



What is fairness?

“A rate is reasonable and not excessive, inadequate, or **unfairly discriminatory** if it is an actuarially sound estimate of the expected value of all future costs associated with an individual risk transfer.”

– Casualty Actuarial Society (1988)

In the theory of justice, Rawls (2017) introduces the principles of justice as **fairness**, focusing on the **equitable** distribution of rights, duties, and social goods.







Equality vs. Equity: different flavors of fairness?

According to Sen (2008), **equality** involves treating everyone the same regardless of their needs, while **equity** entails tailoring resources and opportunities to meet the specific needs of individuals or groups to **ensure relatively balanced outcomes**.

What about discrimination?

Fairness seeks to **eliminate discrimination** by ensuring that individuals are treated equally and **based on merit**, rather than on characteristics that should not have any bearing on their treatment.

Where is unfairness in insurance operations?

Accessibility		“Weblining” (Hernandez et al., 2001)
Service		Unconscious bias (Casualty Actuarial Society, 2022)
Underwriting		Indigenous reserves’ systematic denial (Duchaine, 2020)
Ratingmaking		Solidarity or individualization? (Barry, 2020)
Business adjustments		Non-risk-based discrimination (Guy Thomas, 2012)
Claims		Inequities in claim settlement (Lin et al., 2022).

Why should we care?

Quantity of AI Ethics Guidelines
All fields included

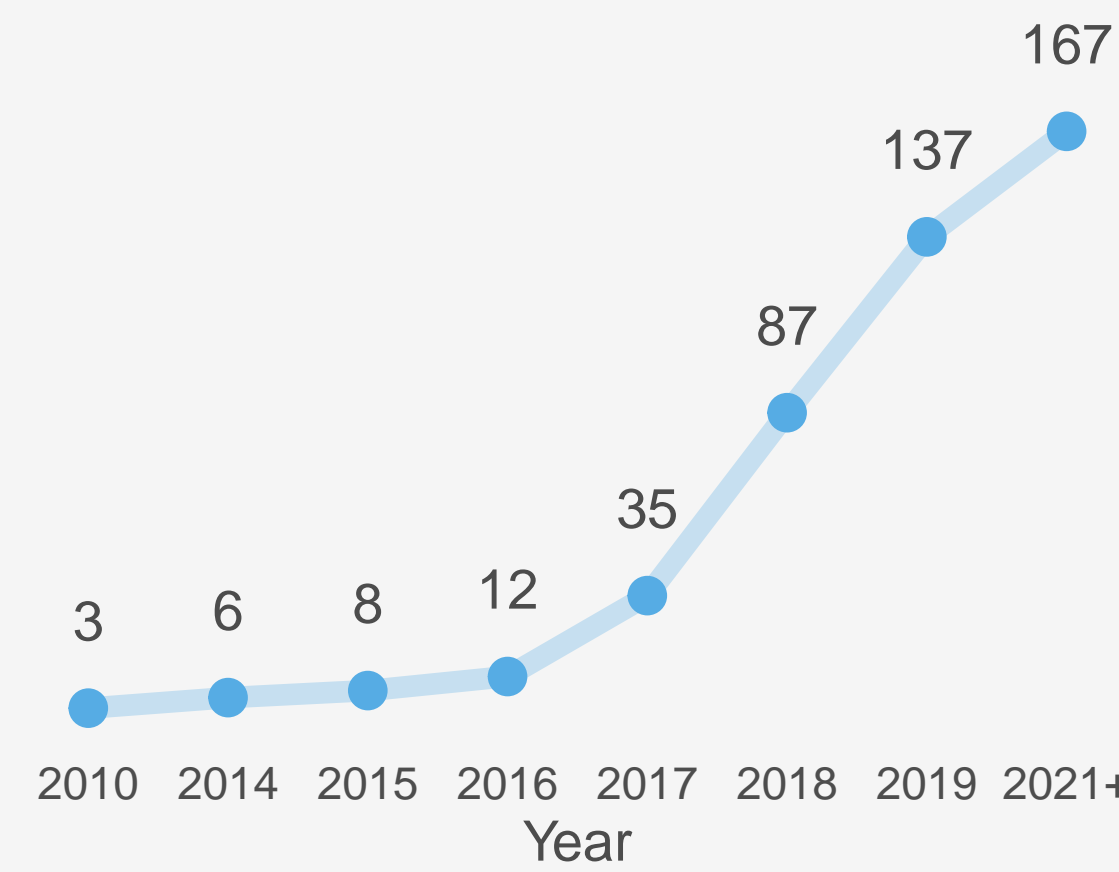


Figure 1. AlgorithmWatch (2020)

The Obama administration released a report in 2016 in which data scientists were urged to analyze “how technologies can deliberately or **inadvertently** perpetuate, exacerbate, or mask discrimination.”

–Kusner et al. (2017)

“Insurance is particularly interesting because the entire industry is based on **discrimination**.”

–Frees and Huang (2023)

Three reasons why the actuarial community should care about fairness

- Maintain public **trust**
 - The use of AI in finance raises concerns for consumers who feel particularly **vulnerable**.
(Autorité des marchés financiers, 2021)
- Responsibility** of the modeler
 - “The statistician cannot evade the responsibility for understanding the process he applies or recommends.”
–Fisher (1956)
 - “A model’s **blind spots** reflect the judgments and priorities of its creators.”
–O’Neil (2016)
- Regulation**

Regulation in the world

- The General Data Protection Regulation (European Union, 2016) specifies prohibited variables in the **European Union**, notably including ethnic origin and gender.
- The **United Kingdom** has adopted a version similar to the GDPR with the Data Protection Act 2018.
- The **United States** showcases a mosaic of regulatory stances (Xin and Huang, 2023), ranging from stringent anti-discrimination measures (e.g., California) to prohibitions regarding a few highly sensitive variables (e.g., Texas).

Colorado’s unique bill (SB21-169)

This bill uniquely **mandates quantitative assessments** to proactively identify and mitigate **indirect discrimination** in life insurance underwriting. It prescribes a statistical methodology to estimate race and ethnicity, and report findings to regulators.

See “Protecting Consumers from Unfair Discrimination in Insurance Practices”.

Regulation in Canada

The Data Protection Act suggests incoming discussions regarding fairness:

“A person who is responsible for a high-impact system must, in accordance with the regulations, establish measures to identify, assess and **mitigate the risks of harm or biased output** that could result from the use of the system.”

–Bill C-27 (House of Commons of Canada)

Examples of explicit prohibitions in auto insurance

Province	Prohibited variables
NB	age , gender , and marital status
NS	age and marital status
NFL	age , sex , marital status , and non-fault accident history
ON	credit history , occupation , and homeowner status

Regulation in Québec

According to CDPDJ, discrimination based on these 14 characteristics is prohibited:



“Every person has a right to [...] equal recognition [...] of his human rights [...] without distinction [...] based on **race**, **colour**, **sex**, **gender identity or expression**, **pregnancy**, **sexual orientation**, **civil status**, **age** [...], **religion**, **political convictions**, **language**, **ethnic or national origin**, **social condition**, a **handicap** or the use of any means to palliate a handicap.”

– Charter of human rights and freedoms, Québec

There are exceptions for **age**, **sex** or **civil status** if the “use thereof is **warranted**” and it is considered a “**risk determination factor** based on actuarial data”.

Is price optimization considered “profiling”?

“ **Profiling** means the collection and use of personal information [...] for the purpose of analyzing that person’s [...] economic situation, health, **personal preferences**, interests or behaviour.”
– Act respecting the protection of personal information in the private sector, Québec

Companies making use of profiling are required by law to **inform** of such practice and of the means available to **disable** such profiling.

Recommendations of Quebec’s financial authority

Autorité des marchés financiers (2021) is consistent with influential reports such as Bengio et al. (2018).

Formally, the principle of **fairness** states that **similar cases should be treated similarly**. [...] The whole problem is to understand what is meant by similar cases.

(Autorité des marchés financiers, 2021)



Autorité des marchés financiers (2024) also places “treating consumers with fairness” as a crucial best practice (4 out of 30).

Recommendations of actuarial organizations

Actuarial organizations demonstrate their interest in fairness in insurance

- “CAS Approach to Race and Insurance Pricing ” (CAS, 2021)
- “Avoiding Unfair Bias in Insurance Applications of AI Models” (SOA, 2022)
- “Fairness Metrics for Life Insurance Processes: An Actuarial Perspective” (SOA, 2023)
- “Fairness in Pricing and Underwriting of Property and Casualty (PC) Risks” (CIA, 2023)

The actuarial organizations recommend to **proactively identify** and mitigate biases through stakeholder engagement and risk management.

This proactive stance enables the insurance industry to **adapt to changing societal norms and expectations**, ensuring fairness in a way that laws, which may lag behind technological and social developments, sometimes cannot fully address.

Recommendations suggest that we envision the future actuary to be consistent with the definition of the actuary of the fifth kind of Embrechts and Wüthrich (2022), that is, a “**socially responsible** financial decision maker”.

References

AlgorithmWatch (2020). Ai ethics guidelines global inventory. algorithm watch.

Autorité des marchés financiers (2021). L'intelligence artificielle en finance : Recommandations pour une utilisation responsable. Accessed: February 28, 2024.

Autorité des marchés financiers (2024). Meilleures pratiques pour l'utilisation responsable de l'ia dans le secteur financier. Accessed: February 28, 2024.

Barry, L. (2020). Insurance, big data and changing conceptions of fairness. *European Journal of Sociology*, 61(2):159–184.

Bengio, Y., Dilliac, M.-A., Maroşan, M. I., et al. (2018). The Montréal Declaration for a Responsible Development of Artificial Intelligence. <https://montrealdeclaration-responsibleai.com/the-declaration/>. Accessed: January 24, 2024.

Casualty Actuarial Society (1988). Statement of Principles Regarding Property and Casualty Insurance Ratingmaking. Accessed: february 13, 2022.

Casualty Actuarial Society (2022). Methods for Quantifying Discriminatory Effects on Protected Classes in Insurance. Accessed: october 31, 2023.

Duchaine, G. (2020). Des refus systématiques dans les réserves. *La Presse*.

Embrechts, P. and Wüthrich, M. V. (2022). Recent challenges in actuarial science. *Annual Review of Statistics and Its Application*, 9:119–140.

European Union (2016). Regulation (eu) 2016/679 of the european parliament and of the council of 27 april 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data (general data protection regulation). <https://eur-lex.europa.eu/eli/reg/2016/679/oj>. Accessed: January 24, 2024.

Fisher, R. A. (1956). Statistical methods and scientific inference.

Frees, E. W. and Huang, F. (2023). The discriminating (pricing) actuary. *North American Actuarial Journal*, 27(1):2–24.

Guy Thomas, R. (2012). Non-risk price discrimination in insurance: market outcomes and public policy. *The Geneva Papers on Risk and Insurance-Issues and Practice*, 37(1):27–46.

Hernandez, G. A., Eddy, K. J., and Muchmore, J. (2001). Insurance weblining and unfair discrimination in cyberspace. *SMUL Rev.*, 54:1953.

Kusner, M. J., Loftus, J., Russell, C., and Silva, R. (2017). Counterfactual fairness. *Advances in neural information processing systems*, 30.

Lin, X., Browne, M. J., and Hofmann, A. (2022). Race discrimination in the adjudication of claims: Evidence from earthquake insurance. *Journal of Risk and Insurance*.

O’Neil, C. (2016). *Weapons of math destruction: How big data increases inequality and threatens democracy*. Broadway Books.

Rawls, J. (2017). A theory of justice. In *Applied Ethics*, pages 21–29. Routledge.

Sen, A. (2008). The idea of justice. *Journal of human development*, 9(3):331–342.

Xin, X. and Huang, F. (2023). Antidiscrimination insurance pricing: Regulations, fairness criteria, and models. *North American Actuarial Journal*, pages 1–35.