Psychology of Regulatory Compliance Mathematical Model

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This research abstract will provide the mathematical model for the Psychology of Regulatory Compliance and the Integrated Regulatory Framework (Fiene, 2026) which have been suggested as an applied behavioral–regulatory framework that is an extension of the Theory of Regulatory Compliance and the Differential Monitoring Systems approach (Fiene, 2025a).

The Integrated Regulatory Framework (IRF) (Fiene, 2026) synthesizes psychological theory, measurement science, and regulatory practice into a unified licensing model. It integrates:

- Predictive rules (Key Indicators),
- Risk-weighted rules,
- Aversion and certainty dynamics from Prospect Theory,
- Explicit controls for false positives, false negatives, and assessor bias (Fiene, 2025b).

The IRF mathematical model prioritizes medium-risk predictor rules that are statistically associated with overall compliance and safety outcomes, rather than attempting exhaustive enforcement of all rules equally.

The IRF Model (Fiene, 2026) introduces a formal algorithm using:

- The Fiene Coefficient (FC) to validate predictive rules,
- A zero-tolerance standard for false negatives (F-),
- Weighted penalties for false positives (F+) to avoid over-regulation.

IRF = (FC = .75+) + (F- = 0 (Null(Φ)) - (F+ = wgt1 x 3)

- Where: IRF = Integrated Regulatory Framework; FC = Fiene Coefficient of .75 or above for quality settings (for licensing reviews, FC = .50+) by using the following formula: FC = (true+)(true-) – (false+)(false-)/sqrt of true and false sums = statistical predictor rules; F- = no occurrences of false negatives; F+ = rules that are weighted 1 x 3 violations in order to mitigate the effect of false positives; this result also keeps the overall score within a substantial regulatory compliance level.

- The Fiene Coefficient (FC) as Validator: The algorithm requires a Fiene Coefficient (phi-coefficient) of .75 or higher. This serves as the statistical validator ensuring that the rules being monitored are "Key Indicators"—those that are statistically predictive of overall compliance. This ensures the system focuses only on rules that actually correlate with safety outcomes.
- Zero-Tolerance for False Negatives (F- = 0): There is an absolute standard for F- on critical safety rules. This reinforces the "safety-first" posture of the framework.
- Weighted Penalty for False Positives (F+): To mitigate the effects of over-regulation and inspector strictness. This ensures that a single "negative bias" inspector does not tank a provider's score into non-compliance based on a False Positive, thereby maintaining the provider's "substantial regulatory compliance level" and protecting the system's procedural fairness.

The IRF Mathematical Model builds from the original measurement theory established with the theory of regulation compliance, the uncertainty-certainty matrix, the regulatory compliance scale, and differential monitoring (Fiene, 2025a, b; 2026). These methodologies are the initial or front-end methods for differential monitoring systems. The IRF and the psychology of regulatory compliance are the back-end methods for differential monitoring systems extending it into the quality arena. The initial methodologies are needed to establish the scoring system and weighting of rules; but it is in the back-end methodologies where an interpretation can be made of the scores obtained earlier.

The IRF Math Model presented in this abstract are for those regulatory scientists and licensing researchers who are developing their system from scratch. For those who are interested in using an off the shelf version, the Child Care Early Education Heart Monitor (CCEEHM) (Fiene, 2025c) is highly recommended. For those scientists who are developing their own systems, the remaining narrative of this abstract will provide the math modeling to be utilized in making licensing mathematical decision points for individual providers of service.

The following table is provided in order to demonstrate how the IRF coefficient would be determined given certain scenarios. The IRF will be somewhat different if one is dealing with licensing/regulatory compliance data vs quality indicator data vs if the purpose of the IRF is to validate a particular finding, such as if key indicators are statistically predicting as they should.

Integrated Regulatory Framework Result Scenarios Table

IRF: Pass/Fail	FC	False Negative F-	False Positive F+	Comments
1.00/-3.00>	1.00	Null (0)	-3	Ultimate Goal
.90+/-3.10>	.90+	Null (0)	-3	Validation Score
.75+/-3.25>	.75+	Null (0)	-3	Quality Score
.50+/-3.50>	.50+	Null (0)	-3	Licensing Score

Let's unpack this table and provide the context to what it means for ongoing program monitoring systems and assessment in applying regulatory science to human care licensing. The ultimate goal of the integrated regulatory framework (IRF) is to have a more effective and efficient means of reviewing and assessing facilities when making licensing decisions. As mentioned above this has been done with the creation of differential monitoring which is a focused and targeted means of a program monitoring systems approach (Fiene, 2025a). It is based upon or a natural result of the theory of regulatory compliance (Fiene, 2025a).

Since the introduction of the theory of regulatory compliance and differential monitoring several other regulatory science innovations have been put forth, such as the use of key indicators and risk assessment in identifying specific rules that either predict overall regulatory compliance or morbidity/mortality. On the measurement side of regulatory science, the uncertainty-certainty matrix and the regulatory compliance scale have been proposed as well in identifying bias in reporting results as well as developing a coherent psychology of regulatory compliance. Also, a *Child Care Early Education Heart Monitor (CCEEHM)* (Fiene, 2025c) has also been developed as an App for assessing both structural and process quality in early care and education facilities.

These above methodologies and innovations are part of a front end or initial approach to program monitoring systems within regulatory science as applied to human service licensing. The IRF provides the back-end or the results interpretation portion of the overall approach (Fiene, 2014). Back to the above table and what each cell means. The IRF: Pass/Fail provides a metric and result that either shows the respective program or facility has passed or failed the various components of the program monitoring system when it comes to predictor rules and risk-based rules. This metric combines what was found in each of those specific analyses. In going down the column, it provides the results for validation studies, licensing results, and quality-based results. The results change a small fraction based mainly on the FC results while False Positives (F+) and False Negatives (F-) remain as constants.

The reason for F+ and F- remaining as constants is determined by the theory of regulatory compliance where substantial compliance and the ceiling/diminishing effect comes into play. In this theory it was discovered that a curvilinear relationship rather than linear relationship exists between regulatory compliance and quality of programming. Based upon this theory, key indicators and risk assessment methodologies were introduced in identifying rules based upon prediction and risk and with the addition of the uncertainty-certainty matrix for licensing decision making false positives and negatives was introduced (Fiene, 2025b). These results provided specific parameters which we did not want to see programs or facilities exceed because it places clients at increased risk of morbidity and/or mortality.

With the FC results, there is variability in this metric because dependent upon which measurement scale being used, licensing vs quality based, the relative data distributions are very different. In licensing the data are much more skewed while with quality-based assessments the data distribution is more normally distributed. In validation studies, the results should approximate a perfect relationship (key compliance indicators predicting overall regulatory compliance; quality indicators predicting overall quality scores; or risk rules protecting overall safety of clients) but in reality, a .90+ coefficient is more realistic.

Additional Reading

Fiene (2013). A Comparison of International Child Care and US Child Care Using the Child Care Aware – NACCRRA (National Association of Child Care Resource and Referral Agencies) Child Care Benchmarks, *International Journal of Child Care and Education Policy*, 7(1), 1-15

Fiene (2025a). Finding the rules that work, *American Scientist, Volume 113*, 16-21.

Fiene (2025b). Uncertainty-certainty matrix for licensing decision making, validation, reliability, and differential monitoring studies, *Knowledge, 2025, 5,* 1-8.

Fiene (2025c). *Child care early education heart monitor (CCEEHM),* National Association for Regulatory Administration, Fredericksburg, VA.

Fiene (2026). *An integrated regulatory framework: The Psychology of Compliance*, Research Institute for Key Indicators Data Laboratory and the National Association for Regulatory Administration, Fredericksburg, VA. Unpublished manuscript.

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