



Bias audit report

for **Life Insurance Underwriting Model v3.2** (version 3.2.1)

Compliance framework	Colorado SB 21-169 (Insurance)
Metric	Approval/outcome rate (5 pp difference threshold)
Audit date	April 13, 2026
Auditor	Michael Reyes
Auditor role	VP of Compliance & Risk Management
Independence	Internal (company employee, not the tool vendor)

Overall assessment

Disparate impact	Adverse impact detected — review recommended
Data completeness	Gaps noted

This audit analyzed 18,429 records across Approval rate by race/ethnicity (BIFSG-estimated). 2 group(s) were flagged as having an impact ratio below the threshold. The lowest impact ratio observed was 0.751 for Black.

Scope of this audit

In scope

- Line of business: Life insurance (term and whole life)
- Decision point tested: Application approval (first-level underwriting)
- ECDIS sources: Credit bureau data, motor vehicle records, pharmacy benefit manager data
- Demographic test: race/ethnicity via BIFSG methodology
- Reference group: White (per Colorado DOI Quantitative Testing Regulation)
- Flagging threshold: 5 percentage point difference from White reference
- Testing period: 2025-01-01 to 2025-12-31

Out of scope

- Does not implement BIFSG race/ethnicity estimation — insurer must provide race-coded data
- Does not test non-race protected classes (color, national origin, religion, sex, sexual orientation, disability, gender identity, gender expression) also covered by C.R.S. § 10-3-1104.9
- Does not perform second-level variable testing required when disparities are found
- Does not generate the DOI annual filing format — this report is supporting evidence
- Does not evaluate actuarial soundness of observed rate differences
- Not intended for compliance with legislation outside Colorado

Compliance checklist

Requirement	Status	Notes
Model and ECDIS source documented	✓	System name and description are documented.
Race/ethnicity testing performed	✓	Results include race/ethnicity analysis.

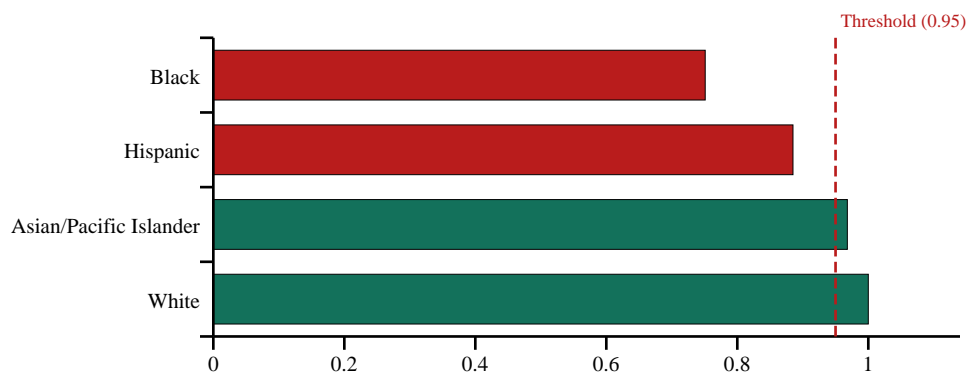
Second-level variable testing	■	2 group(s) flagged — Regulation requires second-level variable testing to identify contributing variables.
Governance framework documented	■	Reg 10-1-1 requires written governance policy, board oversight, cross-functional committee, vendor oversight, and remediation procedures. Document and maintain separately.
Annual DOI filing prepared	■	Colorado DOI requires annual filing by April 1 covering the prior calendar year. Include this report as supporting evidence.
Responsible party identified	✓	Audit performed by Michael Reyes.

Executive summary

Total records	18,429
Total selected	12,341
Overall rate	67.0%
Flagged groups	2
Excluded groups	0
Records with missing data	247

Analyzed 18,429 life insurance applications from calendar year 2025.

Approval rate by race/ethnicity (BIFSG-estimated)



System description

Name	Life Insurance Underwriting Model v3.2
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Version	3.2.1
Description	ML model for life insurance approval decisions using credit, MVR, and pharmacy data as ECDIS inputs.
Deployment context	<i>not provided</i>

Data description

Source	Policy administration system
Date range	2025-01-01 to 2025-12-31
Total records	18,429
Records with missing data	247

Records per demographic category

Approval rate by race/ethnicity (BIFSG-estimated)

Group	Records	Share
White	10,482	56.9%
Asian/Pacific Islander	1,847	10.0%
Hispanic	3,619	19.6%
Black	2,481	13.5%

Methodology

The audit uses the **selection rate** metric. For each demographic group, the selection rate is computed as the number of selected records divided by the total number of records in that group. Each group's rate is then compared to the group with the highest selection rate to produce an **impact ratio**.

The Colorado Division of Insurance Quantitative Testing Regulation under C.R.S. § 10-3-1104.9 and Regulation 10-1-1 requires insurers to test whether Hispanic, Black, and Asian/Pacific Islander applicants/insureds experience outcomes that differ from White applicants/insureds by **5 percentage points or more**. When such a difference is found, the insurer must conduct second-level variable testing to identify which specific variables contribute to the disparity. This report presents rate differences in percentage-point terms alongside impact ratios. An impact ratio below 0.95 is used as a conservative flagging heuristic; the precise 5-percentage-point rule is applied in the per-group findings below. Note that Colorado does not accept pure actuarial justification as a safe harbor — disparities require remediation rather than explanation alone.

Small-sample exclusion. Groups representing fewer than 2.0% of the total records are excluded from impact ratio calculations to avoid statistically unreliable results.

Results

Approval rate by race/ethnicity (BIFSG-estimated)

Highest-rate group: **White** (71.2%)

Group	Records	Selected	Rate	Impact ratio	Status
Black	2,481	1,327	53.5%	0.751	Flagged
Hispanic	3,619	2,279	63.0%	0.885	Flagged
Asian/Pacific Islander	1,847	1,272	68.9%	0.968	Pass
White	10,482	7,463	71.2%	1.000	Pass

Black: outcome rate 53.5% vs. White reference rate 71.2% — a **17.7 percentage point** difference, which substantially exceeds the 5 pp threshold. Colorado Regulation 10-1-1 requires second-level variable testing to identify contributing factors.

Hispanic: outcome rate 63.0% vs. White reference rate 71.2% — a **8.2 percentage point** difference, which exceeds the 5 pp threshold. Colorado Regulation 10-1-1 requires second-level variable testing to identify contributing factors.

Recommended actions

1. Conduct **second-level variable testing** as required by Regulation 10-1-1 to identify which specific variables in the ECDIS or predictive model contribute to the observed rate differences.
2. Document a **remediation plan** — Colorado does not accept pure actuarial justification as a safe harbor. Disparities of 5 percentage points or more require remedial measures, not just explanation.
3. Escalate findings to the **governance committee** and board-level overseers per Reg 10-1-1 governance framework requirements.
4. Consider whether the model or ECDIS source should be **suspended** pending remediation, particularly for applicants in the affected race/ethnicity groups.
5. Include these findings and remediation actions in the **annual DOI filing** due April 1 (covering the prior calendar year).
6. Update **third-party vendor oversight** records if the flagged model is provided by an external vendor.

Regulatory context

C.R.S. § 10-3-1104.9 (SB 21-169, enacted 2021) prohibits Colorado-licensed insurers from using External Consumer Data and Information Sources (ECDIS), or algorithms and predictive models that use ECDIS, in a way that results in unfair discrimination based on race, color, national or ethnic origin, religion, sex, sexual orientation, disability, gender identity, or gender expression.

Regulation 10-1-1 (effective November 14, 2023; amended October 15, 2025 to cover life, private passenger auto, and health benefit plan insurers) establishes the governance and risk management framework. Required

components include board-level oversight, a written governance policy, a cross-functional governance committee, ECDIS and model inventory, ongoing monitoring, third-party vendor oversight, remediation procedures, and documentation retention.

Colorado DOI Quantitative Testing Regulation requires annual testing using the **Bayesian Improved First Name Surname Geocoding (BIFSG)** methodology developed by the RAND Corporation to estimate race and ethnicity. Testing compares outcomes for Hispanic, Black, and Asian/Pacific Islander applicants/insureds against a White reference group across two areas: (1) application approval rates and (2) premium rates per \$1,000 face amount. A statistical difference of **5 percentage points or more** triggers mandatory second-level variable testing.

No actuarial safe harbor. Unlike traditional insurance anti-discrimination law, SB 21-169 does not accept actuarial soundness as a defense when ECDIS or algorithmic outcomes correlate with protected classes. Disparities must be remediated, not merely justified. Insurers must submit annual narrative reports and quantitative testing results to the Colorado DOI by April 1 each year, covering the prior calendar year.

Glossary

ECDIS (External Consumer Data and Information Sources)

Any data about a consumer that is not traditional to the insurance industry or to actuarial science — for example, social media activity, educational attainment, purchase history, or biometric data. ECDIS includes the algorithms and predictive models that consume such data.

BIFSG (Bayesian Improved First Name Surname Geocoding)

A RAND Corporation statistical methodology for estimating a person's race or ethnicity from their first name, surname, and geolocation. Used by Colorado DOI for testing where self-reported race data is not available.

Unfair discrimination (insurance)

Under C.R.S. § 10-3-1104.9, use of ECDIS or models that results in a rate of adverse outcome for a protected class that differs materially from the rate for a reference class. Unlike traditional insurance law, actuarial soundness is not a defense.

First-level testing

The initial quantitative comparison of outcome rates across race/ethnicity groups against the White reference group. A difference of 5 percentage points or more triggers second-level testing.

Second-level variable testing

An analysis, required when first-level testing identifies a 5+ percentage point disparity, to determine which specific variables within the ECDIS or predictive model contribute to the observed difference. Required by Regulation 10-1-1 and must be documented in the annual DOI filing.

Decision point

A specific stage in the insurance workflow where an ECDIS-informed decision is made — for example, application approval, premium rating, rating class assignment, or declination. Each decision point must be tested separately.

Rate difference (percentage points)

The absolute difference between two outcome rates, expressed in percentage points. For example, a 50% White approval rate and a 42% Black approval rate yield an 8 percentage point difference.

Conclusion

This audit of Life Insurance Underwriting Model v3.2 analyzed 18,429 records. 2 of 4 evaluated groups showed rate differences that warrant investigation under Colorado Regulation 10-1-1. The largest disparity was observed for Black (impact ratio: 0.751). Second-level variable testing is required to identify the contributing factors, and a remediation plan must be documented. Colorado does not accept actuarial soundness as a safe harbor; disparities must be remediated rather than merely explained.

Limitations

- The audit measures statistical disparity, not causation. A flagged group does not imply the tool is the cause of that disparity.
- Results are specific to the dataset provided. They do not automatically generalize to different deployment contexts, time periods, or populations.
- Compliance obligations vary by jurisdiction. A passing audit under one framework does not imply compliance with all applicable laws.
- The audit does not evaluate the quality, relevance, or job-relatedness of the underlying features used by the tool.
- Readers should consult qualified legal counsel for interpretation of these results in their specific regulatory context.
- Race and ethnicity must be estimated using the BIFSG methodology or equivalent where self-reported data is unavailable. Accuracy of outcome testing depends on the quality of name and geolocation data and on the BIFSG reference distribution. This report does not implement BIFSG; the insurer must produce BIFSG-estimated race values as input.
- This audit tests race/ethnicity only. C.R.S. § 10-3-1104.9 also prohibits discrimination based on color, national or ethnic origin, religion, sex, sexual orientation, disability, gender identity, and gender expression. The Colorado DOI currently mandates quantitative testing only for race in life insurance; insurers remain responsible for the broader statutory obligation.
- Second-level variable testing and DOI annual filing are separate activities not produced by this report. Use this report as supporting evidence within the insurer's own governance documentation and DOI submission.