At the Intersection of the Theory of Regulatory Compliance, the Fiene Coefficients, Differential Monitoring, and the Effectiveness/Efficiency Relationship

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The purpose of this group of papers, technical research notes, RIKINotes Posts is to provide licensing researchers, regulatory scientists, and licensing administrators all the latest research and theory related to designing and implementing a licensing and monitoring system for tracking regulatory and quality reviews of programs.

The papers are organized chronologically and show the progression in thinking about how to assemble the necessary steps in putting the system together. All the logistics, algorithms, and math are provided to do this, so it will be very helpful to regulatory scientists and licensing researchers in their planning efforts and in informing licensing administrators on how best to allocate resources.

It is important that once these systems are in place to validate that they are working as intended. All the validation studies conducted have demonstrated that the approach works as it has been outlined in these series of papers and research notes. But as with any good science we need to be vigilant about replication to make certain that the theory still holds.

The first series of papers deals with the establishment of what has started to be referred to as the Fiene Coefficients by several states and provinces. These papers are then followed by a paper/powerpoint presentation that integrated the theory of regulatory compliance with the Fiene Coefficients. The last two papers (these appeared as RIKINotes Posts) integrate the effectiveness/efficiency relationship with the theory of regulatory compliance and the Fiene Coefficients. This sequencing provides a blueprint for designing and implementing the respective licensing/regulatory compliance system that state licensing administrators need to entertain.

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The Fiene Coefficient

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This anthology of technical research notes and research reports will trace the history of the development of the Fiene Coefficient (FC) which has been used in licensing and regulatory science to develop key predictor rules/regulations and most recently in the design and implementation of key quality indicators in early care and education programs. The research is organized and presented by chronological order starting with the first publications in the 1980's up to the present time.

The story begins in the late 1970's when the Federal Department of Health, Education, and Welfare (HEW) was interested in coming up with a series of statistical predictors that would demonstrate full compliance with the Federal Inter-Agency Day Care Requirements (FIDCR). HEW was interested in doing abbreviated reviews of child care programs that were governed by the FIDCR. They were concerned about the amount of time that monitoring reviews were going to take with the full set of standards.

The technical research notes and research reports will delineate the development of both key predictors as well as risk assessment rule methodologies. This anthology is for licensing researchers, regulatory scientists and licensing administrators to provide the theory and background research to the methodologies. This is the only way that regulatory science will be able to move forward from a measurement and monitoring system perspective. Thought it was helpful to have all these reports and notes in one location rather than spread out in the research literature.

This research was authored by Dr Rick Fiene and his collaborators over the past 40 years. The methodologies have been validated in several states and provinces but that is for another anthology. For the time being, RIKI - Research Institute for Key Indicators Data Laboratory at Penn State University has all these studies on their Selected Publications web-page.

Just as a footnote, Key Indicator Rules are statistical predictor rules that predict overall regulatory compliance with a full set of rules. Risk Assessment Rules are those rules that place children at greatest risk of morbidity or mortality. When these two methodologies are used together they provide a unique balance of prediction and safeguarding via an abbreviated monitoring approach.

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https://prevention.psu.edu/person/rick-fiene/

https://www.naralicensing.org/key-indicators

Fiene's Key Indicator Statistical Methodology©

September 13, 2013

This short paper provides the technical and statistical aspects of the Fiene key indicator methodology©. It will provide the roadmap in taking businesses through the necessary steps to generating the respective key indicators which will then predict overall successful outcomes for their respective businesses.

One of the first steps is to sort the data into high and low groups, generally the highest and lowest ratings can be used for this sorting. Frequency data will be obtained on those data elements in the top level (usually top 20-25%) and the bottom level (usually the bottom 20-25%). The middle levels are not used for the purposes of these analyses. These two groups (top level & the bottom level) are then compared to how each data element (see Figure 1). An example would be the following: let's say a business has varying levels of success in selling a specific product. Sort all the salespersons by the number in the highest group and the lowest group by successful sales. Then determine how the groups scored on specific data elements, such as number of phone calls back to each client. Sort the number of phone calls into the top 25% number of calls and the bottom 25% of calls. Fill in the cells within Figure 1 accordingly (see Figure 2).

Figure 1	***Data Element in the Top 25%***	***Data Element in the Bottom 25%***	***Row Total***
Highest level (top 20-25%)	**A**	**B**	***Y***
Lowest level (bottom 20-25%)	**C**	**D**	***Z***
Column Total	***W***	***X***	***Grand Total***

Figure 2 depicts that all programs that were in the top 25% (5+ calls) were also in the highest rating while the bottom 25% (3 or fewer calls) were also in the lowest rating.

Figure 2	*5+ Calls*	*3 or Fewer Calls*	*Row Total*
Highest Level	*117*	*0*	*117*
Lowest Level	**0**	*35*	*35*
Column Total	*117*	*35*	**152**

Once the data are sorted in the above matrix, the following formula (Figure 3) is used to determine if Item 16 is a key indicator or not by calculating its respective Fiene coefficient. Please refer back to Figure 1 for the actual placement within the cells and Figure 2 for the data within the cells. The legend (Figure 4) below the formula shows how the cells are defined.

Figure 3 – Formula for Fiene Coefficient

$$\phi = (A)(D)-(B)(C) \div \sqrt{(W)(X)(Y)(Z)}$$

Figure 4 – Legend for the Cells within the Fiene Coefficient

A = High Group + Data Element in High Group.
B = High Group + Data Element in Low Group.
C = Low Group + Data Element in High Group.
D = Low Group + Data Element in Low Group.

W = Total Number of Times Data Element in High Group.
X = Total Number of Times Data Element in Low Group.
Y = Total Number of Times in High Group.
Z = Total Number of Times in Low Group.

Once the data are run through the formula in Figure 3, the following chart (Figure 5) can be used to make the final determination of including or not including the item as a key indicator. Based upon the chart in Figure 5, it is best to have a Fiene Coefficient approaching +1.00 if we are dealing with normally distributed data[1]. This requirement is relaxed with skewed data (+.26 and higher).

Continuing with the chart in Figure 5, if the Fiene Coefficient is between +.25 and -.25, this indicates that the indicator is unpredictable in being able to predict overall compliance with the quality rating assessment tool. Either a false positive in which the indicator appears too often in the low group as being in compliance, or a false negative in which the indicator appears too often in the high group as being out of compliance[2].

The last possible outcome with the Fiene Coefficient is if it is between -.26 and -1.00, this indicates that the indicator is a terrible predictor because it is doing just the opposite of the decision we want to make. The indicator would predominantly be in compliance with the low group rather than the high group so it would be statistically predicting overall non-compliance. This is obviously something we do not want to occur.

Figure 5 – Thresholds for the Fiene Coefficient

Fiene Coefficient Range	Characteristic of Indicator	Decision
(+1.00) – (+.26)	Good Predictor	Include
(+.25) – (-.25)	Unpredictable	Do not Include
(-.26) – (-1.00)	Terrible Predictor	Do not Include

Notes:

1. The reason for pointing out the need to have a higher Phi Coefficient than what has been reported previously is the fact that the dichotomization of data should only be used with skewed data and not normally distributed data because it will accentuate differences. However, since the purpose of the dichotomization of data is only for sorting into a high and low group, it would appear to be acceptable for this purpose (MacCallun, etal, 2002. On the practice of dichotomization of quantitative variables, *Psychological Methods, 7, 1,* 19-40.).

2. These results would show an increase in cells B and C in Figure 1 which is undesirable; it should always be the case where A + D > B + C for key indicators to maintain their predictive validity.

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Technical Detail Updates to the Fiene Key Indicator Methodology

January 2015

The Key Indicator Methodology has recently been highlighted in a very significant Federal Office of Child Care publication series on Contemporary Licensing Highlights. In that Brief the Key Indicator Methodology is described as part of a differential monitoring approach along with the risk assessment methodology. Because of the potential increased interest in the Key Indicator Methodology, a brief update regarding the technical details of the methodology is warranted. For those readers who are interested in the historical development of Key Indicators I would suggest they download the resources available at the end of the paper.

This brief paper provides the technical and statistical updates for the key indicator methodology based upon the latest research in the field related to licensing and quality rating & improvement systems (QRIS). The examples will be drawn from the licensing research but all the reader needs to do is substitute “rule” for “standard” and the methodology holds for QRIS.

Before proceeding with the technical updates, let me review the purpose and conceptual underpinning of the Key Indicator Methodology. Key Indicators generated from the methodology are not the rules that have the highest levels of non-compliance nor are they the rules that place children most at risk of mortality or morbidity. Key Indicators are generally somewhere in the middle of the pack when it comes to non-compliance and risk assessment. The other important conceptual difference between Key Indicators and risk assessment is that only Key Indicators statistically predict or are predictor rules of overall compliance with all the rules for a particular service type. Risk assessment rules do not predict anything other than a group of experts has rated these rules as high risk for children’s mortality/morbidity if not complied with.

Something that both Key Indicators and risk assessment have in common is through their use one will save time in their monitoring reviews because you will be looking at substantially fewer rules. But it is only with Key Indicators that you can statistically predict additional compliance or non-compliance; this is not the case with risk assessment in which one is only looking at those rules which are a state’s high risk rules. And this is where differential monitoring comes into play by determining which programs are entitled to either Key Indicators and/or risk assessment for more abbreviated monitoring reviews rather than full licensing reviews (the interested reader should see the *Contemporary Licensing Series on Differential Monitoring, Risk Assessment and Key Indicators* published by the Office of Child Care.

Technical and Statistical Framework

One of the first steps in the Key Indicator Methodology is to sort the licensing data into high and low groups, generally the highest and lowest licensing compliance with all the rules can be used for this sorting. Frequency data will be obtained on those programs in the top level (usually top 20-25%) and the bottom level (usually the bottom 20-25%). The middle levels are not used for the purposes of these analyses. These two groups (top level & the bottom level) are then compared to how each program scored on each child care rule (see Figure 1). In some cases, especially where there is very high compliance with the rules and the data are extremely skewed, it may be necessary to use all those programs that are in full (100%) compliance with all the rules as the high group. The next step is to look at each rule and determine if it is in compliance or out of compliance with the rule. This result is cross-referenced with the High Group and the Low Group as depicted in Figure 1.

Figure 1	***Providers In Compliance on Rule***	***Programs Out Of Compliance on Rule***	***Row Total***
Highest level (top 20-25%)	***A***	***B***	***Y***
Lowest level (bottom 20-25%)	**C**	**D**	***Z***
Column Total	***W***	***X***	***Grand Total***

Once the data are sorted in the above matrix, the following formula (Figure 2) is used to determine if the rule is a key indicator or not by calculating its respective Key Indicator coefficient. Please refer back to Figure 1 for the actual placement within the cells. The legend (Figure 3) below the formula shows how the cells are defined.

Figure 2 – Formula for Fiene Key Indicator Coefficient

$$\phi = (A)(D)-(B)(C) \div \sqrt{(W)(X)(Y)(Z)}$$

Figure 3 – Legend for the Cells within the Fiene Key Indicator Coefficient

A = High Group + Programs in Compliance on Specific Rule.
B = High Group + Programs out of Compliance on Specific Rule.
C = Low Group + Programs in Compliance on Specific Rule.
D = Low Group + Programs out of Compliance on Specific Rule.

W = Total Number of Programs in Compliance on Specific Rule.
X = Total Number of Programs out of Compliance on Specific Rule.
Y = Total Number of Programs in High Group.
Z = Total Number of Programs in Low Group.

Once the data are run through the formula in Figure 2, the following chart (Figure 4) can be used to make the final determination of including or not including the rule as a key indicator. Based upon the chart in Figure 4, it is best to have a Key Indicator Coefficient approaching +1.00 however that is rarely attained with licensing data but has occurred in more normally distributed data.

Continuing with the chart in Figure 4, if the Key Indicator Coefficient is between +.25 and -.25, this indicates that the indicator rule is unpredictable in being able to predict overall compliance with the full set of rules. Either a false positive in which the indicator appears too often in the low group as being in compliance, or a false negative in which the indicator appears too often in the high group as being out of compliance. This can occur with Key Indicator Coefficients above +.25 but it becomes unlikely as we approach +1.00 although there is always the possibility that other rules could be found out of compliance. Another solution is to increase the number of key indicator rules to be reviewed but this will cut down on the efficiency which is desirable and the purpose of the key indicators.

The last possible outcome with the Key Indicator Coefficient is if it is between -.26 and -1.00, this indicates that the indicator is a terrible predictor because it is doing just the opposite of the decision we want to make. The indicator rule would predominantly be in compliance with the low group rather than the high group so it would be statistically predicting overall non-compliance. This is obviously something we do not want to occur.

Figure 5 gives the results and decisions for a QRIS system. The thresholds in a QRIS system are increased dramatically because QRIS standard data are less skewed than licensing data and a more stringent criterion needs to be applied in order to include particular standards as Key Indicators.

Figure 4 – Thresholds for the Fiene Key Indicators for Licensing Rules

Key Indicator Range	Characteristic of Indicator	Decision
(+1.00) – (+.26)	Good Predictor	Include
(+.25) – (-.25)	Unpredictable	Do not Include
(-.26) – (-1.00)	Terrible Predictor	Do not Include

Figure 5 – Thresholds for the Fiene Key Indicators for QRIS Standards

Key Indicator Range	Characteristic of Indicator	Decision
(+1.00) – (+.76)	Good Predictor	Include
(+.75) – (-.25)	Unpredictable	Do not Include
(-.26) – (-1.00)	Terrible Predictor	Do not Include

RESOURCES AND NOTES

For those readers who are interested in finding out more about the Key Indicator Methodology and the more recent technical updates as applied in this paper in actual state examples, please see the following publication:
Fiene (2014). *ECPQIM4©: Early Childhood Program Quality Indicator Model4,* Middletown: PA; Research Institute for Key Indicators LLC (RIKI). (http://drfiene.wordpress.com/riki-reports-dmlma-ecpqim4/)
In this book of readings/presentations are examples and information about differential monitoring, risk assessment, key indicators, validation, measurement, statistical dichotomization of data, and regulatory paradigms. This publication delineates the research projects, studies, presentations, & reports completed during 2013-14 in which these updates are drawn from.

Technical Detail Notes: Validation Updates to the Fiene Key Indicator Systems

January 2015

These notes will provide guidance on validating existing Key Indicator Licensing Systems. These notes are based upon the last three years of research and data analysis in determining the best means for conducting these validation studies.

These notes are based upon existing Key Indicator Systems in which data can be drawn from an already present data base which contains the comprehensive instrument (total compliance data) and the key indicator instrument (key indicator rule data). When this is in place and it can be determined how licensing decisions are made: full compliance with all rules or substantial compliance with all rules to receive a license, then the following matrix can be used to begin the analyses (see Figure 1):

Figure 1	***Providers who fail the Key Indicator review***	***Providers who pass the Key Indicator review***	***Row Totals***
Providers who fail the Comprehensive review	***W***	***X***	
Providers who pass the Comprehensive Review	**Y**	**Z**	
Column Totals			***Grand Total***

A couple of annotations regarding Figure 1.

W + Z = the number of agreements in which the provider passed the Key Indicator review and also passed the Comprehensive review.

X = the number of providers who passed the Key Indicator review but failed the Comprehensive review. This is something that should not happen, but there is always the possibility this could occur because the Key Indicator Methodology is based on statistical methods and probabilities. We will call these False Negatives (FN).

Y = the number of providers who failed the Key Indicator review but passed the Comprehensive review. Again, this can happen but is not as much of a concern as with "**X**". We will call these False Positives (FP).

Figure 2 provides an example with actual data from a national organization that utilizes a Key Indicator System. It is taken from 50 of its program providers.

Figure 2	***Providers who fail the Key Indicator review***	***Providers who pass the Key Indicator review***	***Row Total***
Providers who fail the Comprehensive review	***25***	***1***	***26***
Providers who pass the Comprehensive Review	**7**	**17**	***24***
Column Total	***32***	***18***	***50***

To determine the agreement ratio, we use the following formula:

$$\frac{A}{A + D}$$

Where A = Agreements and D = Disagreements.

Based upon Figure 2, A + D = 42 which is the number of agreements; while the number of disagreements is represented by B = 1 and C = 7 for a total of 8 disagreements. Putting the numbers into the above formula:

$$\frac{42}{42 + 8}$$

Or

.84 = Agreement Ratio

The False Positives (FP) ratio is .14 and the False Negatives (FN) ratio is .02. Once we have all the ratios we can use the ranges in Figure 3 to determine if we can validate the Key Indicator System. The FP ratio is not used in Figure 3 but is part of the Agreement Ratio.

Figure 3 – Thresholds for Validating the Fiene Key Indicators for Licensing Rules

Agreement Ratio Range	False Negative Range	Decision
(1.00) – (.90)	.05+	Validated
(.89) – (.85)	.10 - .06	Borderline
(.84) – (.00)	.11 or more	Not Validated

RESOURCES AND NOTES

For those readers who are interested in finding out more about the Key Indicator Methodology and the more recent technical updates as applied in this paper in actual state examples, please see the following publication:

Fiene (2014). *ECPQIM4©: Early Childhood Program Quality Indicator Model4*, Middletown: PA; Research Institute for Key Indicators LLC (RIKI). (http://drfiene.wordpress.com/riki-reports-dmlma-ecpqim4/)

In this book of readings/presentations are examples and information about differential monitoring, risk assessment, key indicators, validation, measurement, statistical dichotomization of data, and regulatory paradigms. This publication delineates the research projects, studies, presentations, & reports completed during 2013-14 in which these updates are drawn from.

For those readers interested in a historical perspective to the development of the Key Indicator methodology and licensing measurement, please see the following publications (most of these publications are available at the following website (http://rikinstitute.wikispaces.com/home):

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KEY INDICATOR TECHNICAL NOTES (12-8-15) RJF (this note updates a previous technical note from earlier in 2015 regarding this same topic):

Each state/jurisdication will be different when applying the Key Indicator Methodology but there are some guiding principles that should be used:

1) Sample size should be around 100-200 programs. Less than 100 may not produce significant results and indicators will be missed. Over 200 programs will provide too many indicators reaching significance.

2) Set the p value to .01 ($p < .01$). $P < .05$ is too lenient and $p < .001$ is too stringent. $P < .01$ gives a proper balance for the number of indicators a state/jurisdiction will need.

3) The best model to use is the 100% for the high group (100-99% can also be used) with the middle programs not being used and the bottom 25% being used for the low group. The worse model to use is 100% as the high group and 99% or less as the low group. Too much error variance in the programs is introduced with an increase in making false negatives and the phi and Pearson correlations drop off significantly.

4) Select a moderate number of key indicators, don't select too few. It is more reliable to go with a few additional indicators than using too few.

5) Minimize false negatives by using the model described in #3 above.

Validation of the Key Indicator Methodology: Two Examples

Richard Fiene, Ph.D.

June 2015

Introduction

The purpose of this paper is to address the validation of the key indicator methodology as suggested in the *ASPE White Paper on ECE Monitoring* (2015). It was so accurately pointed out in this *White Paper* regarding the need to continue to access and validate differential monitoring which generally consists of the key indicator and risk assessment methods.

Over the past 35 years various aspects of differential monitoring have been assessed and validated. For example, studies by Kontos and Fiene (1987) and Fiene (2000) demonstrated the relationship between key indicators and child development outcomes. In 2002, another *ASPE White Paper on the Thirteen Indicators of Quality Child Care: A Research Update* summarized the research over the previous 20 years in demonstrating a core set of key indicator risk assessment standards. More recently, a study completed in Georgia (Fiene, 2014) validated the use of core rules in a risk assessment and differential monitoring approach. And in 2012, a study was done in California which demonstrated the time savings in using a key indicator approach. And finally, in 2013-14, a study was done in the national Head Start program in which their key indicator approach (Head Start Key Indicators (HSKI)) validated the decision making ability of key indicators in which an 84% - 91% agreement was found between the HSKI and Full Compliance Reviews. The focus of this paper will be on the latest findings from Head Start since these findings have not been published to date.

The National Child Care Licensing Study (2011) and the National Center for Child Care Quality Improvement (2014) have reported the significant use of differential monitoring, key indicators and risk assessment methods by many states throughout the country. And with the reauthorization of CCDBG (2014) and the increased emphasis on ECE program monitoring there is an increased need to validate these approaches. This paper is the beginning attempt to begin this process focusing on the key indicator method.

Methodology

This validation method is based upon existing Key Indicator Systems in which data can be drawn from an already present data base which contains the comprehensive instrument (total compliance data) and the key indicator instrument (key indicator rule data). When this is in place and it can be determined how licensing decisions are made: full compliance with all rules or substantial compliance with all rules to receive a license, then the following matrix can be used to begin the analyses (see Figure 1):

Figure 1	***Providers who fail the Key Indicator review***	***Providers who pass the Key Indicator review***	***Row Totals***
Providers who fail the Comprehensive review	***W***	***X***	
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Column Totals			***Grand Total***

A couple of annotations regarding Figure 1.

W + Z = the number of agreements in which the provider passed the Key Indicator review and also passed the Comprehensive review.

X = the number of providers who passed the Key Indicator review but failed the Comprehensive review. This is something that should not happen, but there is always the possibility this could occur because the Key Indicator Methodology is based on statistical methods and probabilities. We will call these False Negatives (FN).

Y = the number of providers who failed the Key Indicator review but passed the Comprehensive review. Again, this can happen but is not as much of a concern as with "**X**". We will call these False Positives (FP).

Figure 2 provides an example with actual data from a national organization that utilizes a Key Indicator System. It is taken from 50 of its program providers.

Figure 2	***Providers who fail the Key Indicator review***	***Providers who pass the Key Indicator review***	***Row Total***
Providers who fail the Comprehensive review	***25***	***1***	***26***
Providers who pass the Comprehensive Review	**7**	**17**	***24***
Column Total	***32***	***18***	***50***

To determine the agreement ratio, we use the following formula:

$$\frac{A}{A + D}$$

Where A = Agreements and D = Disagreements.

Based upon Figure 2, A + D = 42 which is the number of agreements; while the number of disagreements is represented by B = 1 and C = 7 for a total of 8 disagreements. Putting the numbers into the above formula:

$$\frac{42}{42 + 8}$$

Or

.84 = Agreement Ratio

The False Positives (FP) ratio is .14 and the False Negatives (FN) ratio is .02. Once we have all the ratios we can use the ranges in Figure 3 to determine if we can validate the Key Indicator System. The FP ratio is not used in Figure 3 but is part of the Agreement Ratio.

Figure 3 – Thresholds for Validating the Fiene Key Indicators for Licensing Rules

Agreement Ratio Range	False Negative Range	Decision
(1.00) – (.90)	.05+	Validated
(.89) – (.85)	.10 - .06	Borderline
(.84) – (.00)	.11 or more	Not Validated

Results

The following results are from a study completed in 2014 using Head Start data where HSKI reviews were compared with comprehensive reviews to make certain that additional non-compliance was not found when HSKI tools were administered to programs.

There was an 84% - 91% (see Table 1) agreement between the HSKI and Comprehensive Reviews which would indicate that the HSKI method was validated in Head Start based upon Figure 3 above in the Methodology section.

FY 2015 HSKI Agreement Table 1

FY 2015 HSKI Agreement Tables with Combined OHSMS Data from FYs 2012, 2013, and 2014

	% agreement	**Sensitivity**
FIS	91%	63%
GOV/SYS	84%	63%
SR	87%	52%

Fiscal (5)

- FIS1.1 - Effective financial management systems (D, I, T)
- FIS2.1 - Timely and complete financial records (D)
- FIS4.1 - Signed and approved time records (T)
- FIS5.3 - NFS contributions are necessary and reasonable (D)
- FIS6.2 - Complete and accurate equipment records (D, T)

SR (9)

- CDE1.2 - System to track, use, and report on SR goals (I)
- CDE2.1 - Evidenced-based curriculum (I)
- CDE3.1 – Individualizing (I)
- CDE3.4 - Child access to mental health services (I)
- CDE4.1 - Teacher qualifications (S)
- CHS1.5 - Health services tracking system (I)
- CHS2.2 - Referrals for children with disabilities to LEA or Part C Agency
- FCE2.3 - Access to mental health services (I)
- FCE5.3 - Coordination with LEAs and Part C Agencies

GOV/SYS (9)

- GOV2.1 - Training and Technical Assistance for GB and PC (I)
- GOV2.2 - GB responsibilities regarding program administration and operations (I)
- GOV3.1 - Reporting to GB and PC (I)
- GOV2.4 - PC submits program activity decisions to GB (I)
- SYS1.2 - Annual Self-Assessment (I)

- SYS4.1 - Communication mechanisms (I)
- SYS5.2 - Publication and availability of an Annual Report (I)
- SYS2.1 - Ongoing Monitoring (I)
- SYS5.1 - Record–keeping (I)

I = Interview
D = Document Review
T = Transaction Review
S = Staff files

Discussion

This paper presents a validation methodology to validate the differential monitoring approach that utilizes key indicators. This is an area that needs additional research as many more states began to think about employing the various approaches for differential monitoring involving risk assessment and key indicators.

The results from this paper are very encouraging in that they clearly demonstrate that a very large delivery system, the national Head Start program, can utilize key indicators (HSKI – Head Start Key Indicators) for a differential monitoring approach (Aligned Monitoring System).

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Appendix

A more recent validation study has been completed in the Province of Ontario, Canada where they compared three sets of Key Indicators over three calendar years in a similar fashion to the Head Start study reported above. Below are the results of these analyses.

Validation Summary

Year	Key Indicators	Agreement Ratio
2014	29 Indicators	0.90
	35 Indicators	0.92
	41 Indicators	0.94
2013	29 Indicators	0.90
	35 Indicators	0.92
	41 Indicators	0.93
2012	29 Indicators	0.91
	35 Indicators	0.93
	41 Indicators	0.94

Note. The key indicators are validated when the agreement ratio is 0.90 or above.

Theory of Regulatory Compliance Algorithm (2/17)

1) ΣR = C
2) Review C history x 3 yrs
3) NC + C = CI
4) If CI = 100 -> KI
5) If KI > 0 -> CI or if C < 100 -> CI
6) If RA (NC% > 0) -> CI
7) KI + RA = DM
8) KI = ((A)(D)) - ((B)(E)) / sqrt ((W)(X)(Y)(Z))
9) RA = ΣR1 + ΣR2 + ΣR3 + ….. ΣRn / N
10) (TRC = 99%) + (ϕ = 100%)
11) (CI < 100) + (CIPQ = 100) -> KI (10% CI) + RA (10-20% CI) + KIQP (5-10% of CIPQ) -> OU

Legend:
R = Rules/Regulations/Standards
C = Compliance with Rules/Regulations/Standards
NC = Non-Compliance with Rules/Regulations/Standards
CI = Comprehensive Instrument for determining Compliance
ϕ = Null
KI = Key Indicators
KI >= .26+ Include
KI <= .25 Null, do not include
RA = Risk Assessment
ΣR1 = Specific Rule on Likert Risk Assessment Scale (1-8; 1 = low risk, 8 = high risk)
N = Number of Stakeholders
DM = Differential Monitoring
TRC = Theory of Regulatory Compliance
CIPQ = Comprehensive Instrument Program Quality
KIPQ = Key Indicators Program Quality
OU = Outcomes
A = High Group + Programs in Compliance on Specific Compliance Measure (R1...Rn).
B = High Group + Programs out of Compliance on Specific Compliance Measure (R1...Rn).
E= Low Group + Programs in Compliance on Specific Compliance Measure (R1...Rn).
D = Low Group + Programs out of Compliance on Specific Compliance Measure (R1...Rn).
W = Total Number of Programs in Compliance on Specific Compliance Measure (R1...Rn).
X = Total Number of Programs out of Compliance on Specific Compliance Measure (R1...Rn).
Y = Total Number of Programs in High Group (ΣR = 98+).
Z = Total Number of Programs in Low Group (ΣR <= 97).
High Group = Top 25% of Programs in Compliance with all Compliance Measures (ΣR).
Low Group = Bottom 25% of Programs in Compliance with all Compliance Measures (ΣR).

Regulatory Compliance Matrices

2 x 2 Matrix (In vs Out of compliance x High vs Low Groups):

A	**B**
C	**D**

(A = In compliance + High Group)(B = In compliance + Low Group)(C = Out of Compliance + High Group)(D = Out of Compliance + Low Group); **B** = false positives; **C = false negatives;** A + D > B + C; B > C; **A + D = + results**.

2 x 3 Matrix (In vs Out of compliance x 100% vs Substantial vs Low Compliance Groups):

A	**B**	**C**
D	**E**	**F**

(A = In compliance + 100% Group)(B = In compliance + Substantial Compliance Group)(C = In compliance + Low Group)(D = Out of compliance + 100% Group)(E = Out of compliance + Substantial Compliance Group)(F = Out of compliance + Low Group); **C** = false positives; **D, E = false negatives;** B > A > C; **B + F = + results.**

3 x 2 Matrix (In vs Partial vs Out of compliance x High vs Low Groups):

A	**B**
C	**D**
E	**F**

(A = In compliance + High Group)(B = In compliance + Low Group)(C = Partial compliance + High Group)(D = Partial compliance + Low Group)(E = Out of compliance + High Group)(F = Out of compliance + Low Group); **B** = false positives; **E = false negatives;** A > C > B > D; **A + F = +results.**

3 x 3 Matix (In vs Partial vs Out of compliance x 100% vs Substantial vs Low Compliance Groups):

A	**B**	**C**
D	**E**	**F**
G	**H**	**I**

(A = In compliance + 100% Group)(B = In compliance + Substantial Compliance Group)(C = In compliance + Low Group)(D = Partial compliance + 100% Group)(E = Partial compliance + Substantial Compliance Group)(F = Partial compliance + Low Group)(G = Out of compliance + 100% Group)(H = Out of compliance + Substantial Compliance Group)(I = Out of compliance + Low Group); **C** = false positives; **G, H = false negatives**; B > A > D > E > C > F; **B + D + I = + results.**

Theory of Regulatory Compliance and Regulatory Compliance Monitoring Paradigm Matrix Notes (Fiene, 2-12-17)

Outline:

- 2x2 absolute vs 3x3+ relative matrices.
- 2x2 In or Out x 100% or 0%.
- 3x3 100%, Substantial, Low x In, Partial, Out.
- TRC proposes 3x2 = 100%, Substantial, Low x In, Out.
- KI 2x2 or 3x2; RA 3x3 matrices.
- Normally distributed curve 3x3+ vs Skewed data 2x2 - visualize a normally distributed curve over the cells vs a very skewed curve over the 2 cells.
- ERS as 7x7 potential matrix.
- Use these matrices to explain RCMP and potential data analyses.
- Better analytical techniques for analyzing these matrices.
- Problem with 2x2 are the false negatives.
- Does a 3x3+ reduce the false negatives. Key question.
- What I have found over my 40+years is that I have as many questions as I have answers at this point, not sure that 2x2 or 3x2 are best matrices. What happens if we expand to a 7x7 matrix.
- Phi to Chi-square as the preferred statistic?
- Would Matrix Algebra be more appropriate.
- First time tying KI and RA together via 2x2 and 3x3 matrices. Common analytical framework.

Research Questions:

What are the differences between a 2x2 vs 2x3 vs 3x3 matrices? This will account for absolute, relative and substantial compliance ranges.

What is the impact of having 2x2, 2x3, and 3x3 on false negatives?

What are the results with 100% vs 99-98% and low compliance groups?

What are the differences between samples and full data sets?

Relationship between PC and PQ? Linear or non-linear

Matrices:

A	**B**
C	D

2 x 2 = I/O x H/L (I = In compliance)(O = Out of compliance)(H = High Group)(L = Low Group)
A + D = positive+ results, to be expected
B = false positives
C = false negatives
A + D > B + C
B > C
Class ARC Matrix

A	**B**	**C**
D	E	F

3 x 2 = H/S/L x I/O (S = Substantial Compliance) or 3 x 3 with I/P/O where P = Partial.
A = 100% compliance
B = Substantial compliance
C = Low compliance
C = false positives
D = false negatives
B > A > C
B + F = + results, to be expected
Fiene TRC Matrix

A	**B**	**C**
D	**E**	**F**
G	**H**	**I**

3 X 3+ = H/M/L x H/M/L
A = Low probability + low risk
E= Medium probability + medium risk
I= High probability + high risk
A > B > C > D > E > F > G > H > I
Fiene RA Matrix

Classification Matrix & Sensitivity Analysis for Validating Licensing Key indicator Systems
Technical Research Note (Fiene, 2017)

	1	2	3	5	7	8	10	Comments
A	1.00	1.00	1.00	0.00	0.00	1.00	1.00	Perfect
B	0.52	0.52	0.52	0.48	0.48	0.52	0.04	Random
C	0.71	0.96	0.94	0.04	0.29	0.84	0.70	False (-)
D	0.94	0.78	0.71	0.22	0.06	0.81	0.70	False (+)
E	------	0.00	0.00	1.00	------	0.00	------	False +100%
F	0.00	0.00	0.00	1.00	1.00	0.00	-1.00	False+-100
H	0.45	0.46	0.40	0.54	0.55	0.46	-0.08	Random

Measures:
1 = Sensitivity *TPR = TP / (TP + FN)*
2 = Specificity *SPC = TN / (FP + TN)*
3 = Precision *PPV = TP / (TP + FP)*
5 = False Positive *FPR = FP / (FP + TN)*
7 = False Negative *FNR = FN / (FN + TP)*
8 = Accuracy *ACC = (TP +TN) (P + N)*
10 = Correlation *((TP)(TN)) - ((FP)(FN)) / SQRT((TP + FP)(TP + FN)(TN + FP)(TN + FN))*

PP = Predicted Positive = CI+
PN = Predicted Negaive = CI-
TP= True Positive = KI+
TN = True Negative =KI-

	TRUE POSITIVE (TP)(KI+)	TRUE NEGATIVE (TN)(KI-)
PREDICTED POSITIVE (PP)(CI+)	++	+-
PREDICTED NEGATIVE (PN)(CI-)	-+	--

CI+/CI-/KI+/KI-
A = 25/0/0/25 – Perfect match between CI and KI.
B = 13/12/12/13 – Random matching between CI and KI.
C = 17/7/1/25 – KI+ x CI- (False-)
D = 17/1/7/25 – KI- x CI+ (False+)
E = 0/0/50/0 – KI- x CI+ unlikely
F = 0/25/25/0 - False + & - 100% unlikely
H = 20/24/30/26 – Random matching between CI and KI.

The Evolution of Differential Monitoring With the Risk Assessment and Key Indicator Methodologies

Richard Fiene, Ph.D.

Research Institute for Key Indicators (RIKIllc)

The Pennsylvania State University

National Association for Regulatory Administration (NARA)

December 2018

The use of differential monitoring by states and Canadian Provinces has evolved very interestingly over the past decade into two parallel approaches which help to inform other interested jurisdictions as they consider a differential monitoring approach.

Differential monitoring is a more targeted or abbreviated form of monitoring facilities or programs based upon "what is reviewed/depth of the review" and "how often/frequent do we review". Two specific methodologies have been used by states to design and implement a differential monitoring approach: risk assessment and key indicators.

It was originally conceived that risk assessment and key indicator methodologies would be used in tandem and not used separately. Over the past decade, a real dichotomy has developed in which risk assessment has developed very independently of key indicators and risk assessment has become the predominant methodology used, while the key indicator methodology has lagged behind in development and implementation.

In this separate development and implementation, risk assessment has driven the "how frequent" visits in a differential monitoring approach while key indicators has driven "what is reviewed" when it comes to rules/regulations/standards.

The other development with both methodologies are the data matrices developed to analyze the data and to make decisions about frequency and depth of reviews. For risk assessment, the standard matrix used is a 3 x 3 matrix similar to the one presented below.

Risk Assessment with Probability along the vertical axis and Risk along the horizontal axis

A	**B**	**C**
D	**E**	**F**
G	**H**	**I**

In the above 3 x 3 Risk Assessment Matrix, (A) indicates a very high risk rule/regulation/standard with a high likelihood that it will occur, while (I) indicates a very low or no risk rule/regulation/standard with a low likelihood that it will occur. (B) through (H) indicate various degrees of risk and probability based upon their position within the Matrix.

The decision making relationship of more frequent visits to the facility or program is made on the following algorithm:

If I > E + F + H > B + C + D + G > A, than more frequent reviews are completed

Just as Risk Assessment utilizes a 3 x 3 Matrix, Key Indicators utilizes a 2 x 2 Matrix in order to analyze the data and make decisions about what is reviewed. Below is an example of a 2 x 2 Matrix that has been used.

Key Indicator with Compliance/Non-Compliance listed vertically and High vs Low Grouping listed hortizontally

A	**B**
C	**D**

In the above 2 x 2 Key Indicator Matrix, (A) indicates a rule/regulation/standard that is in compliance and in the high compliant group, while (D) indicates a rule/regulation/standard that in out of compliance and in the low compliant group. (B) and (C) indicate false positives and negatives.

The decision making relationship of more rules to be reviewed is made on the following algorithm:

If A + D > B + C, than a more comprehensive review is completed

Given the interest in utilizing differential monitoring for doing monitoring review, having this decade's long review of how the risk assessment and key indicator methodologies have evolved is an important consideration.

Is it still possible to combine the risk assessment and key indicator methodologies? It is by combining the 3 x 3 and 2 x 2 Matrices above where the focus of utilizing the Key Indicator methodology is (I) cell of the 3 x 3 Matrix. It is only here that the Key Indicator methodology can be used when combined with the Risk Assessment methodology.

Key Indicator and Risk Assessment Methodologies Used in Tandem

A	**B**	**C**
D	**E**	**F**
G	**H**	**Only Use Key Indicators here**

By utilizing the two methodologies in tandem, both frequency of reviews and what is reviewed are dealt with at the same time which makes the differential monitoring approach more effective and efficient.

Richard Fiene, Ph.D., Psychologist, Research Institute for Key Indicators (RIKIllc); Professor of Psychology (ret), Penn State University; and Senior Research Consultant, National Association for Regulatory Administration (NARA).

Relationship of the Theory of Regulatory Compliance, Key Indicators, & Risk Assessment Rules with Weights and Compliance Data

Richard Fiene, Ph.D.

April 2019

There is a relationship between general regulatory compliance levels, weights and how these work within the risk assessment and key indicator differential monitoring approaches. What generally happens is that there are high compliance levels with high risk assessment/weighted rules and with moderate weighted rules and low compliance levels with more low weighted rules which led to the Theory of Regulatory Compliance and an emphasis on substantial regulatory compliance. This is a general pattern and there are exceptions to every rule. Please see the chart below which depicts this relationship.

The reason for pointing this relationship out is for policy makers and researchers to be cognizant of these relationships and to be alert for when certain rules do not follow this pattern. Regulatory compliance data are very quirky data and because of its non-parametric characteristics can be difficult to analyze. I know that these results and relationships may seem self-evident, but they need emphasis because it is easy to overlook the obvious and to miss "the forest in looking at the trees".

Compliance	**Weights**	**Approach**	**Violation of Approach**
High	High	Risk Assessment Rules	Low Compliance with Rule
High - Medium	Medium	Key Indicator Rules	False Negatives
Medium	Low	Substantial Compliance	100% Compliance with all Rules

Let's walk through this chart.

High compliance means being in compliance with all or a substantial number of rules, but always keep in mind that when we are discussing regulatory compliance, being in high compliance means 100% - 99% in compliance with all rules. This is a very high standard and most programs can achieve these levels.

Medium compliance is still rather high regulatory compliance (98% - 97%) and is generally considered a high enough level for issuing a full license with a brief plan of correction. This is a level that is considered legally to be in substantial compliance with all rules. This regulatory result of substantial compliance led to the Theory of Regulatory Compliance and the public policy suggestion that substantial and not full (100%) regulatory compliance is in the best interests of clients. Low regulatory compliance, although not part of the chart above, happens very rarely. Programs that do not meet basic health and safety rules are issued cease and desist orders and are put out of business.

High weights are rules that place clients at greatest risk and should never be out of compliance. These are the Risk Assessment Rules that are always reviewed when a licensing inspection is completed, either when a full or abbreviated/differential monitoring visit is conducted. A licensing inspector does not want to leave a facility without having checked these rules.

Medium weights are rules that are very important but do not place clients at greatest risk. They generally add to the well-being of the client but will not jeopardize their health or safety. Generally, but not always, we find these rules as part of a licensing key indicator abbreviated inspection in a differential monitoring visit. For whatever, reason, facilities in high compliance generally have these in compliance and facilities in low compliance generally have these out of compliance or not in compliance. These are our predictor rules that statistically predict overall regulatory compliance.

Low weights are rules that do not have a real risk impact on the client. They are generally paper oriented rules, record keeping type rules. A lot of times they make it into the Key Indicator Rule list because it has to do with attention to detail and at times this will distinguish a high performing provider from one that is not doing as well. However, it can also have the opposite effect and these rules can "muddy the waters" when it comes to distinguishing between really high performing facilities and facilities that are just mediocre by contributing to data distributions that are highly skewed and difficult to find the "best of the best". Licensing researchers and policymakers need to pay attention to this dichotomy.

Risk assessment rules are those rules which have been identified as the most critical in providing the safeguards for clients when in out of home facilities. These rules are very heavily weighted and usually always in compliance. A violation of this approach is finding low compliance with specific risk assessment rules. These rules constitute approximately 10-20% of all rules.

Key indicator rules are those rules which statistically predict overall compliance with all rules. There is a small number of key indicator rules that are identified, generally less than 10% of all rules. These rules are in the mid-range when it comes to their weights or risk factor. And the rules are generally in high to substantial compliance. A violation of this approach is finding a facility in compliance with the key indicator rules but finding other rules out of compliance or the facility in the low group. (Please go to the following website for additional information http://RIKInstitute.com)

Substantial compliance is when the majority of the rules are in compliance with only a couple/few rules being out of compliance which are generally low weighted rules, such as paper driven rules. These rules are in the low-range when it comes to their weights or risk factor. Nice to have in place in being able to say we have "crossed every 't' and dotted every 'i'" but not critical in protecting the health, safety and well-being of the client. A violation of substantial compliance would be requiring full (100%) compliance with all rules.

This short RIKI Technical Research Note (#71) provides some additional guidance and interpretation of how particular patterns of licensing data impact and relate to each other. It is provided because of the nuances of regulatory compliance/licensing data which have limitations from an analytical perspective (Please see the RIKINotes blog on the RIKInstitute.com website).

Here is another way of looking at the chart presented on page 1 which incorporates all the elements elaborated in the chart: **Compliance, Weights, Approach, and Violation of the Approach (V).**

			Weights	
		High Risk	**Medium Risk**	**Low Risk**
Non-	**High NC**	**VRA**	**False Negative**	**TRC**
Compliance	**Medium NC**		**Key Indicators**	
(NC)	**Low NC**	**Risk Assessment**	**False Positive**	**VTRC**

VRA = Violation of Risk Assessment; VTRC = Violation of Theory of Regulatory Compliance.

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Risk Assessment and Licensing Decision Making Matrices: Taking into Consideration Rule Severity and Regulatory Compliance Prevalence Data

Sonya Stevens, Ed.D. & Richard Fiene, Ph.D.

June 2019

This short paper combines the use of risk assessment and licensing decision making matrices. In the past, risk assessment matrices have been used to determine the frequency of monitoring and licensing visits and scope of reviews based upon individual rule severity, risk factors, or both. Notably, these data were lacking because they had not been aggregated to determine what type of licensing decisions should be made based upon prevalence, probability, or regulatory compliance history data. The approach described here is a proposed solution to that problem.

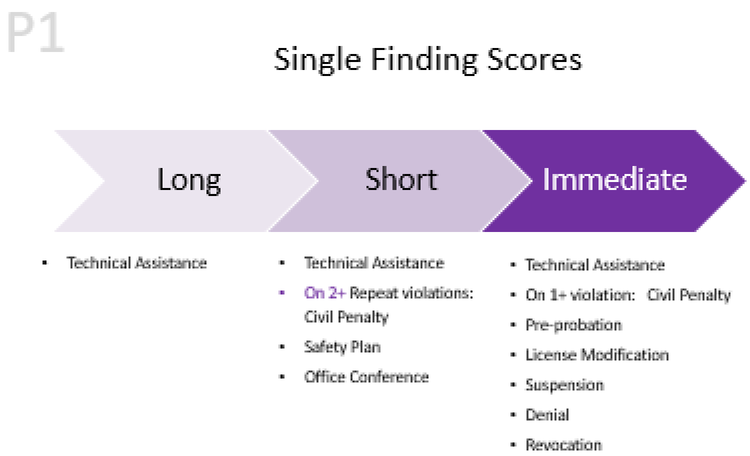
Washington State's HB 1661 (2017) redefined the department's facility licensing compliance agreement (FLCA) process. One feature of this new process is to allow licensed providers to appeal violations noted on the FLCA that do not involve "health and safety standards.[1]" To determine what licensing rules are and are not "health and safety standards" under the new definition, the department worked with community and industry stakeholders, and sought extensive public input, to assignment weights to licensing regulations. These weights were based on each regulation's risk of harm to children. A rule designed to protect against the lowest risk of harm was assigned a "1" and a rule designed to protect against the highest risk of harm was assigned an "8". Weights of "2" through "7" were determined accordingly. These weights were then grouped into three different categories based on risk:

- **Weights 8, 7 and some 6 = immediate concern**
- **Weights 4, 5 and most 6 = short term concern**
- **Weights 1, 2, and 3 = long term concern**

Using the new risk categories, the department developed a two-prong approach that considers both the risk of harm to children at the time a violation is monitored (single findings) and the risk of harm to children arising from violations noted for a given provider over a four year period (historical or overall findings). Used together, the department will assess the single findings and the historical findings to determine appropriate licensing actions, ranging from offering technical assistance to summarily suspending and revoking a child care license. In addition, the department will also note how many times a provider violates the *same* rule, with the severity of a licensing action increasing each time. For example, a violation within the short term concern category could be subject to a civil penalty when violated the second (or potentially the 3rd) time in a four-year period. Whereas, a violation in the immediate concern category could be subject to a civil penalty or more severe action upon the first violation. (See Graphic for Step 1).

[1] Washington law governing child care and early learning defines "health and safety standards" to mean "rules or requirements developed by the department to protect the health and safety of children against substantial risk of bodily injury, illness, or death." RCW 43.216.395(2)(b).

Step 1:



A more difficult task is assigning initial thresholds for the overall finding score. It is this second step (Step 2) where we need to consider probability and severity side by side as depicted in Chart 1 below which is generally considered the standard Risk Assessment Matrix in the licensing research literature:

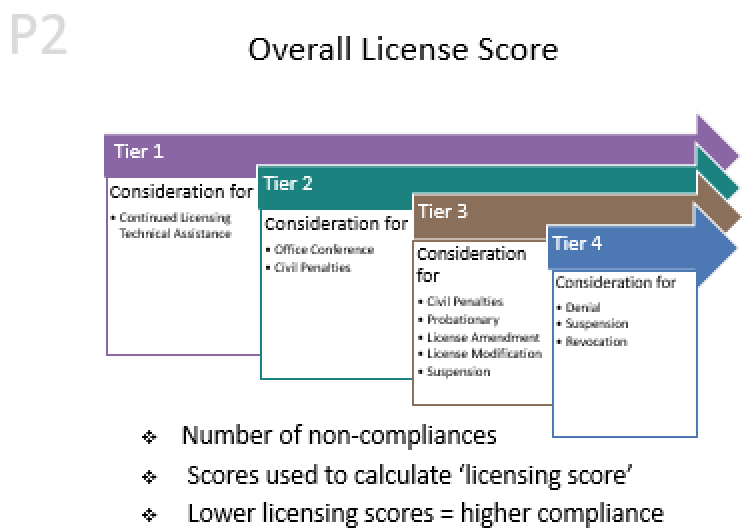
Step 2:

Chart 1 – Risk Assessment Matrix

		Probability/	**Prevalence**		
	Levels	**High**	**Medium**	**Low**	**Weights**
Risk/	**High**	***9***	***8***	***7***	***7-8***
Severity	**Medium**	***6***	***5***	***4***	***4-6***
	Low	***3***	***2***	***1***	***1-3***
	# of Rules	***8 or more***	***3-7***	***2 or fewer***	

The next step (Step 3) is to build in licensing decisions using a graduated Tiered Level system as depicted in the following figure. In many jurisdictions, a graduated Tiered Level system is used to make determinations related to monitoring visits (frequency and scope) and not necessarily for licensing decisions.

Step 3:



Step 4 involves combining steps 1 and 2 into a revised risk assessment matrix as depicted in the following chart:

Step 4:

Risk Assessment (RA) Matrix Revised

	Levels	**High**	**Medium**	**Low**
	Immediate	**9**	**8**	**7**
Risk/Severity	**Short-term**	**6**	**5**	**4**
	Long-term	**3**	**2**	**1**
			Probability	
	Regulatory Compliance (RC): # of Rules out of compliance and In compliance	**8+ rules out of compliance. 92 or less regulatory compliance.**	**3-7 rules out of compliance. 93 – 97 regulatory compliance.**	**2 or fewer rules out of compliance. 98 – 99 regulatory compliance.**

The last step (Step 5) is to take steps 3 and 4 and combine them together into the following charts which will provide guidance for making licensing decisions about individual programs based upon regulatory compliance prevalence, probability, and history as well as rule risk/severity data.

Step 5:

Licensing Decision Making Matrix*

Tier 1 = (1 – 2) RA Matrix Score

Tier 2 = (3) RA Matrix Score
Tier 3 = (4 – 5) RA Matrix Score

Tier 4 = (6 – 9) RA Matrix Score

***Regulatory Compliance (RC)(Prevalence/Probability/History + Risk/Severity Level)**

Tier 1 = ((RC = 93 – 97) + (Low Risk)); ((98 – 99) + (Low Risk)) = Tier 1

Tier 2 = (RC = 92 or less) + (Low Risk) = Tier 2

Tier 3 = ((RC = 93 – 97) + (Medium Risk)); ((98 – 99) + (Medium Risk)) = Tier 3

Tier 4 = (RC = (92 or less) + (Medium Risk)) = Tier 4; ((93 -97) +(High Risk)) = Tier 4; ((98 – 99) + (High Risk)); ((92 or less) + (High Risk)) = Tier 4+

The following algorithms should be followed in moving from the Risk Assessment Matrix (RAM) (Step 4) to the Licensing Decision Making Matrix (Step 5):

1) Σ (Yr1 RC + Yr2 RC + Yr3 RC + Yr4 RC).
2) Identify all rules by high, medium, low, no risk levels. HR, MR, LR, NULL.
3) HR = Tier4.
4) Σ NC Total/# of Years = Average NC.
5) Σ NC by RCH, RCM, and RCL.
6) LR + RCL or LR + RCM = Tier 1.
7) LR + RCH = Tier 2.
8) MR + RCL or MR + RCM = Tier 3.
9) MR + RCH or HR + RCM or HR + RCL = Tier 4.
   HR + RCH = Tier 4+.

Risk Level:
HR = High Risk (7-8 weights)
MR = Medium Risk (4-6 weights)
LR = Low Risk (1-3 weights)
Prevalence Level:
RCH = High Non Compliance (NC) (8+) or Low Regulatory Compliance (RC) (92 or less)
RCM = Medium Non Compliance (3-7) or Medium Regulatory Compliance (93-97)
RCL = Low Non Compliance (1-2) or High Regulatory Compliance (98-99)

Population Health Observatory

Child and residential care facility regulations ranked by the Fiene key indicator methodology_Supplementary Analysis

FROM: Fraser Health, Population Health Observatory

TO: Oonagh Tyson, Director, Health Protection; Amy Lubik, CCFL, Policy Analyst, HEPHU

CC: Rahul Chhokar, Manager, Population Health Observatory; Emily Newhouse, MHO, Health Protection;

DATE: Jan 23, 2020

REQUEST: To repeat the Fiene key indicator methodology using the 'First Inspection' sample selection approach on 2018/19 fiscal data ("supplementary analysis"), with the intention of using the most recent fiscal period with complete inspection data (2018/19) to generate the 'Key Indicators' for the project moving forward. Findings will be compared to the 2017/18 fiscal period results and the results of the former analysis on 2014/15 fiscal data (both provided in previous report).

SUMMARY

- Following the project team meeting on January 13, 2020, the decision was made to proceed with the "First Inspection" approach, whereby the Fiene Coefficients are calculated based on inspections during a <u>single fiscal period</u>, with the following conditions/exceptions:
  - Where multiple inspections have taken place in the fiscal period, only the first inspection was used
  - When a facility did not have an inspection during the fiscal period being analyzed, the first inspection occurring in the subsequent fiscal period was used (if available*)
- Fiene coefficients were calculated for each of 249 regulations, and "good predictors" were identified (*see APPENDIX B for more detail*).
- Child Care and Residential Care licensing inspection data from Data from April 1, 2018 to January 13, 2020* were extracted from Healthspace and included in this supplementary analysis.

*note: inspection data incomplete for 2019/20 fiscal period

KEY FINDINGS:

Table 1. Regulations identified as "good predictors" (Fiene Coefficient of ≥ .26) of overall compliance by facility type: Childcare (left) and Residential care (right). Two recent fiscal periods are compared, in addition to previous findings from 2017.

CHILDCARE FACILITIES

	REGULATION CODE	FIENE COEFFICIENT 2017/18 Fiscal	FIENE COEFFICIENT 2018/19 Fiscal	FIENE COEFFICIENT 2014/15 Fiscal (previous analysis)
Common across both fiscal periods	11010	0.43	0.51	
	19090	0.45	0.46	0.46
	19070	0.47	0.44	0.43
	12140	0.39	0.44	0.49
	12040	0.45	0.44	
	11200	0.37	0.42	0.41
	19100	0.42	0.42	0.34
	12090	0.42	0.38	0.39
	12050	0.38	0.37	0.45
	11020	0.35	0.36	0.42
	13050	0.31	0.34	0.34
	19080	0.38	0.33	0.31
	10050	0.27	0.32	0.31
	19160	0.34	0.30	
	15030	0.28	0.29	0.35
	12060	0.27	0.29	
Differed between fiscal periods	12430	---	0.29	
	13060	---	0.29	
	13020	---	0.28	0.30
	14030	0.26	---	0.30
	Total "Good" Predictors	*17*	*19*	14*

*In total, 16 regulations were identified in the 2017 analysis (2 not listed here)

RESIDENTIAL CARE FACILITIES

	REGULATION CODE	FIENE COEFFICIENT 2017/18 Fiscal	FIENE COEFFICIENT 2018/19 Fiscal	FIENE COEFFICIENT 2014/15 Fiscal (previous analysis)
Common across both fiscal periods	31300	0.39	0.48	0.46
	33280	0.423	0.45	---
	31290	0.48	0.44	0.48
	31260	0.37	0.38	0.41
	32320	0.48	0.37	0.38
	32100	0.41	0.33	0.29
	30240	0.29	0.30	0.36
	32110	0.46	0.29	0.34
Differed between fiscal periods	32010	---	0.27	---
	31100	0.31	---	0.35
	33230	0.40	---	0.36
	Total "Good" Predictors	*10*	*9*	*9***

**In total, 18 regulations were identified in the 2017 analysis (9 not listed here)

Colour Legend

Lower Fiene Score — Higher Fiene Score

*note: inspection data incomplete for 2019/20 fiscal period

APPENDIX A: Background (adapted from the 2017 request memo)

The Fiene key indicator methodology is highlighted in a Federal Office of Child Care publication series on contemporary licensing highlights as part of a differential monitoring approach along with the risk assessment methodology. Key Indicators statistically predict or are predictor rules of overall compliance with all the rules for a particular service type[1].

The health protection department is looking to more efficiently track child and residential care compliance by monitoring the regulations that are the best predictors for the facilities in the Fraser Health authority. There are currently 271 regulations applicable to childcare facilities and 473 regulations applicable to residential facilities.

APPENDIX B: Methodology (adapted from the 2017 request memo)

- An extract from Healthspace was provided by the Health Protection department containing all the monitored childcare and residential facilities inspections from April 1, 2017 to March 31, 2019 and whether they passed each individual regulation.
- Around 80% of facilities had more than one inspection during the two year study period. As a result, three approaches to selecting inspections for analysis were performed and compared:

Approach	Rationale
"First Inspection" Select only the first inspection in the study period	To replicate the methodology of the original analysis performed in 2017. Provides a more 'cross sectional' picture of compliance at the inspection level.
"Most Violations" Select only the inspection with the most violations	Maintains independence of observations, and mitigates bias (see "Inspections Combined"). Compares compliance at the inspection level.
"Inspections Combined" Combine all violations across all inspections for a given facility.	Summarizes compliance at the facility level. Consistent with the Fiene methodology whereby facilities are ranked to identify 'high compliance' vs. 'low compliance'. However, may introduce selection bias: facilities with multiple inspections may be more likely to have a greater number of regulations violated and thus receive a low compliance ranking.

The following figure represents these three approaches visually:

Selecting inspection for analysis

Sample Dataset for Facility "A"

FACILITY	INSPECTION (date)	REGULATIONS (violations = "X")				
		Reg1	Reg2	Reg3	Reg 4	Reg 5
A	1		X		X	
A	2	X		X	X	
A	3		X			

SELECTED FOR FIENE ANALYSIS:

First Inspection:	A	1		X		X	
Most Violations:	A	2	X		X	X	
Inspections Combined:	A	n/a	X	X	X	X	

- The facilities were sorted into quartiles (25%) based on their compliance across all the regulations. Only

1. Research Institute for Key Indicators. Technical Detail Updates to the Fiene Key Indicator Methodology, January 2015.

uded in

- Based on the results for the highest level and lowest level of facilities, the following matrix (Figure 1) was calculated for each individual regulation:

Figure 1	***Providers In Compliance on Rule***	***Programs Out Of Compliance on Rule***	***Row Total***
Highest level (top 20-25%)	***A***	***B***	***Y***
Lowest level (bottom 20-25%)	**C**	**D**	***Z***
Column Total	***W***	***X***	***Grand Total***

- The Fiene key indicator coefficient was then calculated for each regulation based on the following formula: $\phi=((A*D)-(B*C)) \div \sqrt{W*X*Y*Z}$

- The Fiene coefficient for each regulation was categorized based on figure 2. All the regulations that were in the range of being good predictors were kept and summarized in the results.

Figure 2: Thresholds for the Fiene Key Indicators for Licensing Rules

Key Indicator Range	Characteristic of Indicator	Decision
(+1.00) – (+.26)	**Good Predictor**	**Include**
(+.25) – (-.25)	**Unpredictable**	**Do not Include**
(-.26) – (-1.00)	**Terrible Predictor**	**Do not Include**

- SAS and Microsoft Excel were used for these analyses.

RIKI Technical Research Note on the Licensing Key Indicator Predictor Methodology Threshold Updates, Regulatory Compliance, False Positives & Negatives, Data Dichotomization, and Licensing Measurement

April 2021

The purpose of this technical research note is to provide the latest updates to the Key Indicator Predictor Methodology and associated measurement issues, such as eliminating or reducing false positives and negatives, the use of data dichotomization with regulatory compliance frequency distributions.

It has always been recommended that a data dichotomization model be employed in distinguishing between the highly regulatory compliant from the low levels of regulatory compliance. The suggested model was 25/50/25 in which the top 25% constituted the highly compliant group, the middle 50% constituted the substantial – mid range compliant group, and the bottom 25% constituted the low compliant group. This was different from what had been done in the past in which fully compliant (100%) facilities were compared with those facilities who had any violations of regulatory compliance. It was found that by utilizing the 25/50/25 model a clearer distinction could be made between the high and low compliant groups. Generally, the top 25% are those facilities that are in full (100%) compliance, with the middle 50% are those facilities that have regulatory non-compliance ranging from 1 – 10 violations. The bottom 25% are those facilities that have regulatory non-compliance of greater than 10 violations. In this dichotomization model, the middle 50% are not used in the calculations, only the top and bottom 25%.

The dichotomization model described in the above paragraph has worked very well in producing licensing key indicator predictor rules by eliminating false negatives and decreasing false positives in the resultant 2 x 2 Key Indicator Predictor Matrix. The Fiene Coefficients for the licensing key indicator predictor rules have been more stable and robust by utilizing this model. It was made possible because of the increasing sample sizes selected for analyses and in some cases where population data were available. Also, the overall level of full compliance in states/provinces has increased over time and that has been a contributing factor as well in eliminating false negatives. False positives have been decreased because of the same factors but will never be eliminated because of the nature of the data distribution being highly positive skewed. Because of this distribution, there will always be false positives identified in the analyses. But that is the lesser of two evils: a rule being in compliance although it is present in the low regulatory compliant group.

However, are there ways to mitigate the impact of false positives. Based upon results from the *Early Childhood Program Quality Improvement & Indicator Model Data Base (ECPQI2MDB)* maintained at the Research Institute for Key Indicators/Penn State, there appears to be several adjustments that can be made so that the impact of false positives is not as pronounce as it has been in the past. The first adjustment that can be made is to increase the sample size so that additional non-compliance is identified. This is difficult at times because the nature of licensing or regulatory compliance data trends towards very high compliance for most facilities with little non-compliant facilities. It is the nature of a regulatory compliance or licensing program; these are basic health and safety rules which have had a history of substantial to full compliance with the majority of the rules. The data are extremely positively skewed. There is little variance in the data. So, increasing the sample size should help on all these accounts. In addition to increasing the sample size, an additional methodology was developed in order to increase the variance in licensing/regulatory compliance data by weighting rules/regulations based upon the risk children are placed in because of non-compliance. This proposal makes a great deal of sense but its application in reality hasn't played out as intended. What most jurisdictions do in implementing the risk assessment methodology is to identify the most heavily weighted rules but then to deal with these rules as high risk rules and not using the weights assigned to them for aggregating regulatory compliance scores. The use of the methodology in this way is very effective in identifying the specific rules based upon risk, but does little to nothing in increasing the variance in the regulatory compliance data distribution. The data distribution remains severely positively skewed.

Another way to mitigate the impact of false positives is to increase the data dichotomization of the data distribution but this is recommended only with the increase sample size. If it is done without an increased sample size, the resultant Fiene Coefficients for the licensing key indicator predictor rules will be less robust and stable. For example, the data dichotomization model of 25/50/25 could be increased to a 10/80/10 model which should help in decreasing the false positives in the analyses. But this is cautionary, for example, in going to a 5/90/5 model could again make the resultant Fiene Coefficients for the licensing key indicator predictor rules less robust and stable. The sample size needs to be very large or the full population needs to be measured in order to do these analyses and co-balance the increased data dichotomization because the cell sizes will be decreasing significantly. The following 2 x 2 matrix will depict these relationships for generating the Licensing Key Indicator Predictor Fiene Coefficients (FC).

Licensing Key Indicator Predictor Fiene Coefficient (FC) Table

Individual Rules/Groups ->	High Compliant (Top 25%)	Low Compliant (Bottom 25%)
Rule In Compliance	FC (++)	FP (+)
Rule Out of Compliance	FN (-)	FC (--)

((FC (++) + (FC (--)) > ((FN (-)) + (FP (+))

where FC = Fiene Coefficient which results in Licensing Key Indicator Predictor Rules (FC = .25 or >);

FN (-) = False Negative; FP (+) = False Positive

The cells represented by the Fiene Coefficients should always be larger than the False Positive and Negative results in the above table. With the above dichotomization 25/50/25 model and high levels of full 100% regulatory compliance, false negatives can be eliminated and by increasing the sample size, false positives will be decreased but never fully eliminated. Full 100% regulatory compliance increased levels will help to eliminate false negatives, but it will also increase the chances of false positives. There is a delicate balance with confounding the increased sample sizes (false positives will decrease) and increased levels of full 100% regulatory compliance (false positives will increase). This will take a bit of adjusting to get this balancing just right.

By utilizing the *ECPQI2MDB* it has demonstrated that the above-mentioned dichotomization models may be difficult to hit the percentages exactly. The actual models may be more heavily weighted in the percent for the high group as versus the low because of the regulatory compliance data distribution being highly positive skewed as mentioned earlier. This may have an impact on the Fiene Coefficients (FC) for licensing key indicator predictor rules but it will not impact the actual selection of the licensing key indicators – they will remain the same, just the FCs will change.

One last footnote on the relationship between regulatory compliance and program quality. This relationship has been addressed several times over the past four decades in the regulatory science and human services regulatory administration fields; but it needs to be re-emphasized as it relates to this discussion about licensing measurement. Regulatory compliance and program quality are linear and non-random in moving from low regulatory compliance to mid-substantial regulatory compliance as with low program quality to mid program quality. However, when one moves from substantial regulatory compliance to full 100% regulatory compliance the relationship with program quality is more non-linear and random.

Regulatory Compliance Key Indicator Metric and Matrix Update/Revision Technical Research Note

Richard Fiene, Ph.D.

January 2023

Over the past decade in doing research on the Regulatory Compliance Key Indicator Metric (RCKIm) it has become very clear that false negatives needed to be controlled for because of their potential to increase morbidity and mortality. When dealing with regulatory compliance and full compliance as the threshold for the high grouping variable in the 2 x 2 Regulatory Compliance Key Indicator Matrix (RCKIM)(see matrix below), false negatives could be either eliminated or reduced to the point of no concern.

However, in the event that substantial compliance rather than full compliance is used as the thresh old for the high grouping variable in the 2 x 2 Regulatory Compliance Key Indicator Matrix (RCKIM) this becomes a problem again. There is the need to introduce a weighting factor.

In utilizing the RCKIm, the following equation/algorithm is used to produce the Fiene Coefficient (FC):

$$FC = ((A)(D)) - ((B)(C)) \ / \ \mathrm{sqrt}\ (WXYZ)$$

This RCKIm needs to be revised/updated to the following in order to take into account the need to again eliminate false negatives being generated by the results of the equation/algorithm; this can be accomplished by cubing B:

$$FC^* = ((A)(D)) - ((B^3)(C)) \ / \ \mathrm{sqrt}\ (WXYZ)$$

By this simple adjustment to cube (B) it will basically eliminate the use of any results in which a false negative occurs when substantial compliance is determined. The table below displays the variables of the Regulatory Compliance Key Indicator Matrix (RCKIM).

RCKIM	High RC Group	RC Low Group	Totals
KI In Compliance	A	B^3	Y
KI Violations	C	D	Z
Totals	W	X	

Regulatory Compliance Key Indicator Matrix (RCKIM)

In the above examples, FC can be used when the High RC Group is at full regulatory compliance, but FC* needs to be used when the High RC Group is including substantial as well as full regulatory compliance. By using both equations/algorithms, it better deals with the results of the Regulatory Compliance Theory of Diminishing Returns.

The results should clearly show that only positive (+) coefficients will become Regulatory Compliance Key Indicators versus those rules that do not show any relationship to overall regulatory compliance (0), but now the negative (-) coefficients will more clearly show when any false negatives appear and clearly not include them as Regulatory Compliance Key Indicators. This is a major improvement in the Regulatory Compliance Key Indicator methodology which clearly demonstrates the differences in the results. It provides a gateway in those regulatory compliance data distributions where substantial regulatory compliance is heavily present while full regulatory compliance is not. This could become a problem as the regulatory science field moves forward with the use of the Regulatory Compliance Theory of Diminishing Returns. Below are some data displays to support this revision/update:

RCKIM: Regulatory Compliance Key Indicator Metric (Fiene, 2023)

A	B	C	D	E	F	G	H	I	J	K	L	M	N
20	24	30	26	44	56	50	50	520	720	6160000	2481.934729	-200	-0.080582
20	0	30	26	20	56	50	26	520	0	1456000	1206.64825	520	0.430946
20	1000	30	26	1020	56	50	1026	520	30000	2.93E+09	54131.83906	-29480	-0.544596
20	1	30	26	21	56	50	27	520	30	1587600	1260	490	0.388889
20	24	1000	26	44	1026	1020	50	520	24000	2.3E+09	47982.7469	-23480	-0.489343
20	0	0	26	20	26	20	26	520	0	270400	520	520	1
0	24	30	0	24	30	30	24	0	720	518400	720	-720	-1
25	25	25	25	50	50	50	50	625	625	6250000	2500	0	0
20	5	30	26	25	56	50	31	520	150	2170000	1473.091986	370	0.251172
20	5	10	26	25	36	30	31	520	50	837000	914.8770409	470	0.51373
20	24	30	6	44	36	50	30	120	720	2376000	1541.427909	-600	-0.389249
10	24	30	6	34	36	40	30	60	720	1468800	1211.940593	-660	-0.544581

Variables Reference

Excel = RCKIM Variables

a=a	OK
b=b	False Negative (-)
c=c	False Positive (+)
d=d	OK
e=a+b	
f=c+d	
g=a+c	
h=b+d	
i=a*d	
j=b*c	
k=w*x*y*z	
l=sqrt wxyz	
m=(a*d)-(b*c)	
n=fc	+=OK
	0=Random
	-=NULL

Regulatory Compliance Key Indicator Equations/Algorithms and 2 x 2 Matrix:

*fc = ((a*d) - (b*c)) / sqrt wxyz* — Full Regulatory Compliance

fc = ((a*d) - ((b^3*c)) / sqrt wxyz* — Substantial Regulatory Compliance

A	B^3	W
C	D	X
Y	Z	RCKIMatrix

(Fiene (2023). Regulatory Compliance Key Indicator Metric & Matrix. Research Institute for Key Indicators, Etown, PA.)

A	B	C	D	E	F	G	H	I	J	K	L	M	N=FC	B^3
20	1	50	20	21	70	70	21	400	50	2160900	1470	350	0.238095	1
20	2	50	20	22	70	70	22	400	100	2371600	1540	300	0.194805	8
20	3	50	20	23	70	70	23	400	150	2592100	1610	250	0.15528	27
20	4	50	20	24	70	70	24	400	200	2822400	1680	200	0.119048	64
20	5	50	20	25	70	70	25	400	250	3062500	1750	150	0.085714	125
20	6	50	20	26	70	70	26	400	300	3312400	1820	100	0.054945	216
20	0	50	20	20	70	70	20	400	0	1960000	1400	400	0.285714	0
20	0	40	20	20	60	60	20	400	0	1440000	1200	400	0.333333	0
20	10	40	20	30	60	60	30	400	400	3240000	1800	0	0	1000
20	11	40	20	31	60	60	31	400	440	3459600	1860	-40	-0.021505	1331

A	B^3	C	D	A+B	C+D	A+C	B+D	A*D	B*C	WXYZ	sqrtWXYZ	(A*D)-(B*C)	FC*
20	1	50	20	21	70	70	21	400	50	2160900	1470	350	0.238095
20	8	50	20	28	70	70	28	400	400	3841600	1960	0	0
20	27	50	20	47	70	70	47	400	1350	10824100	3290	-950	-0.288754
20	64	50	20	84	70	70	84	400	3200	34574400	5880	-2800	-0.47619
20	125	50	20	145	70	70	145	400	6250	1.03E+08	10150	-5850	-0.576355
20	216	50	20	236	70	70	236	400	10800	2.73E+08	16520	-10400	-0.62954
20	0	50	20	20	70	70	20	400	0	1960000	1400	400	0.285714
20	0	40	20	20	60	60	20	400	0	1440000	1200	400	0.333333
20	1000	40	20	1020	60	60	1020	400	40000	3.75E+09	61200	-39600	-0.647059
20	1331	40	20	1351	60	60	1351	400	53240	6.57E+09	81060	-52840	-0.651863

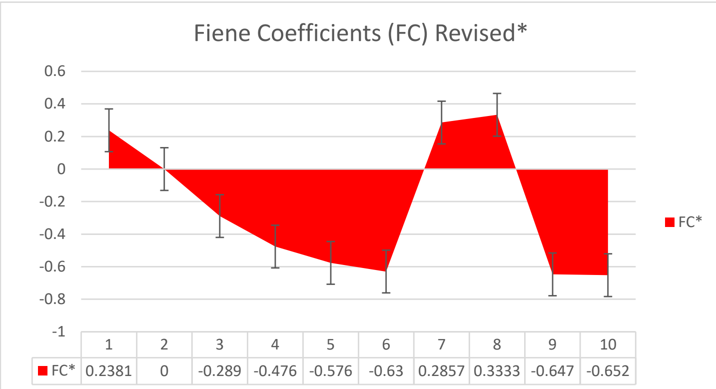


Chart 1: Revised/Updated Fiene Coefficients

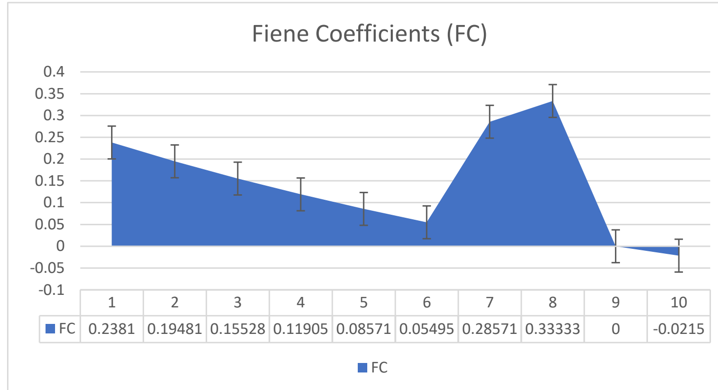
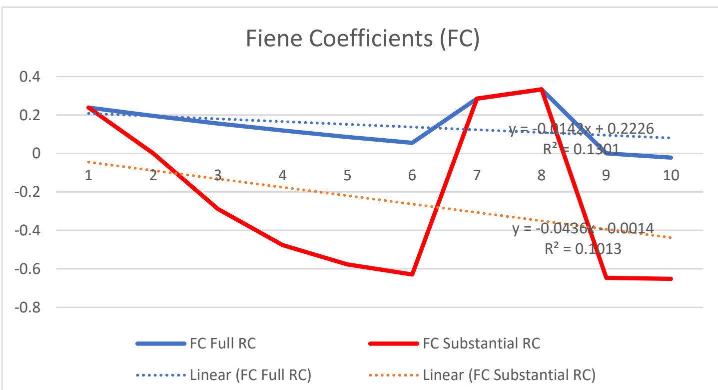


Chart 2: Standard Fiene Coefficients

It is clear from the above two charts that the revised/updated Fiene Coefficients take the risk factor more into account than the standard Fiene Coefficient.
Using Chart 1 will be a more effective and efficient methodology to determing the regulatory compliance key indicators, especially when substantial compliance is utilized in determining the high regulatory compliant group. Chart 1 utilizies a weighting factor while that is not the case in Chart 2.
When full compliance is utilized in determining the high regulatory compliance group than Chart 2: Standard Fiene Coefficients is sufficient.



0.238095	0.238095	1
0.194805	0	2
0.15528	-0.288754	3
0.119048	-0.47619	4
0.085714	-0.576355	5
0.054945	-0.62954	6
0.285714	0.285714	7
0.333333	0.333333	8
0	-0.647059	9
-0.021505	-0.651863	10
FC Full	FC Subst	Pairings

Chart 3: Fiene Coefficients side by side for full regulatory compliance and substantial regulatory compliance.

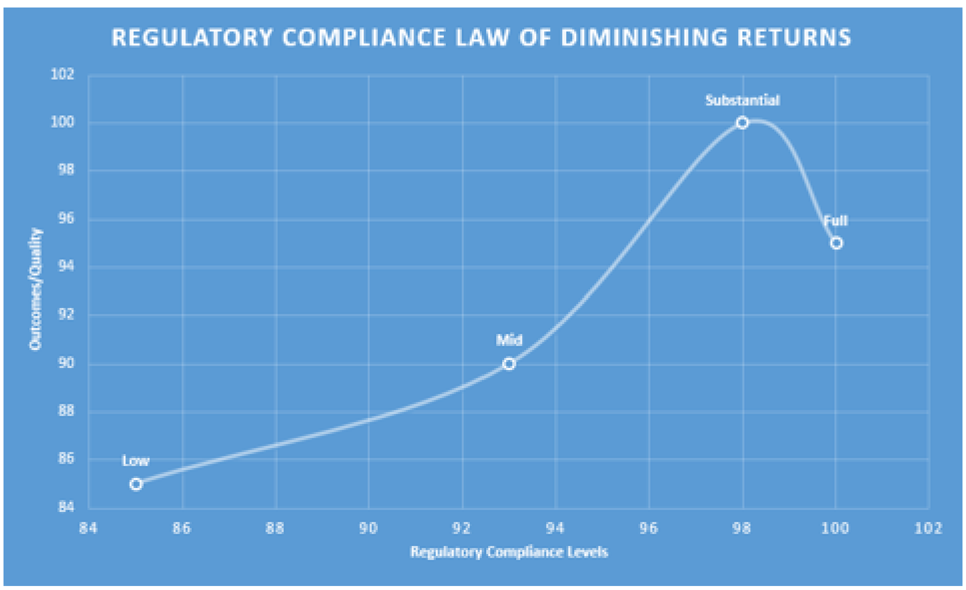
FC for substantial regulatory compliance clearly demonstrates the effectiveness and efficiency of the revised and updated Regulatory Compliance Key Indicator Metric.
It eliminates any potential key indicator that has significant false negatives present within the Regulatory Compliance Key Indicator Matrix.
It should be noted the perfect match on the 7th and 8th pairing when there are not any false negatives present.

The Relationship between the Theory of Regulatory Compliance and the Fiene Coefficients

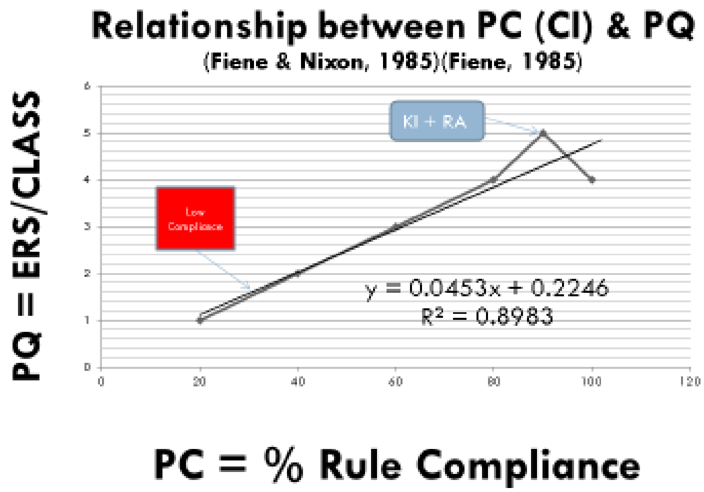
Richard Fiene PhD

October 2023

This paper will formalize the logical relationship between the theory of regulatory compliance and the Fiene Coefficients as demonstrated by key predictor rules and risk assessment rules. The relationship between the theory and the coefficients has been implicated in previous research but it is clear now from a public policy and research perspective that it is in everyone's best interest to move substantial regulatory compliance to the identification of key risk predictor rules. It is the only way to develop more effective and efficient program monitoring systems, not only in the human services but throughout regulatory science.



The above graph depicts the relationship between regulatory compliance and program quality that has been demonstrated in repeated studies over the past decade. It clearly shows how moving from substantial to full regulatory compliance does not produce an equal increase in quality. In fact, in the studies to date, either quality dropped off as depicted in the graphic or it plateaued out and showed no statistically significant increase. This is problematic from a public policy standpoint which requires full regulatory compliance with all rules. It just is not an effective or efficient approach. A more effective and efficient approach would be one of finding the rules that are predictor rules and those rules which place children/clients at greatest risk of harm. An approach that balances "Do No Harm" along with "Do Good". This is depicted more clearly in the next graphic.



The above graph builds upon the previous graphic in providing additional detail about the relationship between regulatory compliance and program quality and at the same time where risk assessment and key indicator predictor rules can come into play. The next group of figures will provide displays of the risk assessment methodology and the key indicator predictor methodology providing key decision points related to licensing decisions and how rules get included as key indicator predictor rules. The figure below presents the risk assessment matrix that is used in determining the relative risk of particular rules as well the key licensing decisions made from these determinations.

Risk Assessment Matrix (RAM)

Risk Assessment (RA) Matrix Revised

	Levels	High	Medium	Low
Risk/Severity	Immediate	9	8	7
	Short-term	6	5	4
	Long-term	3	2	1
			Probability	
	Regulatory Compliance (RC): # of Rules out of compliance and in compliance	8+ rules out of compliance. 92 or less regulatory compliance.	3-7 rules out of compliance. 93 – 97 regulatory compliance.	2 or fewer rules out of compliance. 98 – 99 regulatory compliance.

*Regulatory Compliance (RC)(Prevalence/Probability/History + Risk/Severity Level)

Tier 1 = ((RC = 93 – 97) + (Low Risk)); ((98 – 99) + (Low Risk)) = Tier 1

Tier 2 = (RC = 92 or less) + (Low Risk) = Tier 2

Tier 3 = ((RC = 93 – 97) + (Medium Risk)); ((98 – 99) + (Medium Risk)) = Tier 3

Tier 4 = (RC = (92 or less) + (Medium Risk)) = Tier 4; ((93 -97) +(High Risk)) = Tier 4; ((98 – 99) + (High Risk)); ((92 or less) + (High Risk)) = Tier 4+

Using RAM to make licensing decisions

Key Indicator Formula Matrix

Use data from this matrix in the formula on the next slide in order to determine the phi coefficients.

	Providers In Compliance with specific standard	*Programs Out Of Compliance with specific standard*	*Row Total*
High Group = top 25%	*A*	*B*	*Y*
Low Group = bottom 25%	C	D	*Z*
Column Total	*W*	*X*	Grand Total

The above figure provides the key indicator formula matrix in designing how the data will be organized for analysis in determining which rules are predictive of overall regulatory compliance. The below figure presents the expected results from the matrix.

Key Indicator Matrix Expectations

- **A + D > B + C**
- **A + D** = 100% is the best expectation possible.
- If **C** has a large percentage of hits, it increases the chances of other areas of non-compliance (False positives).
- If **B** has a large percentage of hits, the predictive validity drops off considerably (False negatives). This can be eliminated by using 100% compliance for the High Group.

Key Indicator Statistical Methodology

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$$\phi = (A)(D) - (B)(C) \div \sqrt{(W)(X)(Y)(Z)}$$

A = High Group + Programs in Compliance on Specific Compliance Measure.
B = High Group + Programs out of Compliance on Specific Compliance Measure.
C = Low Group + Programs in Compliance on Specific Compliance Measure.
D = Low Group + Programs out of Compliance on Specific Compliance Measure.

W = Total Number of Programs in Compliance on Specific Compliance Measure.
X = Total Number of Programs out of Compliance on Specific Compliance Measure.
Y = Total Number of Programs in High Group.
Z = Total Number of Programs in Low Group.

The above figure provides the formula for generating the Fiene Coefficient for Key Indicator Predictor Rules. It takes the data from the key indicator formula matrix and generates those specific rules that meet the key indicator matrix expectations. The below figure provides the algorithm for generating the key indicator predictor rules.

Theory of Regulatory Compliance Algorithm (Fiene KIS Algorithm)

8

- 1) ΣR = C
- 2) Review C history x 3 yrs
- 3) NC + C = CI
- 4) If CI = 100 -> KI
- 5) If KI > 0 -> CI or if C < 100 -> CI
- 6) If RA (NC% > 0) -> CI
- 7) KI + RA = DM
- 8) KI = ((A)(D)) - ((B)(E)) / sqrt ((W)(X)(Y)(Z))
- 9) RA = ΣR1 + ΣR2 + ΣR3 + ... ΣRn / N
- 10) (TRC = 99%) + (ϕ = 100%)
- 11) (CI < 100) + (CIPQ = 100) -> KI (10% CI) + RA (10-20% CI) + KIQP (5-10% of CIPQ) -> OU

Legend:

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- R = Rules/Regulations/Standards
- C = Compliance with Rules/Regulations/Standards
- NC = Non-Compliance with Rules/Regulations/Standards
- CI = Comprehensive Instrument for determining Compliance
- ϕ = Null
- KI = Key Indicators; KI >= .26+ Include; KI <= .25 Null, do not include
- RA = Risk Assessment
- ΣR1 = Specific Rule on Likert Risk Assessment Scale (1-8; 1 = low risk, 8 = high risk)
- N = Number of Stakeholders
- DM = Differential Monitoring
- TRC = Theory of Regulatory Compliance

These two figures on this page provide the legends for the key indicator predictor algorithm presented on the previous page. It provides the definitions of each of the terms utilized in the previous figures presented in this paper.

Legend (cont)

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- CIPQ = Comprehensive Instrument Program Quality
- KIPQ = Key Indicators Program Quality
- OU = Outcomes
- A = High Group + Programs in Compliance on Specific Compliance Measure (R1...Rn).
- B = High Group + Programs out of Compliance on Specific Compliance Measure (R1...Rn).
- E= Low Group + Programs in Compliance on Specific Compliance Measure (R1...Rn).
- D = Low Group + Programs out of Compliance on Specific Compliance Measure (R1...Rn).
- W = Total Number of Programs in Compliance on Specific Compliance Measure (R1...Rn).
- X = Total Number of Programs out of Compliance on Specific Compliance Measure (R1...Rn).
- Y = Total Number of Programs in High Group (ΣR = 98+).
- Z = Total Number of Programs in Low Group (ΣR <= 97).
- High Group = Top 25% of Programs in Compliance with all Compliance Measures (ΣR).
- Low Group = Bottom 25% of Programs in Compliance with all Compliance Measures (ΣR).

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The Balancing of Efficiency with Effectiveness in Doing Licensing Reviews/Inspections

Posted on October 12, 2023 by Dr Fiene

In this RIKINotes Post we need to address the delicate balancing of efficiency with effectiveness in doing program monitoring and licensing reviews. Differential monitoring has been suggested as an efficient approach to program monitoring. However, I do want to caution licensing administrators when they are considering differential monitoring approaches such as key indicator predictor or risk assessment rule methods for conducting abbreviated reviews in making licensing decisions.

There is a delicate balance between regulatory compliance and program quality which has been delineated in the regulatory compliance theory of diminishing returns. In taking this relationship one step further we always need to make certain that our efficiency approaches do not negatively impact the overall quality of services being provided. In other words, abbreviated reviews should not be conducted if it is going to jeopardize program quality. Only a more comprehensive review which is far more effective in determining the overall quality of a program is in order to maintain this delicate balance. When a program has demonstrated this attained level of regulatory compliance and quality it would then be eligible for a more efficient, abbreviated review focusing on specific predictor rules or high risk rules.

As licensing administrators, you want to make certain that all clients are healthy and safe but also that they are receiving the highest level of quality care possible. Balancing "do no harm" and "doing good" is critical in maintaining the balance of efficiency and effectiveness in a program monitoring system. It is far to easy to drift to one extreme or the other in which too much emphasis on efficiencies in attempting to reduce the number of key predictor rules or the number of actual on-site reviews will decrease the overall quality of the program setting.

Differential monitoring is not suggested as a generic approach for all programs but rather only for those who have a history of high regulatory compliance and quality. The only exception to this would be if a state/province wanted to use the differential monitoring approach as a screening to determine what subsequent reviews would look like. This approach could work in high caseload jurisdictions in order to prioritize how to do comprehensive reviews (effectiveness) and those programs that would be eligible for abbreviated reviews (efficiency).

About Dr Fiene

Dr. Rick Fiene has spent his professional career in improving the quality of child care in various states, nationally, and internationally. He has done extensive research and publishing on the key components in improving child care quality through an early childhood program quality indicator model of training, technical assistance, quality rating & improvement systems, professional development, mentoring, licensing, risk assessment, differential program monitoring, and accreditation. Dr. Fiene is a retired professor of human development & psychology (Penn State University) where he was department head and director of the Capital Area Early Childhood Research and Training Institute.

View all posts by Dr Fiene →

The Effectiveness/Efficiency Relationship within the Theory of Regulatory Compliance

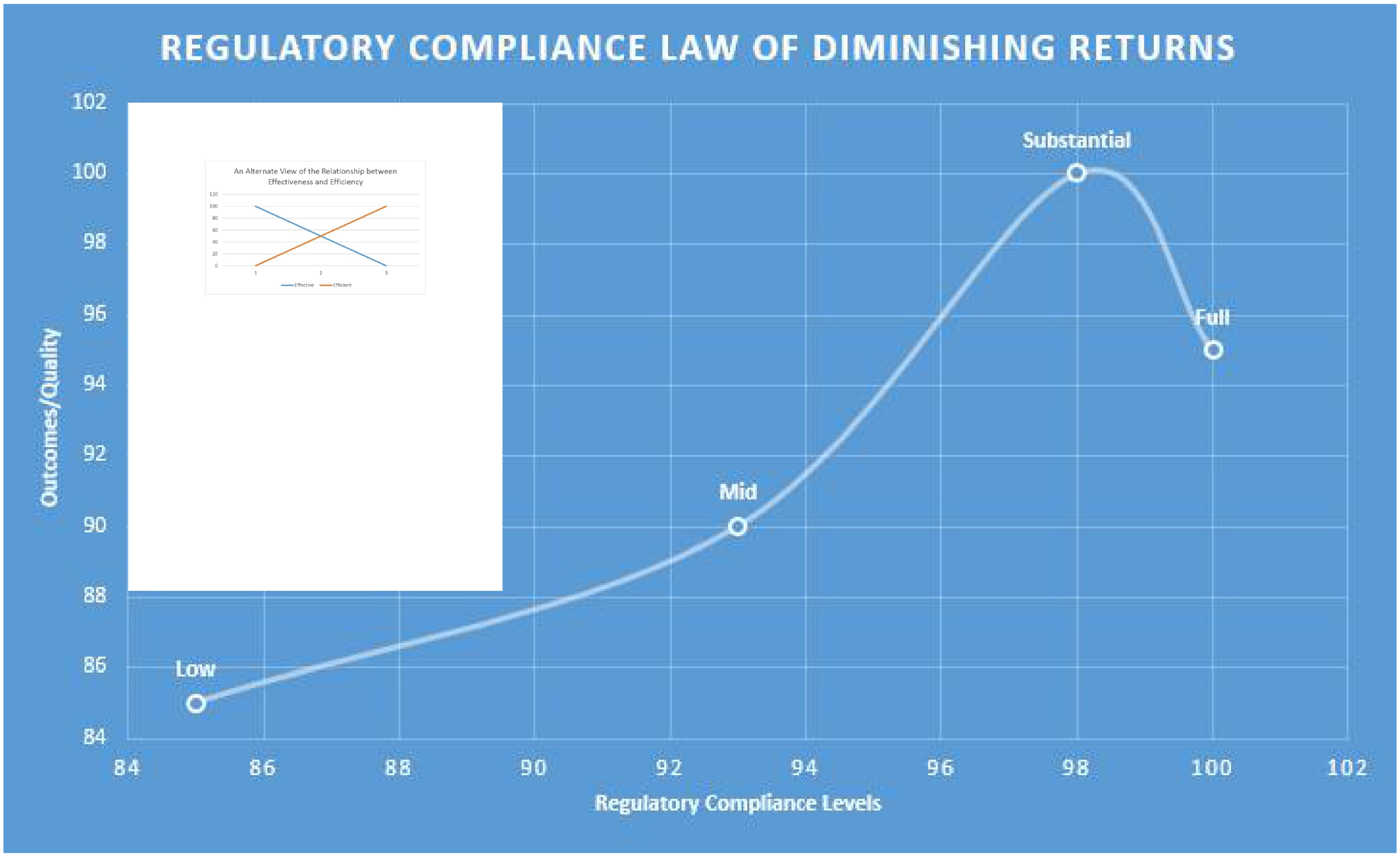
Posted on October 15, 2023 by Dr Fiene

Both the effectiveness/efficiency relationship and the theory of regulatory compliance have been presented in several previous posts. In this post, let's look at how the effectiveness/efficiency relationship varies within the theory of regulatory compliance.

Let's review briefly, the theory of regulatory compliance (see graphic below for a depiction of this relationship between regulatory compliance and program quality) has three major areas or buckets of compliance: low/mid compliance, substantial compliance, and full compliance in how they relate to program quality. The effectiveness/efficiency relationship (see the second graphic below for a depiction of this relationship) also has three major pertinent areas as it relates to regulatory compliance: high effectiveness x low efficiency (1), low effectiveness x high efficiency (3), and mid effectiveness x mid efficiency (2)(in balance) which then could lead to high effectiveness x high efficiency or low effectiveness x high efficiency.

Low regulatory compliance equates with low effectiveness x low efficiency while full regulatory compliance equates with high effectiveness x low efficiency and substantial regulatory compliance equates with mid effectiveness x mid efficiency (in balance) which will lead hopefully to high effectiveness x high efficiency but it could lead to low effectiveness x high efficiency if there is too much emphasis on cutting back in what is reviewed. This is the essence of the theory of regulatory compliance to determine the balance of effectiveness and efficiency as it relates to the Fiene Coefficients. A previous post dealt with this relationship. This post extends that thinking to how it could play out with the dual relationship of effectiveness and efficiency.

The two related figures for the theory of regulatory compliance and the relationship between effectiveness and efficiency are provided below (place the effectiveness/efficiency relationship within the theory of regulatory compliance at the three data points of low/mid, substantial, and full regulatory compliance as suggested in the above paragraphs and you can get a sense of how the relationship of effectiveness and efficiency potentially can change):



About Dr Fiene

Dr. Rick Fiene has spent his professional career in improving the quality of child care in various states, nationally, and internationally. He has done extensive research and publishing on the key components in improving child care quality through an early childhood program quality indicator model of training, technical assistance, quality rating & improvement systems, professional development, mentoring, licensing, risk assessment, differential program monitoring, and accreditation. Dr. Fiene is a retired professor of human development & psychology (Penn State University) where he was department head and director of the Capital Area Early Childhood Research and Training Institute.

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