Census Bureau Statistics Measure Equity Gaps Across Demographic Groups," *Understanding Equity Through Census Bureau Data*, United States Census Bureau, <https://www.census.gov/library/stories/2021/09/understanding-equity-through-census-bureau-data.html>.

<sup>14</sup> B. Mazumder, 2018 November 14, "Intergenerational Mobility in the United States: What We Have Learned from the PSID," *The Annals of the American Academy of Political and Social Science*, 2018 Nov. Vol 680, Issue 1, <https://journals.sagepub.com/doi/abs/10.1177/0002716218794129>.

<sup>15</sup> Harrison Wein (ed.), October 2015, *Biology of Addiction: Drugs and Alcohol Can Hijack Your Brain*, National Institutes of Health, <https://newsinhealth.nih.gov/2015/10/biology-addiction>.

The list of characteristics, behaviors, or choices that may or may not be fully within a person’s control is long. Few characteristics, behaviors, or choices are equally distributed across groups within a risk class, regardless of group definition. In addition to those above, some that jump to mind include, but definitely are not limited to eating habits, exercise, general health habits, medical history (aside from genetics) and a policyholder’s face amount.

Policies with higher face amounts (benefits) have clear, statistically valid, well-established patterns of lower mortality rates, and life insurers typically factor that into risk classification. Contemplate these related questions:

- Income is not typically used as a risk classification factor. Would it be fair to use income directly in risk classification?
- If income were not factored into risk classification, would it be fair to sell higher face amount policies only to individuals with incomes above a certain level?
- If face amount size is a proxy for income, is it fair or unfair for the company to vary mortality rates by face amount?
- If the company stops varying mortality rates by face amount and raises its minimum face amount such that it would no longer write the smaller policies associated with higher mortality, would that affect the fairness of using face amount in risk classification?

This section discussed the need for context for evaluating fairness in life insurance processes. One common question that emerges is, “fair to whom?”

### **Illustrative Example C: Different Face Amounts**

Two applicants for one-year term life insurance have similar underwriting information, but the face amount for one is double that of the other and is considered a high face amount from a risk perspective. Assume the information from the younger applicant in Illustrative Example A and that mortality rates for the higher face amount are 70% of the rates for the lower face amount.

$$\begin{aligned}\text{Lesser Face Amount Premium} &= \frac{\$50 + \$20}{1 - .30} \\ &= \$100\end{aligned}$$

$$\begin{aligned}\text{Greater Face Amount Premium} &= \frac{(2 \times \$50 \times .70) + \$20}{1 - .30} \\ &= \$128\end{aligned}$$

The greater face amount premium rate for the same amount of insurance as the lesser face amount is \$64 ( $\$128 \div 2$ ).

## **Fair to Whom?**

In addition to needing a definition of “fair” to evaluate fairness, one also needs to answer the question, “Fair to whom?” While the goal may be to achieve fairness to all parties, it may not be possible to accomplish it. For example, in some situations, two or more parties may define fairness differently such that one party’s concept of fairness is considered unfair by the other party or parties. The remainder of this section outlines some of the varying perspectives involved in the context of life insurance.

### **MARKET SELECTION**

For practical reasons, it is difficult for most life insurers to actively market their products with audience-specific messaging to all people in all locations within the U.S. Consequently, choosing a target market is necessary, and it is also a form of selection. Some insurers have a more narrowly defined target market than do others. One example of a more narrowly defined target market is an insurance company whose products are available only to members of a specific association or societal group, such as a religious organization or current or former military personnel. Is it fair or unfair to the public to define a niche target

market? What if the association or societal group membership bears a relationship to certain protected classes?

Does allowing companies to sell their life insurance products to different markets, affect the number of fair or unfair policies in the overall marketplace, thereby affecting the economic utility of private life insurance to society?

### COMPETING INTERESTS

Two parties may understand fairness differently because the parties have competing interests.

In the U.S., most private insurance is a for-profit venture. The insurance company needs to earn a profit to benefit its shareholders (a publicly traded or privately owned company) or its policyholders (a mutual company). One point of view might say that it is fair to earn the greatest profit that the market will bear. Another point of view might say that a better approach is to achieve fairness at the cost of reduced profit.

Consider a different example of a mutual company that has sold policies over the last 50 years primarily to a target market of upper-middle-class families with two parents, only one of whom who works outside the home, and some wealth. Is it fair or unfair for an insurance company to focus on a single target market when that target market may not be representative of society as a whole?

As previously noted, it is generally well understood that females tend to live longer than males. If life insurance is priced differently for females and males, all else being equal, then premium rates would generally be lower for females than for males. Is it fair or unfair that a male pays more than a female for the same benefit? One group may believe it is fair because neither sex is subsidizing the other. Another group may believe it is unfair for females and males to pay different rates, and subsidization across sexes (females would be subsidizing males) is the fairer approach.

The fact that females tend to live longer than males has the opposite effect on annuities. All other things being equal, annuities cost more for females than for males, meaning that for the same premium, a female receives a lesser annuity payment than does a male. Is that fair to females? If females and males pay the same rate for annuities, then males would be subsidizing females. Is that fair to males?

Further, consider fairness from the insurer's point of view. If life insurance and annuity prices were the same for females and males, is it fair or unfair to the insurance company if the buyers of each product are primarily from the sex that benefits (i.e., far more males than females buy the life insurance policy, and far more females than males buy the annuity)?

### GROUP VS. INDIVIDUAL

The insurance industry is well regulated, with regulations focused on two objectives: financial solvency of insurance companies and fair treatment of policyholders and claimants.<sup>16</sup> As previously mentioned, insurance works by spreading the potential burden of an individual's loss across a large group of policyholders. Individual policyholders have entrusted their money (insurance premiums) to the insurer, and the insurer must manage the funds on behalf of the policyholders as a group so that monies are available to pay individual life insurance benefits when they are due. Therein lies a tension between the

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<sup>16</sup> National Association of Insurance Commissioners and The Center for Insurance Policy and Research, 2011, "State Insurance Regulation," [https://content.naic.org/sites/default/files/inline-files/topics\\_white\\_paper\\_hist\\_ins\\_reg.pdf](https://content.naic.org/sites/default/files/inline-files/topics_white_paper_hist_ins_reg.pdf).

individual and the group. In some situations, choosing in favor of individuals may seem fair but may result in unfairness to the group.

To illustrate, consider a hypothetical parent of young children who applies to buy a life insurance policy and appears likely to qualify for a better risk class (i.e., lower risk levels). However, the physical examination that is a standard part of the underwriting process reveals an aggressive and untreatable cancer that is often unknown to its host until the opportunity for successful treatment has long passed, as is the case for this applicant. The cancer is advanced enough that successful treatment is unlikely, and the insurer denies the applicant coverage because the cancer is present. The applicant and the applicant's family may find it unfair to have been denied coverage because they had been completely unaware of the cancer, and now premature death is likely, leaving the family financially at risk. However, if the insurance company were to accept the applicant, even in a higher-risk class, the end result is that the other policyholders will be subsidizing the family, and the insurance company would knowingly expose the larger group of existing policyholders to undue risk.

Insurance works by pooling risks across a large group of policyholders within a risk class. The policyholders within a risk class essentially subsidize one another.

### ADVERSE SELECTION

Adverse selection (also known as antiselection) occurs when an individual either purchases insurance because the cost is less than the cost of their true risk level or refrains from purchasing insurance because its cost is greater than the cost of their true risk level. If age were not a factor in life insurance prices, elderly people would be able to buy life insurance at a price much lower than their true risk level—a good deal. However, many young families—who are typically among the most financially vulnerable to the risk of losing a significant income earner—may be unwilling to buy life insurance coverage, deeming the cost too high for the risk—a bad deal. Without younger, lower-risk people in the risk pool, the premium prices would need to increase to reflect the higher risk levels of the older people who are actually buying insurance. The premium hike would also increase the age below which individuals are getting a bad deal, which would result in more people deeming the price of insurance not worth the risk. The result would be an upward spiral in premium prices and along with it, an upward spiral in the number of financially vulnerable and underinsured individuals.

Thoroughly studied and well-documented differences in mortality across groups exist for several definitions of groups; age and sex are only two of them. What is the best way to define risk classes so the results are fair to both the individual and the group?

Competitive market forces can also generate opportunities for adverse selection. Insurance companies are under constant competitive pressure to find novel risk classification factors that may give an insurer a competitive edge in the marketplace. The goal is to incorporate novel risk classification factors into their policies to reduce the expected claims costs for their lowest risk groups, hence lower the policy price. Lower-priced policies attract healthier applications who can benefit from the novel risk classification factor and encourage applicants who do not benefit from the new factor to purchase life insurance from other insurers.

Because mortality experience is tracked by existing risk classification variables, a new risk classification factor typically is not associated with enough credible mortality experience to establish a robust relationship between the new factor and expected experience. Almost by definition, a new risk classification factor brings with it a risk of adverse selection.

In addition, an insurer's introduction of a new risk classification factor into the market may change market dynamics. If a new risk classification factor is shown to be predictive and material, other companies often must also use the new risk classification factor to avoid being selected against.

### NEW VS. EXISTING POLICYHOLDERS

Many life insurance customers purchase long-term policies that are in effect for the remainder of their lives. When a life insurer significantly changes its underwriting or risk classification practices, the changes typically apply only to new policies that are issued after the change. How does one evaluate fairness with respect to such changes, especially if such a change could potentially adversely impact its existing policyholders?

For example, if an insurer began aggregating risk classes, individuals who would have been eligible for a lower-risk class, hence lower premium, under the old arrangement would likely choose to buy life insurance elsewhere or forgo buying it. Individuals who had purchased a policy and been placed in a higher-risk class with a higher premium, would be more likely to lapse their existing policy and purchase the new, lower-priced policy. In other words, such a change would open the door to adverse selection, potentially in both purchases and lapses. Without the lower-risk policyholders to balance the higher-risk policyholders, the risk class would be underpriced, which would erode the financial strength of the insurer and put the existing policyholders at risk. Such a change could potentially put the insurer, hence, existing policyholders, at risk. The insurer would need to increase premiums to support the higher risks it is taking on, which would deter customers. And the remaining underpriced risks could impair the solvency of the insurer as claims would likely exceed amounts the company can support.

## Fairness of Opportunity and Outcome-Based Fairness

Fairness of opportunity has been the traditional approach for looking at fairness in life insurance risk classification. The fairness of opportunity approach assumes that if all life insurance applicants are subject to the same processes and criteria for risk classification, then the risk classification process is fair, so risk classification outcomes must be fair. However, that assumption is being challenged. An alternative to the fairness of opportunity approach is outcome-based measurement of fairness. To illustrate, consider a hypothetical example from auto insurance.

Suppose that two personal auto insurance applications from a large city look the same except for the applicant's neighborhood, and the insurance carrier includes geography in risk classification. Applicant A lives in a neighborhood with 20% higher claims costs than Applicant B's neighborhood, and Applicant A's premium is about 20% greater than Applicant B's premium. Also, over 80% of Neighborhood A's residents are Black, and over 80% of Neighborhood B's residents are white.

The fairness of opportunity approach would say that large volumes of data spanning many years show clearly that geography is a factor in claims costs, and all applicants are subjected to the same objective risk classification criteria. Geography is known to be a significant factor in expected claims costs—for example, few people would be surprised to learn that claims costs in small towns tend to be much less than in large cities. Within a city, the reason that one neighborhood's claims costs exceed another's may not be well understood, but the fact remains that Neighborhood A's average claims costs exceed those of Neighborhood B. Therefore, according to the fairness of opportunity approach, because the process is fair, the resulting higher premium for Neighborhood A is fair.



In this hypothetical example, expected claims costs, hence auto insurance prices, are much higher for the predominantly Black residents of Neighborhood A than for the predominantly white residents of Neighborhood B. Outcome-based fairness metrics ask that the process be questioned or changed because the results (expected claims costs and prices) are significantly different. Suppose that looking more closely at Neighborhoods A and B uncovers that few homes in Neighborhood A have garages, while most homes in Neighborhood B have garages, and the presence of a garage had not been factored into risk classification. Suppose further that after digging deeper into the claims costs, almost all of the claims costs differentials can be explained by the presence of garages in Neighborhood B (cars housed in garages are less susceptible than cars parked on the street to damage from weather, damage by passing vehicles or pedestrians, etc.). Under an outcome-based approach, it would be unfair to continue to use geography (neighborhood) in risk classification instead of the presence of a garage.

Alternatively, suppose that after examining many risk classification factors that had not been originally reflected, the insurer is still unable to explain the difference in expected claims costs between neighborhoods. The outcome-based perspective might say that continuing to use geography as a risk classification factor would be unfair because regardless of its facial neutrality, the results have a disproportionately negative impact on certain groups—in this hypothetical example, all other things equal, Black drivers typically pay more for auto insurance than do white drivers.

## Data May Not Be as Objective as We Think

Bias may be present in data that on the surface appears to be objective. Consider a couple of hypothetical auto insurance examples that illuminate opportunities for potential bias.

Suppose an auto insurer factors into risk classification the number of DUIs (Driving Under the Influence charges) on a driver's record. The insurer automatically rates drivers with one DUI as higher-risk (higher expected cost) and automatically declines drivers with two or more DUIs. The number of DUIs appears to be an objective indication of driver risk. Suppose further that two drivers from different areas within a large city have similar driving records in terms of accidents, speeding tickets, cars, mileage, age and several other factors. However, the driver from area A of the city has two DUIs and is declined coverage, while the driver from area B has no DUIs and is accepted. Now consider these questions:

- Is policing of DUI equally stringent in both areas of the city?
- Is the rate at which DUI charges are bargained down to a lesser charge and—thus unlikely to appear on a motor vehicle record or criminal background check—equal for both areas of the city?

One could argue that virtually all data is flawed in some way, bias being one of the many potential flaws. Actuaries have figured out how to spot some of those flaws, as well as how to correct for them in risk classification. As a profession, actuaries are looking to ascertain whether differences identified by characteristics, behaviors, or choices are the result of social or other biases that influence the data. If the data is found to be biased, the professional will seek to find appropriate ways to correct for it?

## Correlation vs. Causation

One potential approach to mitigating the risk of biased social behaviors creating biased data is to focus on causation rather than correlation. When data shows a clear relationship between a characteristic, behavior, or choice (a variable) and an outcome, the variable is correlated with the outcome. However, the variable

may or may not be the cause of the outcome. Causation means that the characteristic, behavior or choice gives rise to the outcome.

Identifying or demonstrating causation can be extremely difficult, if not impossible. Even when causation is determined, often causation is limited to the likelihood of an outcome rather than the certainty of an outcome. For example, it is generally accepted that smoking causes lung cancer—a conclusion based on a significant volume of research.<sup>17</sup> However, not all smokers develop lung cancer.<sup>18</sup> While it is not certain that smoking will cause lung cancer, it is a reasonable probabilistic-based inference that smoking causes lung cancer.

An American Academy of Actuaries Issue Brief outlines the distinction between correlation and causation in the context of risk classification and discusses the difficulty and potential impossibility of demonstrating causation for risk classification variables. It also examines the potential pitfalls that arise from the inability of predictive models to distinguish between correlation and causation.<sup>19</sup>

The difficulty of establishing causality and the potential for mistakenly doing so are clearly recognized in actuarial guidance. *Actuarial Standard of Practice (ASOP) No. 12 Risk Classification (for All Practice Areas)* expects actuaries to objectively demonstrate a relevant correlation between a risk characteristic and an expected outcome, but it does not demand actuaries to establish a cause-and-effect relationship.<sup>20</sup>

In its *Regulatory Review of Predictive Models White Paper*, the National Association of Insurance Commissioners (NAIC) discusses the need for guidance on the evaluation as well as explanation of causal relationships between rating variables and expected costs.<sup>21</sup> The New York State Department of Financial Services requires that insurers “establish that the external data sources, algorithms or predictive models are based on sound actuarial principles with a valid explanation or rationale for any claimed correlation or causal connection. An insurer must also disclose to consumers the content and source of any external data upon which the insurer has based an adverse underwriting decision.”<sup>22</sup>

Although establishing causation does not appear to be required, does it still play a role in determining whether the incorporation of a specific factor into a risk selection program may be considered fair or unfair?

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<sup>17</sup> Centers for Disease Control and Prevention, *What Are the Risk Factors for Lung Cancer?*, accessed June 4, 2023, [https://www.cdc.gov/cancer/lung/basic\\_info/risk\\_factors.htm#:~:text=Cigarette%20smoking%20is%20the%20number,of%20more%20than%207%2C000%20chemicals](https://www.cdc.gov/cancer/lung/basic_info/risk_factors.htm#:~:text=Cigarette%20smoking%20is%20the%20number,of%20more%20than%207%2C000%20chemicals).

<sup>18</sup> Huang, Z., Sun, S., Lee, M. et al, 2022 April 11, “Single-Cell Analysis of Somatic Mutations in Human Bronchial Epithelial Cells in Relation to Aging and Smoking,” *Nature Genetics*, 54, 492–498 (2022), <https://www.nature.com/articles/s41588-022-01035-w>.

<sup>19</sup> American Academy of Actuaries, 2022 July, “An Actuarial View of Correlation and Causation—From Interpretation to Practice to Implications,” Issue Brief, [https://www.actuary.org/sites/default/files/2022-07/Correlation.IB\\_6.22\\_final.pdf](https://www.actuary.org/sites/default/files/2022-07/Correlation.IB_6.22_final.pdf).

<sup>20</sup> Actuarial Standards Board, 2005 Dec., *Actuarial Standard of Practice No. 12 Risk Classification (for All Practice Areas)*, Section 3.2, [http://www.actuarialstandardsboard.org/wp-content/uploads/2014/07/asop012\\_101.pdf](http://www.actuarialstandardsboard.org/wp-content/uploads/2014/07/asop012_101.pdf).

<sup>21</sup> Casualty Actuarial and Statistical (C) Task Force, 2020 September 15, *Regulator Review of Predictive Models White Paper*, National Association of Insurance Commissioners, Accessed September 27, 2023, [https://content.naic.org/sites/default/files/CA-WP\\_1.pdf](https://content.naic.org/sites/default/files/CA-WP_1.pdf).

<sup>22</sup> New York State Department of Financial Services, 2019 Jan. 18, Insurance Circular Letter No. 1 (2019) RE: Use of External Consumer Data and Information Sources in Underwriting for Life Insurance, [https://www.dfs.ny.gov/industry\\_guidance/circular\\_letters/cl2019\\_01](https://www.dfs.ny.gov/industry_guidance/circular_letters/cl2019_01)

## Further Considerations

### DATA ON RACE AND ETHNICITY

U.S. life insurers typically do not collect information on race, ethnicity, or other protected class data from applicants and policyholders. No matter the definition of fairness with respect to protected classes, without such data, it is difficult to prove that life insurance prices or processes are not unfairly biased to the detriment of protected classes. However, for an insurer to collect data on race, ethnicity and/or other protected class identifiers may raise suspicion among the public.

### DOES FAIRNESS APPLY ONLY TO PROTECTED CLASSES?


Contemporary discussions of fairness in the context of insurance are often focused on fairness with respect to protected classes. Do fairness questions extend beyond protected classes? If so, to what extent?

## Closing Remarks

Exploring and defining fairness in the context of life insurance pricing and processes in the U.S. is a worthwhile endeavor. The actuarial profession is carefully and thoughtfully considering concepts of fairness through its efforts to provide research and workable standards for applying that research. It is hard work, but worth the effort.


The author and advisory panel intend this paper to be a contribution toward the broader, more comprehensive effort and do not believe it to be a complete rendition of the issues, perspectives, and nuances involved in rethinking fairness in the context of life insurance. For example, this paper avoids identifying specific definitions of fairness in the context of life insurance and instead offers discussion of varying perspectives that might be reflected in fairness concepts with respect to life insurance. Seeking to inform but not direct the broader discussion, this paper also expressly avoids discussing any tangible outcomes, which may reflect elements not examined in this higher-level discussion.

The issues and perspectives to consider are numerous and complex. Throughout this discussion of rethinking fairness in the context of life insurance, especially in risk classification, a recurring theme presents itself: evaluating fairness against any single definition of fairness will likely fall short of achieving fairness in the context of multiple perspectives. One size does not fit all.



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