FINANCIAL SERVICES REGULATORY AUTHORITY OF ONTARIO

Territory Guidance – Principles-Based Framework

May 1, 2023

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Commitment Beyond Numbers

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May 1, 2023

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RE: Territory Guidance – Principles-Based Framework

Dear Mr. Wang:

Attached is the report prepared by Pinnacle Actuarial Resources, Inc. (Pinnacle) regarding the proposed territory guidelines for Financial Services Regulatory Authority (FSRA).

Roosevelt C. Mosley, Jr., FCAS, MAAA, CSPA, is responsible for the content and conclusions set forth in the report. I am a Fellow of the Casualty Actuarial Society and a member of the American Academy of Actuaries, and am qualified to render the actuarial opinion contained herein. It has been a pleasure working with you and your team to complete this study. We remain available for any questions or comments you have regarding the report and its conclusions.

Respectfully Submitted,

Roosevelt C. Mosley, Jr., FCAS, MAAA, CSPA
Principal and Consulting Actuary

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Financial Services Regulatory Authority of Ontario

Territory Guidance – Principles-Based Framework

EXECUTIVE SUMMARY

Financial Services Regulatory Authority of Ontario (FSRA) has engaged Pinnacle Actuarial Resources, Inc. (Pinnacle) to perform a review of FSRA's current territory definition guidelines and bulletins, and to provide recommendations and assist FSRA with building a principles-based approach/framework for future territory rating guidance.

FSRA has committed to being a principles-based regulator that focuses on ensuring proper market outcomes.

To evaluate the need for revised Ontario territory guidelines in the context of principles-based regulation, Pinnacle completed an evaluation of the current territory requirements in the context of the FSRA Rate Regulation Principles. The results of this review were included in the Pinnacle report titled "Territory Rating Review Report," which was released on October 28, 2022[1]. Based on these findings, Pinnacle concluded that the current territory requirements should be revised to be consistent with FSRA's principles-based regulatory framework.

Recommendations

Pinnacle's recommendations for proposed territory guidelines are as follows:

1. Do not issue separate guidance for territory rating, but ensure that general rate guidance for rating is sufficient to cover potential concerns with territory rating.

2. Require support for territory definitions prior to implementation. Post implementation, consider requiring support for continued use of territory definitions if they have been in-force for a specified length of time.

3. Credibility of experience used to support territory rates should be determined based on observable outcomes, and stability of rates should be considered at an overall level, not just at

[1] https://www.fsrao.ca/media/15146/download

the territory level.

4. Insurers are expected to use their own data to the extent it is credible, and can rely on external data to enhance the credibility or provide additional insight. One of the external sources can be the Automobile Statistical Plan of Ontario, however other sources can be used given the insurance company provides support.

5. FSRA should not require a specific frequency of territory review, but should base the requirements for territory reviews on specific considerations, such as a change in distributions, the length of time since the last review, and demographic shifts.

6. Insurance companies should provide FSRA with full disclosure and support for modeling methodologies and resulting territories.

7. FSRA should consider capping requirements at the overall policy level, not just the territory level. This would allow the new territory requirements to be phased in.

8. FSRA should remove contiguity requirements for territory definitions.

9. FSRA should not require a single set of territory definitions for all coverages.

10. FSRA should remove the cap on the number of territories.

Potential Risks

Implementing new territory definition guidelines has the potential to create outcomes that some believe are unfair. This potential exists across several dimensions, including:

- Actuarial
- Affordability
- Availability
- Transparency
- Social

The actuarial risk of premiums not being sufficiently reflective of loss costs is addressed by the implementation of guidelines discussed in this report.

To address the risk of affordability, FSRA should define a measure of affordability that can be applied at the market level. Once this measure is calculated, appropriate steps can be taken to address any identified affordability issues.

The issue of availability is mitigated by Ontario's "take all comers" requirement and FSRA's function to monitor insurance companies to ensure they are following the rule.

Pinnacle does not believe that the risk of transparency will be any greater under the new requirements than it is now, and FSRA should continue to encourage companies to provide consumers with information that will help them understand how premiums relate to risk.

To address the risk of social unfairness, FSRA should work to develop a definition of social fairness, establish principles for model governance that minimize the likelihood of unfairness, establish guidelines for testing for social fairness, and establish guidelines for fairness reporting.

Potential Impacts of Removing Current Territory Requirements

To illustrate the potential impacts of removing the current territory requirements, Pinnacle analyzed the Ontario Automobile Statistical Plan data from GISA.

To estimate the impact of removing the current territory requirements on the accuracy of premiums, we developed indicated territory definitions using the current territory requirements and indicated territory definitions removing the current requirements. We then compared the resulting indicated premiums to actual losses to assess how reflective the premiums were of actual experience. Based on this comparison, we conclude that the new territory definitions will produce premiums that are much more reflective of losses by coverage and provide insurance companies with significantly greater flexibility to match risk to expected loss.

The removal of the current territory requirements also facilitates greater flexibility to match premiums with the level of risk by allowing for more potential rate levels, and thus potentially smoother transition of rates between adjacent territories.

Concerns have been raised about the potential that the removal of current territory requirements would lead to significant increases in policy premium. To estimate this impact, we compared the indicated territory relativity by Forward Sorting Area (FSA) after removing current territory requirements to the indicated relativity prior to the removal of current territory requirements. We made this comparison for the entire province of Ontario excluding the city of Toronto, and separately for the city of Toronto.

While the impact does vary by policyholder, most policyholders have an estimated premium change that is within a reasonable minimum and maximum percent change range, and the range of impacts in the city of Toronto is not significantly different than the range of impacts overall.

Given the range of indicated changes, most policyholders would see a change that is lower than the maximum change allowed under the current territory requirements. For policyholders that have a significant indicated increase, the recommendation to use overall rate caps would allow for a smooth transition as current territory requirements are removed.

PURPOSE & SCOPE

Financial Services Regulatory Authority of Ontario (FSRA) has engaged Pinnacle Actuarial Resources, Inc. (Pinnacle) to:

- perform a review of FSRA's current territory definition guidelines and bulletins,
- research territory definition/grouping techniques and issues across North America,
- provide recommendations and assist FSRA with building a principles-based approach/framework for future territory rating guidance,
- identify potential risks (such as unfair discrimination) in defining territory rating practices, and
- provide advice on risk mitigation by detailing how FSRA might review insurers' territory definition model/proposal to ensure they are actuarially justified and not unfairly discriminatory.

In a previous report titled **Territory Rating Review Report**, issued on October 28, 2022, Pinnacle performed a review of FSRA's current territory requirements, and provided the results of research of territory definition techniques and rate regulation in North America. This report provides recommendations for FSRA in accordance with building a principles-based framework for territory rating guidance, identifies potential risks associated with implementing new territory guidelines, and provides guidance for mitigating these potential risks.

DISTRIBUTION AND USE

This report is being provided to FSRA for its use and the use of makers of Ontario public policy in developing revised territory rating regulatory guidelines. Permission is hereby granted for its distribution on the condition that the entire report is distributed rather than any excerpt. We are available to answer any questions that may arise regarding this report.

Any third parties receiving the report should recognize that the furnishing of this report is not a substitute for their own due diligence and should place no reliance on this report or the data contained herein that would result in the creation of any duty or liability by Pinnacle to the third party.

Our conclusions are predicated on several assumptions as to future conditions and events. These assumptions, which are documented in subsequent sections of the report, must be understood to place our conclusions in their appropriate context. In addition, our work is subject to inherent limitations, which are also discussed in this report.

RELIANCES AND LIMITATIONS

We have included a list of data sources Pinnacle has relied upon in our analysis. We have relied on the accuracy of these data sources in making our recommendations and drawing our conclusions. If it is subsequently discovered that the underlying data or information is erroneous, then our recommendations and conclusions would need to be revised accordingly.

We have relied on a significant amount of data and information from external sources without audit or verification. However, we reviewed as many elements of the data and information as practical for reasonableness and consistency with our knowledge of the automobile insurance industry. It is possible that the historical data used to develop our estimates may not be predictive of future claim experience. We have not anticipated any extraordinary changes to the legal, social, or economic environment which might affect the number or cost of claims.

Pinnacle is not qualified to provide formal legal interpretation of Ontario legislation or FSRA policies and procedures. The elements of this report that require legal interpretation should be recognized as reasonable interpretations of the available statutes, requirements, and administrative rules.

DATA

Pinnacle reviewed the following documentation as part of our research and analysis.

1. "Automobile Insurance Experience, Special FSA Analysis: Kxx, Lxx, Mxx, Nxx and Pxx" – General Insurance Statistical Agency (GISA), 2021/12.
2. "Private Passenger Automobile Filing Guidelines – Major" – Financial Services Commission of Ontario, October 2016.
3. "Technical Notes for Automobile Insurance Rate and Risk Classification Filings" – Financial Services Commission of Ontario, October 2016.
4. FSRA - Auto Product PBR deck_.pptx
5. "Proposed Principles-Based Regulation" – Financial Services Regulatory Authority of Ontario. These guidelines are still in the consultation stage, and thus are not yet finalized.
6. Proposed Territory Changes in Recent Rate Filings
7. "Automobile Insurance Territory Analysis - Financial Services Regulatory Authority of Ontario
8. United States General Accounting Office. Report to Congressional Requesters. "Auto Insurance: State Regulation Affects Cost and Availability." August 1996.
9. FSRA Standard Filing Requirement No. AU0126APP (https://www.fsrao.ca/industry/auto-insurance/regulatory-framework/guidance-auto-insurance/standard-filing#appendix1)
10. GISA Data

PRINCIPLES-BASED REGULATION BACKGROUND

FSRA was established as an independent regulatory agency in Ontario. FSRA is designed to respond to a rapidly evolving financial services sector by:

- promoting high standards of business conduct,
- fostering strong, sustainable, competitive, and innovative financial services sectors,
- responding to changes in the financial services landscape on a timely basis where possible, and
- promoting good administration of pension plans.

FSRA has committed to being a principles-based regulator that focuses on ensuring proper market outcomes. Principles-based regulation facilitates a regulator's ability to:

- respond more quickly to technological changes, consumer and beneficiary needs, and disruptions in the financial services landscape,
- more effectively focus on desired regulatory outcomes and objectives to be achieved, and
- reduce regulatory burden through a more flexible regulatory approach, which allows regulated entities to determine how to best achieve adherence with outcomes based on their size, complexity, and risk profile.

FSRA has developed enterprise-wide Framework Principles to guide its regulatory approach. These principles are still in consultation and thus are not finalized yet. The general principles are:

1. Outcome-Focused – FSRA will focus its regulatory activities on the outcomes it seeks to achieve for consumers and pension plan beneficiaries, regulated entities and the sectors based on the statutory objects in the FSRA Act, which will be used as an overlay to the interpretation of the sector statutes.

2. Innovative – FSRA will continue to develop its own culture and capabilities in a manner that enables it to fulfill its objects, which specifically includes facilitating innovation and transformation in the sectors it regulates.

3. Consumer-Centric – In formulating its regulatory approach toward regulated entities and individuals, FSRA will focus on impact on consumers and pension plan beneficiaries. FSRA Rules and guidance strive to reflect the interests and needs of consumers.

4. Risk-Based – FSRA will direct its resources to the issues and regulated entities and individuals that pose the highest risk. FSRA's risk assessment will consider the size, complexity, nature of the regulated entity, and where non-compliance or the inability to achieve the desired outcomes, will result in the most harm to consumers or pose the greatest threat to FSRA's ability to execute against its statutory objects.

5. Transparent – FSRA will communicate its expectations and/or requirements, as well as its activities and performance to stakeholders. FSRA will design Rules and guidance that reference the applicable principles against which FSRA will supervise and identify the specific outcomes FSRA is seeking to achieve.

6. Collaborative – FSRA will engage with all stakeholders and leverage public consultations to ensure that its regulatory activities reflect the viewpoints and needs of its stakeholders, which include the interests of consumers and pension plan beneficiaries.[2]

Pinnacle evaluated FSRA's existing territory requirement relative to FSRA's Rate Regulation Principles (RRP) in a previous report issued on October 28, 2022[3]. It was found that several of FSRA's current territory requirements are not consistent with FSRA's RRP.

FSRA's RRP became effective in October 2019, soon after FSRA's launch. Since then, enterprise-wide Framework Principles have been introduced and are currently under consultation. There appears to be general alignment between the two sets of principles and from Pinnacle's perspective, our recommendations in this report and the October 28 report align most prominently with outcome-focused, consumer-centric and innovative enterprise-wide Framework Principles.

Given FSRA has nearly four years of experience and is now executing a strategy to reform rate and underwriting regulation in Ontario, this may be an opportunity to reassess the RRP to ensure relevance going forward.

[2] "Proposed Principles-Based Regulation" – Financial Services Regulatory Authority of Ontario.

[3] https://www.fsrao.ca/media/15146/download

TERRITORY GUIDELINE RECOMMENDATIONS

As part of the development of principles-based regulation, FSRA would like to update their territory rating regulatory guidelines. To accomplish this, FSRA will need to develop principles associated with territory definitions, understand what regulatory steps can be taken to achieve those principles, and quantify measurable outcomes to determine if the principles are being achieved.

To develop the territory guideline recommendations, Pinnacle has taken the following steps:

- Review of the current Ontario territory requirements
- Comparison of the current Ontario territory requirements with principles-based regulations and rate regulation principles
- Review of territory requirements in other North American jurisdictions
- Consultation with insurance companies writing automobile insurance business in Ontario
- Analysis of GISA data to estimate the impact of removing the current territory requirements

Below, we set forth Pinnacle's recommendations for Ontario's proposed territory guidance consistent with principles-based regulation. We also provide discussion to support each recommendation.

Recommendation 1: Do not issue separate guidance for territory rating, but ensure that the general guidance for rating is sufficient to cover potential concerns for territory rating

Most rating factors used by auto insurance companies do not have special guidance or requirements associated with them. However, there are several reasons why territories have been subject to special requirements in some jurisdictions.

1. The range of rates by territory can be significant, with the highest rated territories having indicated rates up to five times greater than the rates for the lowest territories
2. There is a perception that the use of territory rating results in rates that are unaffordable in urban areas
3. There is a perception that the use of territory rating results in rates that are unfair for some protected classes

The current territory requirements limit the variance in rates by limiting the number of territories that companies can use, and by prohibiting companies from defining territories by coverage. However, there is no evidence that the current territory requirements help improve affordability or limit the unfairness of rates on protected classes.

Ultimately, the key question to be answered is whether there is a good reason to treat territory differently than any other rating factor. While the concerns regarding territory rating listed above may have some validity, there are other rating factors for which the concerns may also be true. Therefore,

this suggests that any guidance should not be specific to any one rating factor, but should be applicable to all rating factors.

Also, as highlighted in the previous report, the survey of rating guidelines for other North American jurisdictions shows that most jurisdictions do not have specific guidelines related to territory rating, but territory rating is subject to the same regulations as other rating factors.

It is important to remember that the absence of specific territory guidance does not mean there is an absence of guidance. The rate regulation guidelines will apply to territories as well; therefore, insurance companies will still be required to ensure that rates by territory are appropriate based on loss experience and other adopted criteria.

Additionally, if there is a concern that rates are unfair or unaffordable, this is not just a concern related to one variable, but to the overall rate being charged. Therefore, the issues of fairness and affordability should be addressed holistically, not variable by variable. This suggests that any regulations or guidance related to fairness and affordability should be applied to the overall rate, not to individual rating characteristics. The issues of fairness and affordability are addressed in the Potential Risks section of this report.

Recommendation 2: Require support for territory definitions prior to implementation. Post implementation, consider requiring support for continued use of territory definitions if they have been in-force for a specified length of time.

The requirement to provide support for territory definitions prior to implementation is in place today. Providing this support is consistent with the rate regulation guidelines, and should include both descriptions of the data and methods used to establish territories, as well as validation that the final territories are supported by historical experience.

Once new territory definitions and rates are implemented, there are customer and competitor responses that, over time, may decrease the effectiveness of the territory definitions that have been developed. Also, changes in demographics can also lead to decreased effectiveness of territory definitions. To address this, FSRA should also consider requiring insurance companies to provide support for continued use of territory definitions after the definitions have been in-force for a specified length of time without review or adjustment. This would involve requiring companies to analyze emerged experience to determine if the territory definitions are still appropriate.

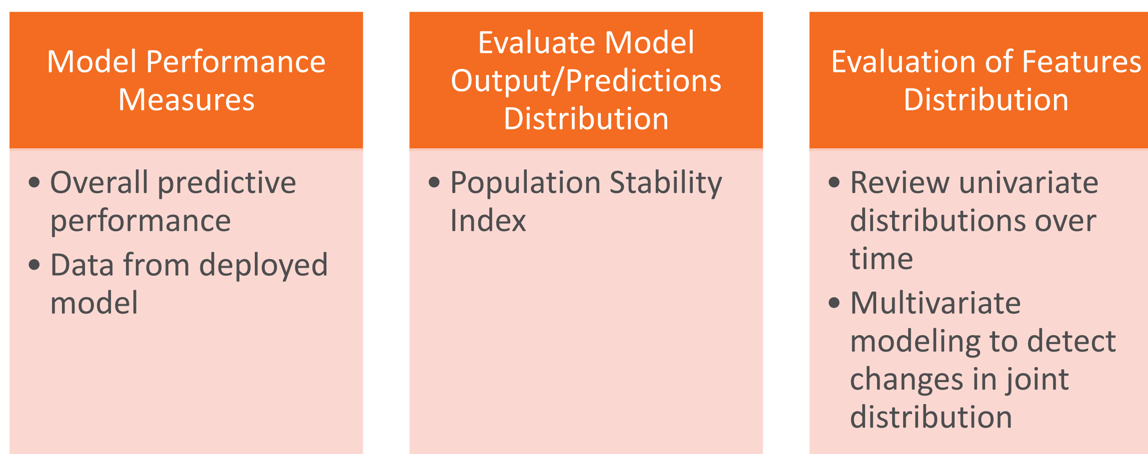
Determining the appropriateness of territories after implementation other than in the context of a new rate filing is not a typical requirement in North American jurisdictions. Companies are generally required to justify territories before implementation, and then review emerged experience as part of the effort to support future changes. So companies are currently reviewing emerged experience as part of subsequent rate filings. It is possible to review many of the same measures used to support territory definitions prior to implementation to determine appropriateness of territories post

implementation. It is also true that requiring that a filing be made at some periodic time interval could also accomplish the same outcome.

This approach would help FSRA accomplish its goal of ensuring that desired outcomes are being achieved not just when territory definition changes are implemented, but that the desired outcomes continue to be achieved post-implementation.

Examples of outcomes that can be tested are shown in Figure 1.

Figure 1: Outcome Tests



Recommendation 3: Credibility of experience used to support territory rates should be determined based on observable outcomes, and stability of rates should be considered at an overall level, not just at the territory level.

Actuarial principles of risk classification seek to ensure that risk is segmented in a way that ensures each policyholder pays a premium that is reflective of the risk of loss they represent. To determine the appropriate risk classification, actuaries analyze data at refined levels reflecting the risk of each policyholder. This requires striking the right balance between homogeneity (requiring more refined data to ensure that risks are similar) and credibility (requiring sufficient volume of data to ensure that results are not reflective of random fluctuation). While this is an important consideration, it is not unique to territory rating. Rate refinement occurs across many risk characteristics, so any recommendations related to stability or credibility should be related to the overall rate and all risk characteristics.

Current FSRA territory requirements require a minimum number of exposures in each territory. While this is one way to measure credibility, a specific number of exposures required does not ensure that the resulting territories will be fully credible or that the right balance will be achieved between homogeneity and credibility. Predictive analytics techniques are advancing at a significant pace, and these advancements can result in trends being identified from smaller volumes of data. Additionally, different variances in loss processes (between injury coverages versus physical damage coverage, as an example), can result in different volumes of data needed to ensure full credibility. Therefore, rather than require a specific number of exposures for full credibility, credibility should be demonstrated as part of the rate filing and justification process.

Companies can demonstrate credibility using classical methods (number of exposures or number of claims), or can demonstrate credibility by demonstrating stability of indicated results over time.

Ultimately, territory rates should be reflective of claims experience, so the stability of rates will be a function of the stability of the underlying claims experience. To the extent that claims experience is stable, rates should exhibit that same stability. However, if claims experience is shifting, there should be an expectation that rates should be shifting as well.

Insurance companies ultimately do not have control over the consistency of claims experience, but obviously have more influence over the premiums charged. Any recommendations related to stability, however, should be based on the overall rate, and not be just specifically focused on territories. It is possible that territory definitions and rating factors are stable, but other rating factors could be impacting the stability of the overall rate. Therefore, we recommend that for any recommendation to truly reflect stability, it should be developed in consideration of overall premiums.

Recommendation 4: Insurers are expected to use their own data to the extent it is credible, and expected to rely on external data to the extent it is not credible. One of the external sources can be the Automobile Statistical Plan of Ontario, however other sources can be used given the insurance company provides support.

Given that each company is unique and has a specific target market and business plans, insurance companies should be expected to rely on their own historical data for the development of territory rates to the extent it is credible.

For most companies, relying on their own data to develop territory definitions is not going to be sufficient, as most companies will not have the volume of data that allows them to be fully credible in all geographic areas in Ontario. This means that companies will either have to propose less territory refinement to achieve greater credibility or will need to rely on supplemental data as a complement of credibility to establish additional refinement.

Presently, large insurance companies benefit from their significant credible experience data in defining territories and analyzing territory rating. However, many smaller insurance companies with limited

data volume find it challenging to define territories and analyze territory rating, which places them at a competitive disadvantage.

One source of supplemental data would be the Automobile Statistical Plan of Ontario. While data from the Automobile Statistical Plan of Ontario is available for use, we do not recommend that it be a requirement for companies to use this data. There are at least three reasons for this. First, insurance companies may choose to rely solely on their own data, and as a result, potentially accept less refinement in their territory definitions. To the extent that the proposed definitions are supported by company internal data, this outcome is consistent with FSRA's regulatory principles. Second, if a company has a unique focus or target market, using the data from the Automobile Statistical Plan of Ontario may not be sufficiently reflective of the company experience. Third, there are other sources of geographic data that may be used as a complement of credibility, and this should be an option for insurance companies.

If insurance companies choose to support territory definitions by incorporating data other than their internal data or Automobile Statistical Plan data, this will require additional support and regulatory review to ensure that the data is appropriate for use and that the use of the data results in outcomes that satisfy regulatory principles. Also, if the current territory constraints are removed, even small insurers will have the ability to use flexible and creative tools, as well as a wider range of data sources, to enhance the credibility of the data used for defining territories and analyzing territory rating. Ultimately consumers will benefit from the increase in competition in the auto insurance market.

Recommendation 5: FSRA should not require a specific frequency of territory review, but should base the requirements for territory reviews on a combination of considerations, such as a change in distributions, the length of time since the last review, and demographic shifts.

Currently, FSRA requires that insurance companies provide a territory indication in all major filings. However, companies can be exempted from this requirement if they are not planning to make any modifications to their territory definition and territory rating differentials. For reasons discussed above, once territory definitions are implemented, there are a number of reasons why territory rates may become less reflective of territory experience over time. As a result, periodic review of territory definitions may be warranted.

One approach to ensuring this review occurs is a time-based requirement. Typically, data does not change significantly enough after the implementation of new territory rates to require them to be reviewed annually, but requiring a review after some longer period may be warranted, such as every three to five years.

A time-based requirement, however, will not apply equally to all situations. Depending on the company and the dynamics of the market, it is possible that applying the same frequency of review in all situations could results in reviews that occur too frequently or do not occur frequently enough. To

address this, an alternative approach is to base the requirements for territory review or revision on a combination of considerations, including:

- a change in exposure distribution (as measured by the population stability index, for example)
- the length of time since the last review
- shifts in the underlying demographics.

A combination of changes in these elements may suggest that a territory review is appropriate. Consistent with principles-based regulation, insurance companies would be expected to monitor these elements and complete territory reviews as appropriate. FSRA would be authorized to review this monitoring upon request to ensure that companies have appropriate monitoring in place.

Recommendation 6: Insurance companies should provide FSRA with full disclosure and support for modeling methodologies and resulting territories.

This recommendation is consistent with current practice. Insurance companies are required to provide support to FSRA for current territory rates, and must also demonstrate the proposed territory rates conform with the current territory requirements. Continuing this level of transparency to FSRA will allow FSRA to ensure that the proposed territory rates are consistent with rate regulation principles, and will also provide assurances to consumers that insurance companies are not being allowed to charge premiums without justification.

While transparency is also important from a consumer perspective, we do not believe that providing full transparency of modeling methodology will achieve this. Most members of the general public will not find this level of detail helpful. Insurance companies and FSRA should find ways to communicate the impact of claims costs on premiums to consumers in a way that is useful to the general public.

In most states in the United States, the details of model development and territory rate development are required to be filed and are open for public viewing and inspection. The use of this information by consumers is limited, and has not proved useful in making rates more transparent to consumers.

Recommendation 7: FSRA should consider capping requirements at the overall policy level, not just the territory level. This would allow the new territory requirements to be phased in.

If the current territory requirements are removed, this could result in significant rate impacts for policyholders as companies implement new territory definitions. Significant rate increases could be difficult for policyholders to absorb all at once. Two approaches to addressing this potentially significant change would be to encourage customers to shop for coverage, and also to impose caps on the overall rate changes at renewal.

Customers have the ability to obtain quotes from other insurance companies to determine if coverage is available in the market at a lower cost. As new territory requirements are implemented, it will be

important for FSRA and the insurance companies to communicate the potential impacts of the new territory requirements, and to provide consumers with practical steps they can take to manage the impact of those changes. An example of a step that can be taken is increasing the time required for renewal notices associated with revised territory requirements to provide additional time for consumers to shop for different coverage options.

Insurance companies can also cap rate changes to help consumers manage the impact of this change. While removing current territory requirements has the potential to result in a significant premium impact, it is also true that any rating factor has the potential to contribute to a significant premium impact. Therefore, we recommend that capping be applied at the policy level overall, as opposed to only capping the territory change. Also, if capping is implemented, it will be important for insurance companies to communicate the impact of capping to policyholders, including communicating the ultimate indicated rate to be charged after full implementation.

During the industry consultation period, while some insurance companies were open to the idea of rate caps, other insurance companies believed caps should not be mandated by FSRA, and should be instead determined by the companies themselves. Another option which was proposed by some insurance companies was to phase out the current territory requirements over a longer transition period. For reasons discussed in this report, we believe that capping should be done at the overall rate level, and not focused just on the territory restrictions. Also, given the potential rate disruption resulting from the removal of current territory requirements, requiring caps will be helpful to increase the likelihood of a smoother market transition.

Recommendation 8: FSRA should remove contiguity requirements for territory definitions.

Current FSRA territory requirements mandate contiguity for territory definitions. Stated differently, all postal codes defined as part of the same territory must have a common border with at least one other postal code in the territory. This requirement in other jurisdictions has historically been based on the belief that areas that are geographically close will exhibit similar automobile claim experience. However, based on research and years of practical experience, imposing a contiguity requirement will frequently result in territories that are less predictive of loss experience. This is a straightforward statistical result – if you limit the number of potential combinations of postal codes such that they cannot reflect the underlying losses, the resulting territory definitions will always be less predictive.

If loss experience indicates that two non-contiguous geographic areas should be rated the same, it is reasonable to include them in the same territory. Even if there was a contiguity requirement, two non-contiguous areas could be rated the same, and just given two different territory numbers, so the non-contiguous result could still be achieved if there are no limits on the number of territories or requirements on the credibility associated with specific territories. To ensure that territories are predictive and credible, we recommend removing the contiguity requirement.

Typically, non-contiguous territories are more of a concern with respect to transparency of rates or consumer understanding, not predictive power. If the rates between two adjacent geographic areas are significantly different, this can be difficult for a customer to understand. In reality, though, such stark premium differences might be observed as a result of the current territory requirements that limit the number of territories. Relaxing the territory requirements will allow insurance companies to apply smoothing techniques more effectively, which often consider the experience of neighboring geographic areas. The implementation of smoothing techniques, along with the elimination of the territory contiguity requirement, could result in comparable rate differences between adjacent geographic areas.

Recommendation 9: FSRA should not require a single set of territory definitions for all coverages.

Different coverages are related to different underlying cost drivers. As an example, Accident Benefits and Collision coverage are both triggered by an automobile accident, but the determinant of whether this accident will result in a claim is different for each coverage. For Accident Benefits, accident frequency depends on whether the people involved in the accident are injured, the severity of the accident, and the occupant protection associated with the vehicle. For Collision, accident frequency depends on whether the damage to the vehicle exceeds the deductible amount. The drivers of the ultimate cost of the accident are different as well – Accident Benefit costs are related to medical costs, while Collision costs are related to the cost of vehicle repair. For Comprehensive, the cause of a claim is altogether different than both Accident Benefits and Collision. To the extent that the influences on claim frequency and claim severity vary by geographic area, the territory definitions should be allowed to vary by geographic area as well.

One reason why insurance companies have implemented the same territory definitions for all coverages is operational efficiencies, as historically, it may have been easier to program one set of territories than to program different territory definitions for each coverage. For many companies, advances in rating systems have made this consideration a non-issue, but if this is an issue for a company, the company should be able to make the decision to apply a single set of territory definitions for all coverage. We recommend that FSRA not impose this requirement on the entire industry.

Recommendation 10: Remove cap on the number of territories.

Premiums should be reflective of claim experience. The current limitation on the number of territories limits the potential variability of premiums to reflect loss experience. This means that some customers pay more than they should, and some pay less. The limitation of ten territories in the city of Toronto results in the same issue. This sets up subsidies that customers outside of the city of Toronto end up paying to make up for the premiums in city of Toronto that are too low.

Removing the cap on the number of territories could result in premiums that are significantly higher in some geographic areas. The impact would be mitigated by capping (discussed earlier) and by recommendations covered in the next section.

Balance

The recommendations attempt to strike a balance between the key principles. It is not possible to fully satisfy all principles simultaneously. As an example, if companies implement rates that are more closely based on loss costs, it may decrease the likelihood that rates will remain stable. Therefore, the evaluation of current requirements and proposed changes has been evaluated in the context of these principles and how they should be balanced.

POTENTIAL RISKS IN DEFINING RATING TERRITORY PRACTICES

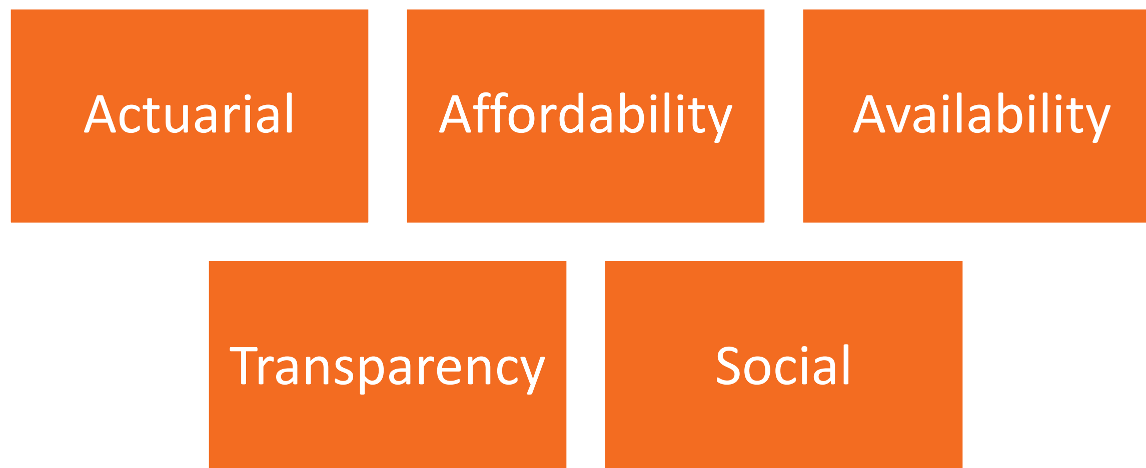
Geographic location has a significant impact on the expected loss cost associated with an automobile insurance policy. The reasons for this are intuitive – the environment within which a vehicle is being operated will affect the risk of loss. Driving in an area with higher vehicle density, for example, will lead to a greater risk of loss than driving in a rural area with little traffic. The speed profiles of certain road segments will influence risk. The condition of the roads and road design in different geographic areas may also influence risk. It has been shown across multiple jurisdictions that territory is one of the most significant determinants of loss cost, and this is also true in Ontario.

Even though geographic location is a significant predictor, it is also influenced by socio-economic factors. Socio-economic factors, generally, are not allowed to be used in insurance pricing. A concern may be raised, however, that the use of geography is a way to incorporate socio-economic factors that are not allowed.

As FSRA endeavors to develop updated territory guidance to be consistent with Principles Based Regulations, FSRA should be aware of these potential risks and should be prepared to identify and mitigate these risks if necessary. There are several outcomes related to these risks that may be considered unfair by different stakeholders. In this section, we identify and describe these risks, and discuss ways to measure and mitigate these risks.

The potential fairness criteria are shown in the Figure below.

Figure 2: Potential Risks Associated with Removal of Current Territory Requirements



As part of the discussion of fairness, it is important to remember a couple of points. First, independently, all these definitions of fairness are noble goals and in theory the insurance industry as a whole should strive to meet them. However, it is also true that these are difficult goals to achieve, and achieving just one of these ideas of fairness would require a significant undertaking. Thus, it stands to reason that achieving all these ideas of fairness simultaneously is not possible. Therefore, part of the process of addressing potential risks will require determining appropriate trade-offs, such that the market achieves the right balance of these goals.

<u>Actuarial Fairness</u>

From the perspective of actuarial standards, unfair discrimination refers to whether rates are supported by loss experience. Most states in the United States have laws in place that require that rates be "not inadequate, not excessive, and not unfairly discriminatory." The Statement of Principles Regarding Property and Casualty Insurance Ratemaking states that "a rate is reasonable and not excessive, inadequate, or unfairly discriminatory if it is an actuarially sound estimate of the expected value of all costs associated with an individual risk transfer."

Actuarial Standard of Practice Number 12 (ASOP 12) – Risk Classification – states that "rates within a risk classification system would be considered equitable if differences in rates reflect material differences in expected cost for risk characteristics. In the context of rates, the word fair is often used in place of the word equitable."

A potential risk with removing current territory requirements is that proposed rates would not be reflective of loss experience. We believe, however, given the Principles-Based Regulation and the recommendations in this report, that the risk of not achieving actuarial fairness is low. Rates not being actuarially supported would be relatively easy to detect by reviewing supporting information that insurance companies would be required to file with the territory definition support. In cases where FSRA's review identifies situations where territory definitions are not supported, FSRA can rectify the concern by requiring additional support from insurance companies, or requiring changes to be made to the territory rate proposal.

As an example, if an insurance company filed a territory plan with 1,000 distinct territories, it is unlikely that all of the proposed territories will be supported by data. Requiring support for proposed territories will help prevent actuarially unreasonable or unsupported outcomes.

The requirement that rates are actuarially supported will decrease the risk that after removal of the current territory requirements, insurance companies will propose territory plans that are unreasonable. As an example, removing the limit on the number of territories could theoretically result in an insurance company proposing a significantly large number of territories. The requirement for actuarial support will practically limit the number of territories to a reasonable number due to the limitation in the credibility of data at the territory level.

Affordability

The removal of the current territory requirements will result in rates that are more closely reflective of loss experience. This could potentially result in a wider range of indicated rates by territory. For some policyholders, this could result in significant increases in premium, and with these increases in premium come potential concerns with the affordability of insurance.

To determine whether there is an issue with affordability, a proper measure of affordability must be defined to indicate whether outcomes are appropriate. There are several considerations that should be incorporated when defining Affordability.

- Cost of insurance purchased
- Cost of minimum coverage options
- Financial resources of the purchasers of insurance
- Threshold of affordability

There have not been consistent measures of affordability in the United States regulatory market, nor have there been consistent analyses developed to determine whether affordability is a problem. Affordability is a function of the cost of insurance relative to the income of those purchasing the insurance coverage. Insurance companies have information on the cost of insurance, and so when insurance costs rise, concerns are raised about whether insurance is affordable, often without considering the income portion of the equation.

Affordability is generally not a market-wide issue; it is not often the case that insurance is affordable or not affordable across an entire market. Affordability is more localized and likely varies within segments of a market. As an example, rates may be higher in an urban area due to traffic density and a higher frequency of accidents, but if income is also higher in the urban area, it may not necessarily result in an affordability problem. Also, rates tend to be higher for younger drivers, and younger workers also tend to have lower incomes than older drivers. Therefore, it may be more likely that there is more of an affordability issue with younger drivers.

To determine whether affordability could become a more significant issue after the implementation of new territory guidelines, FSRA would need to develop a definition of affordability. Outcome test metrics could be defined to determine whether affordability concerns are valid and whether policies should be implemented to enhance or ensure affordability.

In 2017, the Federal Insurance Office in the United States completed a study of affordability at the ZIP code level. The study analyzed average premium paid per ZIP code relative to the average income in each ZIP code. The standard of affordability that was used was a 2% ratio of premium to income. If this ratio was above 2%, insurance was deemed unaffordable in this area. While this provided a high-level assessment of affordability, the study was not performed at a level granular enough to truly determine whether there was an affordability problem. Also, there was not a significant amount of justification behind the 2% threshold.

Once the definition of affordability is developed, industry data can be studied to determine whether there is an issue of affordability in specific segments of the Ontario market. Once these studies have been completed, FSRA can determine appropriate next steps, which could be either implementing regulatory rules to address any issues discovered or implementing market outcomes tests to continue to monitor affordability.

Affordability should be measured on a market wide basis, not an individual company basis. Requiring each individual company to meet a definition of affordability in every case will potentially create unintended consequences, including profitability and competitive concerns. If a market segment is deemed uncompetitive at the market level, then appropriate measures to address these issues should apply consistently to all companies.

We also note that the cost of auto insurance is determined by several factors, including claim cost, insurer operating expenses, and underwriting profit. Pricing actuaries use actuarial projections and past claim experience to suggest the best estimate of rates in the future while adhering to the Actuarial Standards of Practice. However, the affordability of auto insurance is not solely within the control of pricing actuaries or insurance companies. Insurance premium is directly influenced by insurance cost, assuming a reasonable underwriting profit is achieved over a long period. Therefore, affordability should not be used as a measure of whether certain rate regulation principles have been achieved. The responsibility of making auto insurance more affordable will require broader solutions

(such as product reform or direct subsidization), which is outside the scope of rate regulation but would fall within the government's purview. Pricing actuaries and insurance companies can play a role in helping government and the public understand the drivers of costs, and how these costs potentially affect the affordability of insurance.

Availability

Availability is defined as "the quality or state of being available, present or ready for immediate use."[4] Ontario has a "take all comers" requirement, which requires insurance companies to accept all auto insurance business from customers that meet their approved rules and are required to offer their customers a renewal if that customer continues to meet the insurer's eligibility rules. Therefore, in this sense, there is no availability issue. However, this could also be related to the affordability issue. Even though a consumer can purchase insurance, if the cost of insurance is prohibitive, it is truly available?

There are also operational decisions that a company could make that might impact the availability of insurance. As an example, if an insurance company sells insurance through brokers, they could strategically locate their brokers in certain areas. This would not violate the "take all comers" requirement, as these brokers would still be required to sell insurance to any customer that asks and is eligible, but if it requires a longer journey or more effort to get to the broker's office, there is a lower likelihood that the consumer will make the effort to obtain insurance from the broker.

FSRA currently has policies and procedures in place to ensure that insurance companies are following regulatory rules to provide insurance to eligible insureds. FSRA can also take a variety of enforcement actions if companies are found to be in violation of these rules. Therefore, we believe the implementation of new territory guidelines will not result in a significant change in the availability of insurance, as monitoring by FSRA would continue after the implementation of the new guidelines.

Transparency

Transparency is defined as something that is "easily detected or seen through," or as something that is "easily understood."[5] Transparency is characterized by visibility of information, especially concerning business practices. The increased sophistication of data analytics and predictive modeling has the potential to make territory rates less transparent, especially if more complex methodologies are applied. We do not believe, however, that introducing new territory requirements will decrease transparency. Insurance companies have already been using more sophisticated analytics techniques to set rates in Ontario related to non-territory rating factors. Even though territory rates are limited in

[4] https://www.merriam-webster.com/dictionary/availability

[5] https://www.merriam-webster.com/dictionary/transparent

Ontario, insurance companies are also currently using more advanced techniques to analyze territory rates. Therefore, the potential for transparency issues related to more sophisticated models is already present in the Ontario automobile insurance market. Recommendations discussed earlier in this report to require support for territory rates and to help improve transparency for customers will help to mitigate this risk.

Social Fairness

Pinnacle believes the idea of social fairness in pricing is rooted in this fundamental premise:

> ***As a society, we have agreed that there are certain elements that should never be considered in insurance pricing, no matter how predictive they are.***

All stakeholders to the insurance process accept this premise as a given. In today's increasingly sophisticated world, availability of data is increasing at a significant pace, and we have greater ability to analyze that data in more complex ways. If the prohibited elements are predictive of auto insurance loss, then using increasing amounts of data and utilizing more sophisticated analysis techniques increases the potential that the predictive power of these prohibited variables might be indirectly picked up in insurance models, even if the protected characteristic is not directly used in the models themselves. The important questions are how to measure the presence or extent of social unfairness in insurance models, and how to repair models if problematic outcomes are discovered to exist.

Within the fairness framework, data related to the prohibited factors would need to be collected to determine whether premiums are picking up the predictive power of the prohibited factors. This type of analysis would allow FSRA to determine whether there are any concerning outcomes generated by the models, and whether premiums are fair with respect to the fairness guidelines. Additional analyses can by undertaken to also define fairness tolerance thresholds and propose actions for bias mitigation.

Given the complexity of interactions of data elements and more sophisticated analyses, fairness should not be analyzed in the context of specific variables (e.g., territory), but should be studied with respect to the premiums being charged. Given that fairness in insurance is not premised on a single variable (e.g., territory usually does not perfectly correlate with a prohibited factor), the proposed solution to the fairness problem should not be related to a single variable, but to the overall premium. Therefore, we recommend that any determination of fairness be completed at the overall premium level, and not focus solely on specific rating variables.

Tests for determining the impact of pricing on protected characteristics are available but given this is a relatively new field, the science is still developing. At least two approaches have been identified, however, to determine the impact of multivariate models on protected classes. These tests are the Generalized Linear Model (GLM) method and the Fairness Metrics method.

GLMs are regularly used in the actuarial field for the development of pricing models. GLMs consider all potential rating variables simultaneously to eliminate double counting of model effects, and their

structure is intuitive and easy to understand. Insurance companies that use GLMs to develop their pricing models could consider several approaches to determine the impact of their models on protected classes.

1. Control variable: Control variables are used to remove their impact from other variables used in the model. In this case, the protected characteristic can be introduced into a GLM as a control variable to isolate the influence of the protected characteristic. Parameter estimates can be compared between the model including and the model excluding the control variable to determine the extent of the impact of the control variable on other variables in the model.

2. Fair GLM: The Fair GLM algorithm adjusts the parameter estimate formulas to minimize the impact on protected classes. This is accomplished by introducing larger penalties in the regression for prediction errors related to protected classes.

3. Interaction Test: An interaction test can be performed by interacting the protected characteristic with other key rating factors to determine if there is a significant difference in the predicted relativities by the levels of the protected characteristic.

Fairness metrics can be applied more broadly to any model prediction. These metrics are developed based on the relationship between the actual and predicted results for each level of the protected characteristics. There are three types of fairness metrics:

1. Independence: the model should predict equal outcomes regardless of the protected attribute

2. Separation: for a specified class of observed outcomes (good or bad), the model should predict equal outcomes regardless of the protected attribute

3. Sufficiency: for observations predicted to have a particular class of outcomes (good or bad), the actual class of outcomes should match regardless of the protected attribute.

To the extent that the condition of the test is not satisfied, the associated metrics will reflect this reality.

If it is determined that there is a concern based on the tests, there are a few options that can be taken to address these concerns. These potential solutions are not mutually exclusive, as different types of solutions can be applied in different situations.

1. Prohibit or restrict individual variables: in some cases, regulators may determine that a variable results in concerns so significant that they decide to ban the variable. Alternatively, regulators may also decide to limit the use of the variable in some way. As an example, Regulation 664 under the Insurance Act prohibits insurers from considering the credit history in policy rating, or

when deciding whether to issue, renew or terminate automobile insurance contracts and related matters. The Ontario's Unfair or Deceptive Acts or Practices also prohibits the use of credit information in auto insurance quotations, applications, and renewals. While prohibiting or restricting variables is a simple approach, it often does not result in greater social fairness – in fact, in some cases it can create a less fair situation than was in place previously.

2. Inherent adjustment to rating factor indications: in two of the GLM approaches (Control Variable test and Fair GLM), the algorithm adjusts the rating factor indications to remove any potential overlap between the rating variables and the protected characteristics.

3. Data and Model Adjustments: if the fairness metrics described above indicate there is a concern, adjustments can be made to the raw input data (pre-processing), to the model algorithm (in-processing), or to the model predictions (post-processing) to remove bias.

Just as this is a developing field from a technical perspective, approaches to regulating social fairness are also developing. There are three examples, albeit still in development, that will provide the reader with examples how this regulation can be applied.

- Australia: in December 2022, actuarial guidance was released to address the potential for discrimination with the use of artificial intelligence. This guidance defined the discrimination that is possible in Australia, and provides guidance to actuaries to help address this potential discrimination.[6]

- Singapore: released a principles-based guide on how to implement fairness principles in financial institutions. This application began with banks and will be extending to insurance companies.[7]

- Colorado: the state of Colorado has passed a law requiring companies to ensure there is no unfair discrimination in their insurance processes. Colorado has released an initial framework

[6] Actuaries Institute, Australian Human Rights Commission. "Guidance Resource: Artificial Intelligence and Discrimination in Insurance Pricing and Underwriting." December 2022.

[7] Monetary Authority of Singapore. "Implementation of Fairness Principles in Financial Institutions' Use of Artificial Intelligence/Machine Learning – Observations from a Thematic Review". June 2022.

for model governance to address unfair discrimination, and will also be releasing guidelines for model testing.[8]

There are some key learnings from these examples.

1. Principles are being established to create guidelines for companies to follow, but **specific** tests have not yet been mandated.

2. Governance and testing will be required to be conducted by the insurance companies rather than by a regulatory body.

3. Specific remedies have not been prescribed, but principles have been established for desired outcomes.

Therefore, Pinnacle recommends that FSRA take the following steps:

1. Define social fairness.
2. Establish principles for model governance that minimize the likelihood of unfairness.
3. Establish guidelines for testing for social unfairness.
4. Establish guidelines for fairness reporting.

POTENTIAL IMPACTS OF REMOVING CURRENT TERRITORY REQUIREMENTS

Removing current territory requirements will provide companies with more freedom in developing territory definitions. This will potentially result in several outcomes for the Ontario automobile insurance marketplace:

- Resulting rates could be more reflective of risk.
- There could be a wider variation in rates across territories.
- Some policyholders might see significant rate impacts.

To illustrate the potential impacts of removing the current territory requirements, Pinnacle analyzed the Ontario Automobile Statistical Plan data from GISA. Pinnacle was provided access to two datasets from GISA. The first dataset was a summary of vehicles, premium, claim count and claim amount by vehicle location FSA. The second, more comprehensive, dataset included additional policy

[8] https://doi.colorado.gov/for-consumers/sb21-169-protecting-consumers-from-unfair-discrimination-in-insurance-practices

characteristics. Pinnacle has completed an analysis of the summary dataset to illustrate the impacts of removing territory requirements.

Summary of Data Processing and Territory Analysis

Pinnacle developed indicated territory definitions by applying the current territory requirements, and compared these results to indicated territory definitions developed without applying the current territory requirements.

To develop the indicated territory definitions by applying the current territory requirements, Pinnacle took the following steps:

1. Pure premiums were calculated by FSA for the Accident Benefits, Third Party Liability, Comprehensive, Collision and All Perils coverages.

2. Pure premiums were summed across coverages to determine the all-coverage combined pure premium.

3. Pure premiums were smoothed (see description below).

4. Smoothed pure premiums for FSAs in Toronto were clustered using the SKATER algorithm (see description below) to develop 10 Toronto territories.

5. Smoothed pure premiums for FSAs not in Toronto were clustered using the SKATER algorithm to develop 45 non-Toronto territories.

6. The resulting territory definitions were then applied to each individual coverage to develop indicated territory relativities by FSA.

Smoothing Process: The smoothing process results in credibility weighted pure premiums for each FSA. To calculate the credibility-weighted pure premium, the FSA pure premium is credibility weighted with pure premium of the surrounding FSAs. The smoothing process starts at each FSA's centroid and moves out concentrically in half-mile increments until the smoothing threshold is reached or exceeded. Linear decay is used to calculate each surrounding FSA's contribution to the pure premium. The farther away an included FSA is from the original FSA, the less contribution or weight it will receive. A smoothing threshold is the size at which the process of combining neighboring FSAs stops. The chosen threshold was 5% of Ontario total exposures. The weighted pure premium of the surrounding FSAs determined by the smoothing original process was used as the complement of credibility for the FSA pure premium.

SKATER Algorithm: The SKATER (Spatial 'K'luster Analysis by Tree Edge Removal) method[9] is a type of clustering method which imposes a contiguity contsraint. We used a limit of 10 clusters for the city of Toronto and a limit of 45 clusters for FSAs not in the city of Toronto.

To develop the indicated territory definitions without applying the current territory requirements, Pinnacle followed the following steps:

1. Pure premiums were calculated by FSA for the Accident Benefits, Third Party Liability, Comprehensive, Collision and All Perils coverages.

2. Pure premiums were smoothed individually by coverage.

3. Smoothed pure premiums were clustered using Pinnacle's algorithm (see description below) to develop indicated territories by coverage. The use of the chosen algorithm is to be illustrative of the potential impact of removing the current territory requirements. It is not intended to suggest that this the best or only possible solution for developing territories

4. The resulting territory definitions were then applied to each individual coverage to develop indicated territory relativities by FSA.

Clustering Process: Each FSA starts as an individual cluster. The FSAs are sorted by descending pure premium and the two most similar FSAs (FSAs with the closest pure premiums) are joined together to produce a cluster solution with one less cluster than the previous iteration. This process is repeated until all FSAs are combined into one cluster.

The optimal solution is selected by determining the point where the curve representing the ratio of within-variance to total variance begins to flatten. Solutions with more clusters are less likely to materially improve the clustering quality; conversely, solutions before the point of curve flattening could result in less optimal clustering.

We then compared the indicated territory relativities developed by incorporating the current territory requirements to the indicated territory relativities developed without the current territory requirements. A summary of these differences is shown below.

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[9] Martins, Assuncao & Neves, Marcos & Câmara, Gilberto & Da Costa Freitas, Domingos. (2006). Efficient Regionalization Techniques for Socio-Economic Geographical Units Using Minimum Spanning Trees. International Journal of Geographical Information Science. 20. 797-811. 10.1080/13658810600665111.

Resulting Rates are More Reflective of Risk

To illustrate that the removal of the current territory restrictions could lead to rates that are more reflective of risk, we tested how well the territory definitions reflected the actual experience when the current territory requirements were applied and when they were removed. We also calculated the mean squared error (MSE) in both scenarios.

In developing indicated territory definitions, we randomly split the summary data into training and validation datasets. 60% of the data was used for training, and 40% of the data was used for validation. We then used the training dataset to develop the indicated territories and the validation dataset to test how well the territory definitions matched the actual experience.

The charts below show the result of the validation test for territories developed under the current territory requirements. For each coverage, we ordered the territories in ascending pure premium order based on the training dataset, and then calculated the pure premium of the territory based on the validation data.

Chart 1: Validation Chart - Collision with Current Territory Requirements

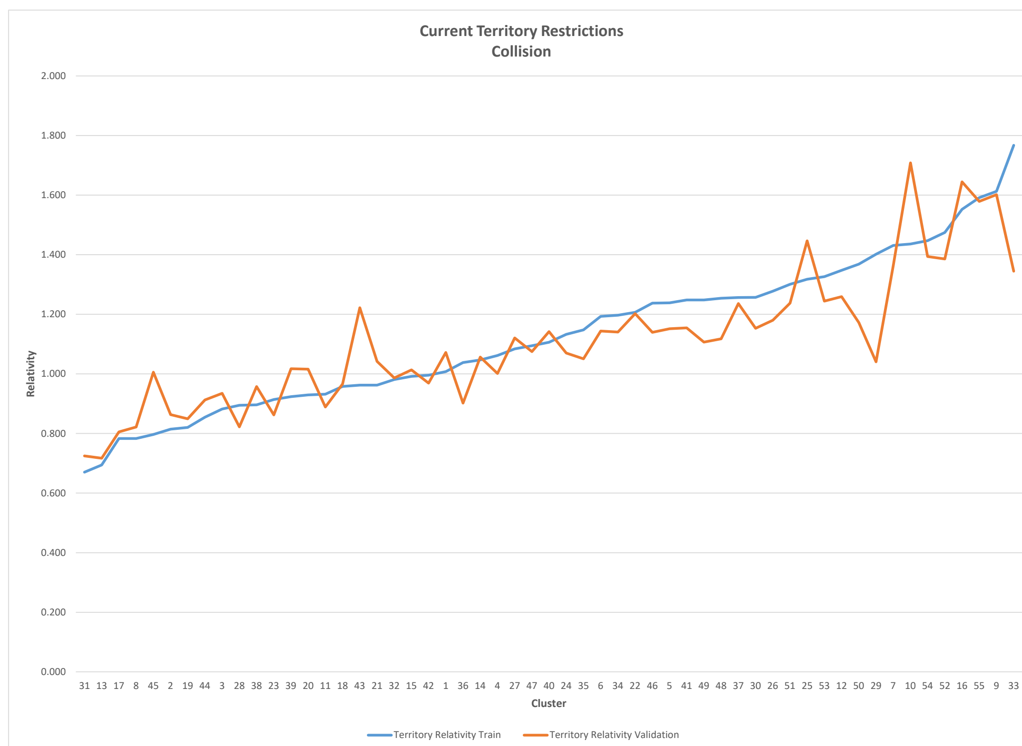


Chart 2: Validation Chart - Comprehensive with Current Territory Requirements

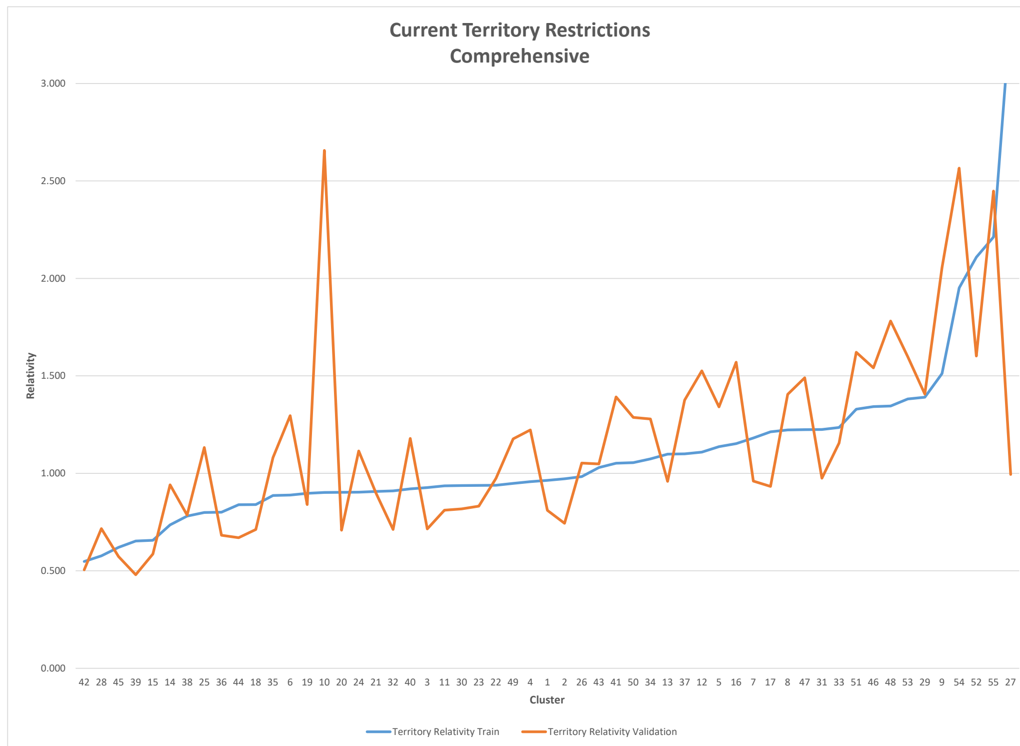


Chart 3: Validation Chart – Accident Benefits with Current Territory Requirements

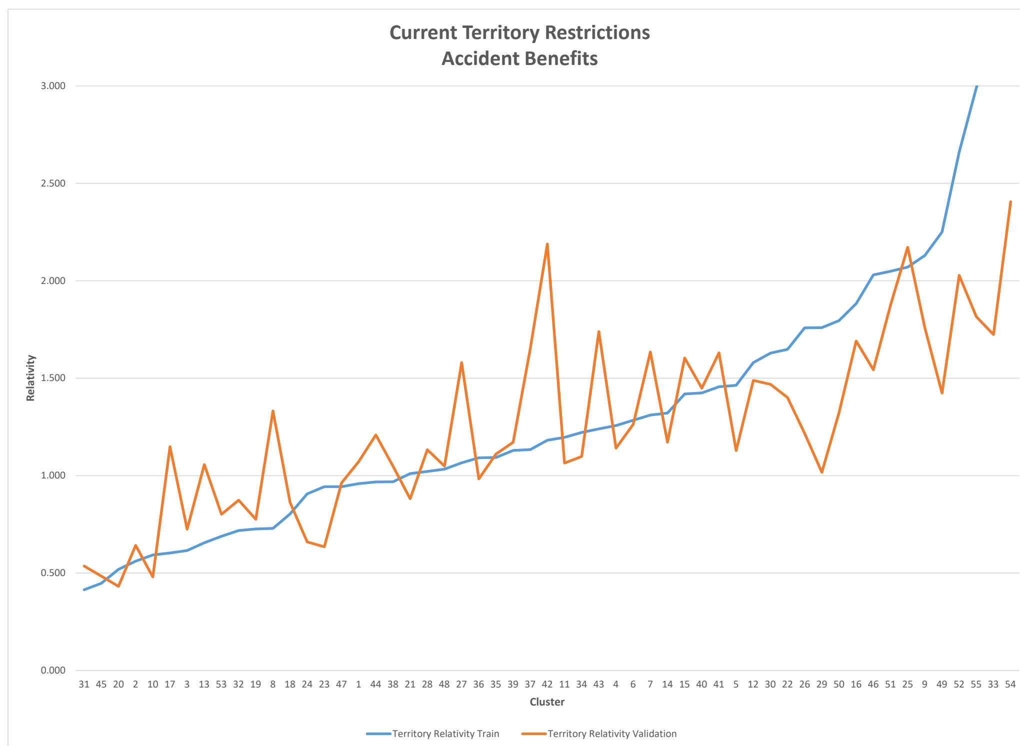
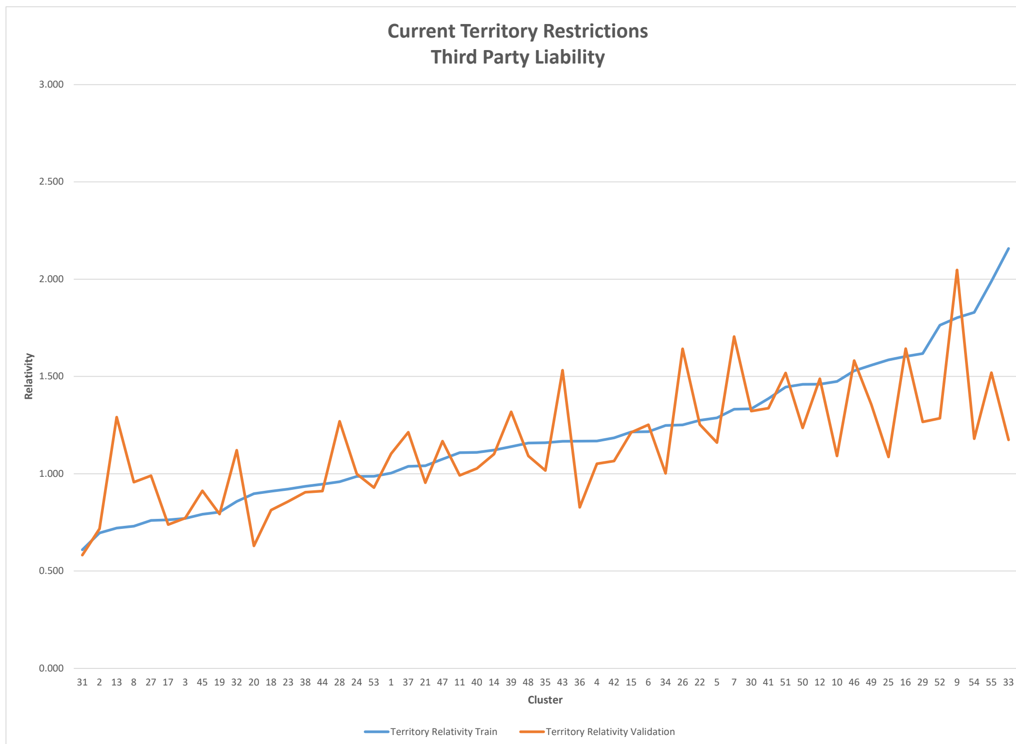


Chart 4: Validation Chart - Third Party Liability with Current Territory Requirements



As seen in the charts above, while the slope of the validation line follows an upward trend, there is a significant amount of variation when comparing the pure premium of the training dataset for each territory to the pure premium of the validation dataset.

The charts below show the result of the validation test for territories developed after removal of the current territory requirements. Again, for each coverage, we ordered the territories in ascending pure premium order based on the training dataset, and then calculated the pure premium of the territory based on the validation data.

Chart 5: Validation Chart - Collision After Removal of Current Territory Requirements

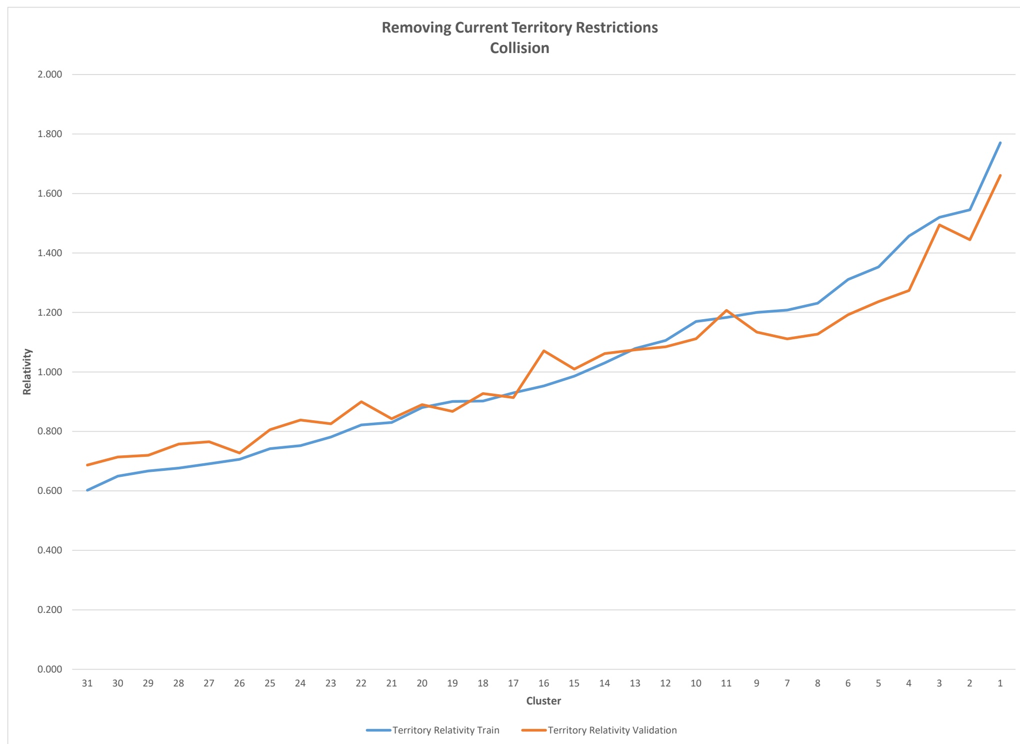


Chart 6: Validation Chart - Comprehensive After Removal of Current Territory Requirements

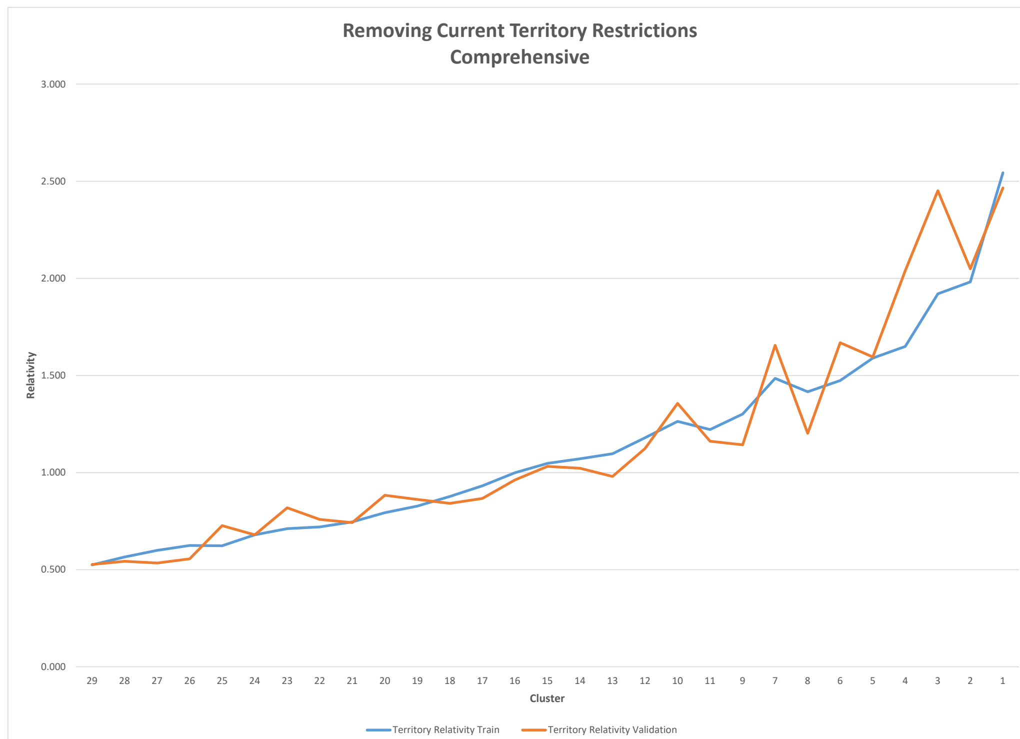


Chart 7: Validation Chart – Accident Benefits After Removal of Current Territory Requirements

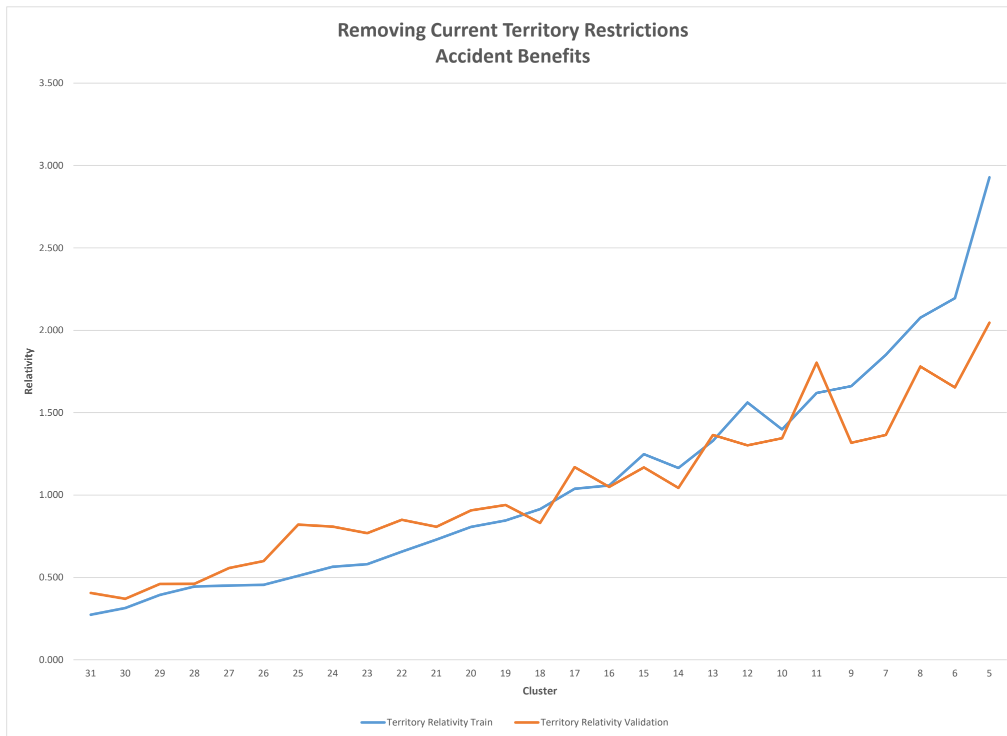
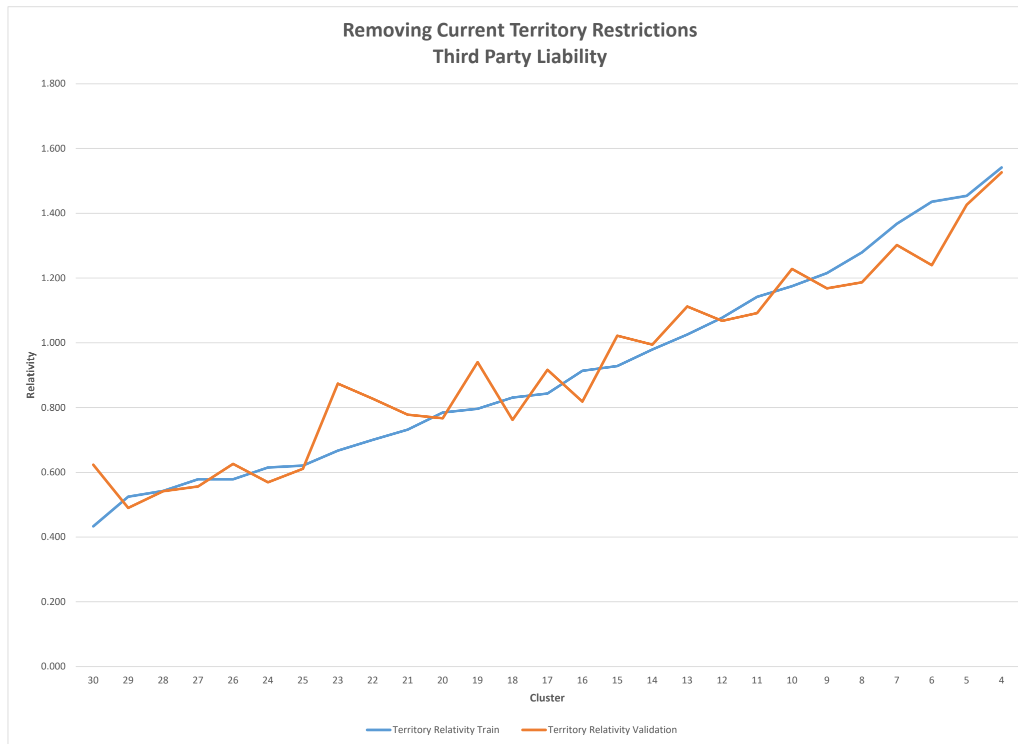


Chart 8: Validation Chart – Third Party Liability After Removal of Current Territory Requirements



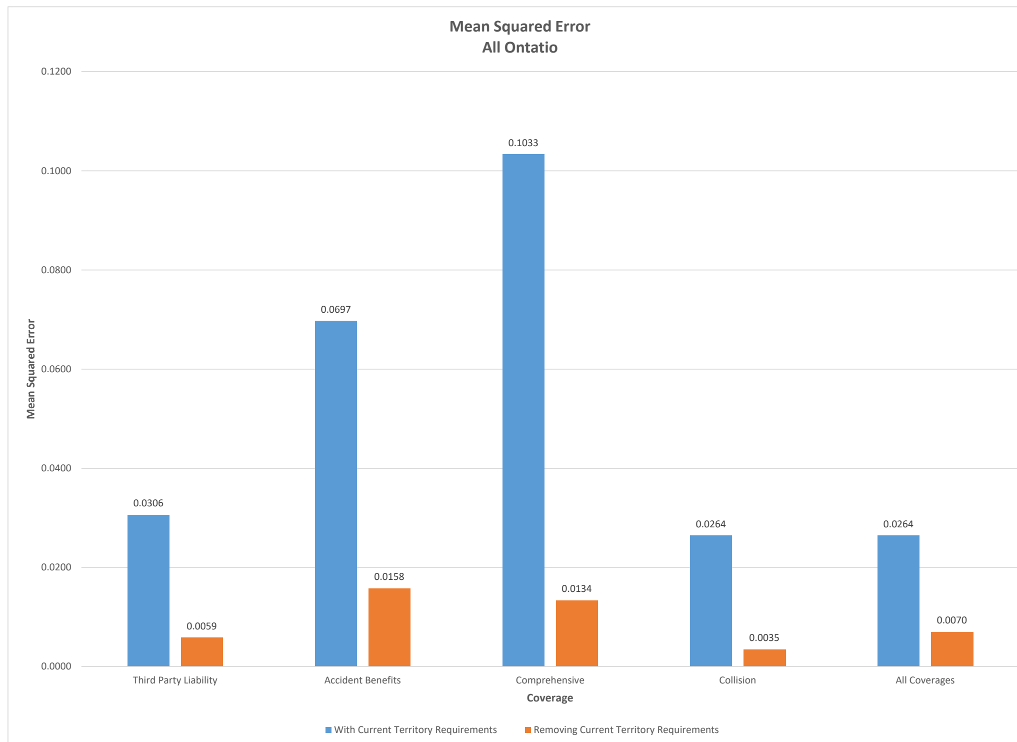
When reviewing the validation charts after removal of the current territory requirements, we conclude that the new territory definitions validate much better by coverage, with the validation data showing a much closer relationship to the training data results.

We also calculated the MSE of the indicated territory rates by FSA with the application of the current territory requirements and after the removal of the current territory requirements. The mean square measures the average squared error and is used as a measure of accuracy for a predictor. The formula for the MSE is shown below.

$$\mathrm{MSE} = \frac{1}{n}\sum_{i=1}^{n}\left(Y_i - \hat{Y}_i\right)^2.$$

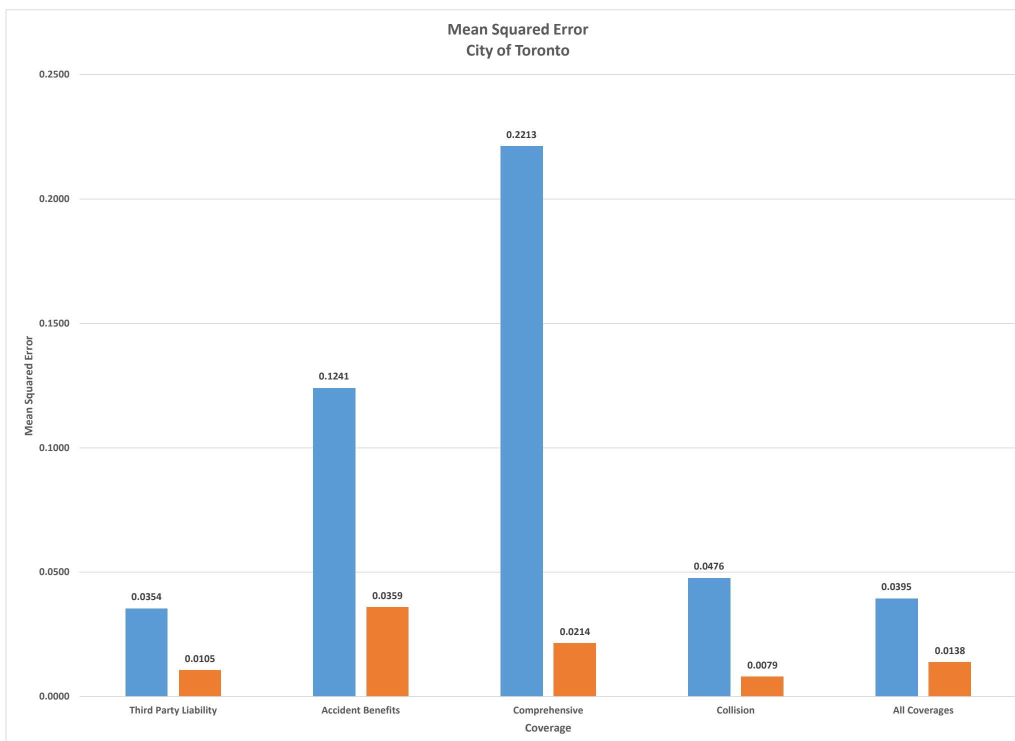
The MSE by coverage for all FSAs in Ontario is shown below.

Chart 9: MSE - All Ontario



As can be seen in the chart above, the MSE decreases significantly for each coverage when the current territory requirements are removed. The fact that the MSE decreases is not a surprise, but the magnitude by which the MSE decreases may be. The MSE decrease by coverage ranges from 73% to 87%. This shows that the current territory requirements impose a significant limitation on being able to match premium to risk of loss.

The mean squared error by coverage for all FSAs in the city of Toronto is shown below.



For FSAs in the city of Toronto, the MSE also significantly decreases after the removal of the territory requirements. However, the MSE still remains higher than the MSE for FSAs that are not in the city of Toronto. While this demonstrates that rates in Toronto will also be significantly more reflective of risk after the removal of the current territory requirements, the variability in loss experience in the city of Toronto is still greater than the variability of loss experience in the rest of Ontario, and this will still be reflected in the indicated rates.

Based on the validation charts and the calculation of the MSE, we conclude that the removal of territories would provide insurance companies with significantly greater flexibility to match risk to expected loss.

Increased Range of Rate Relativities

If territory rates, after the removal of current territory requirements, are more reflective of risk, we expect to see a wider distribution of indicated territory rates. As an example, we expect there would be a lower concentration of policies at specific rate levels, as policies would be spread across a wider distribution of territory rates.

To evaluate whether removing the current territory requirements results in a wider range of territory rates, we compared the distributions of indicated rate relativities for each coverage before and after the removal of the current territory requirements. These charts are shown below.

Chart 10: Collision - Distribution of Indicated Territory Relativities

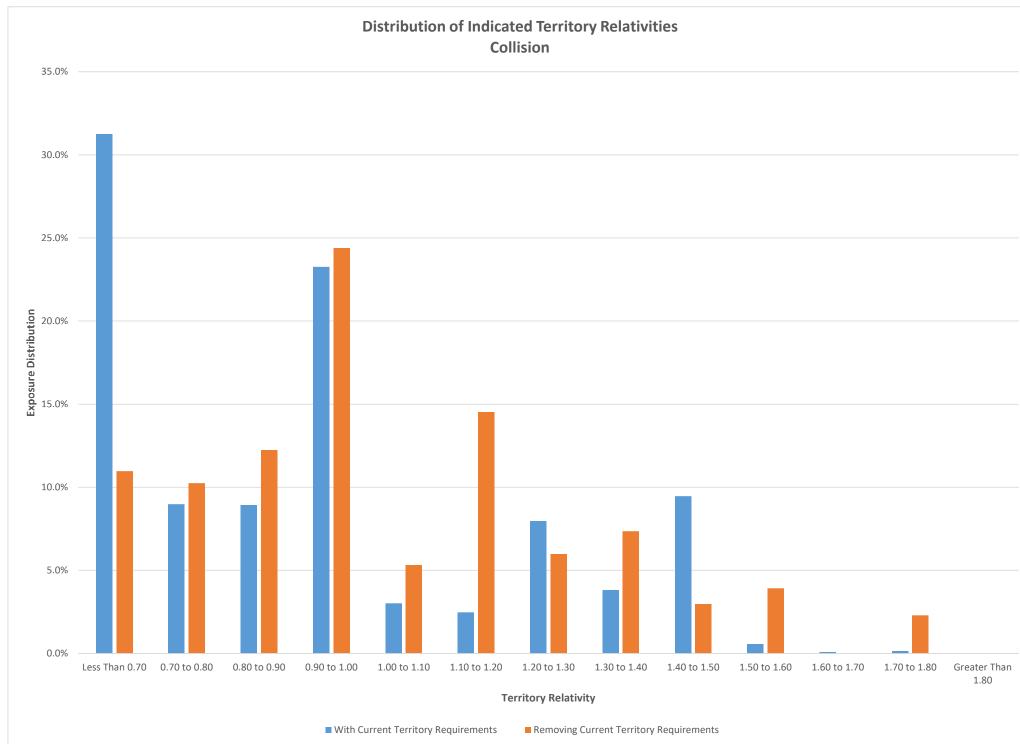


Chart 11: Comprehensive - Distribution of Indicated Territory Relativities

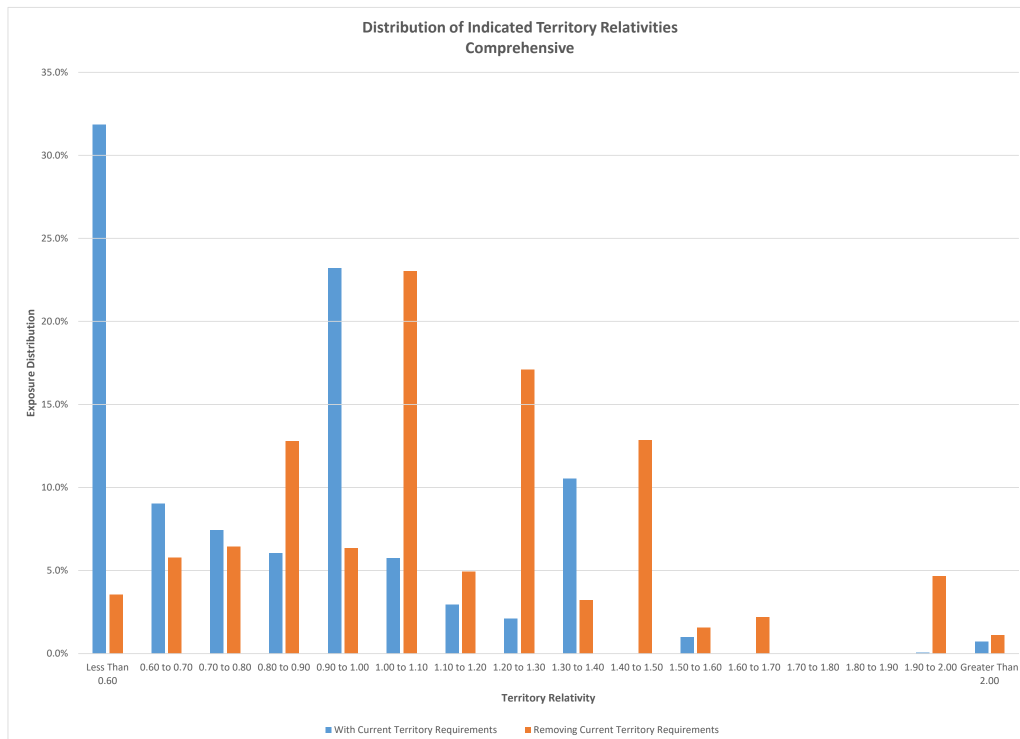


Chart 12: Accident Benefits - Distribution of Indicated Territory Relativities

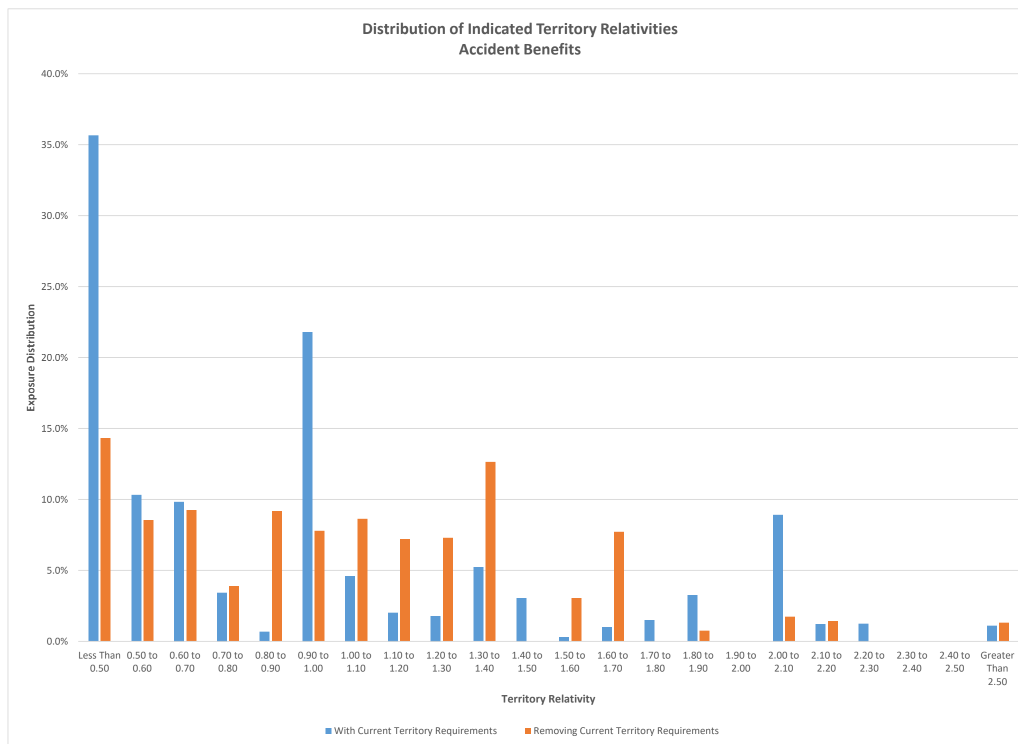
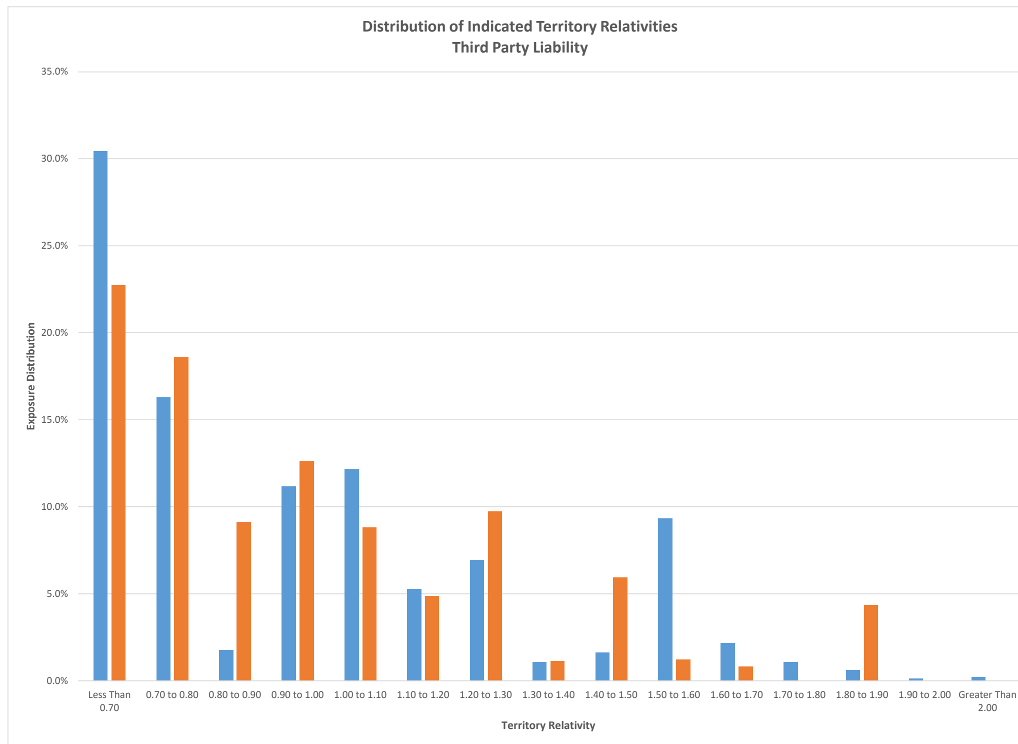


Chart 13: Third Party Liability - Distribution of Indicated Territory Relativities



These charts show that the distribution of indicated rate relativities by coverage is more even after removal of the current territory requirements. To further demonstrate this, we calculated the absolute difference of the indicated rate relativities from unity and computed a weighted average of these differences before and after removal of the current territory requirements. For each coverage except Comprehensive, the weighted average decreased after the removal of the current requirements, indicating less extreme indicated relativities for policyholders. The difference by coverage is shown in the table below.

Table 1: Average Absolute Difference of Territory Relativities from Unity

Coverage	With Current Territory Requirements	After Removal of Territory Requirements
Comprehensive	0.275	0.287
Collision	0.243	0.211
Accident Benefits	0.559	0.395
Third Party Liability	0.303	0.279

A more even distribution of rate relativities facilitates greater flexibility to match premiums with the level of risk, but also allows for more potential rate levels, and thus potentially smoother transition of rates between adjacent FSAs.

Rate Impacts

Concerns have been raised about the potential impact of removing current territory requirements to significantly increase policy premium. To estimate this impact, we compared the indicated territory relativity by FSA after removing current territory requirements to the indicated relativity prior to the removal of current territory requirements. We made this comparison for the entire province of Ontario excluding the city of Toronto, and separately for the city of Toronto. The charts showing this impact by coverage and for all coverages combined are shown below.

Chart 14: Collision Estimated Rate Impacts

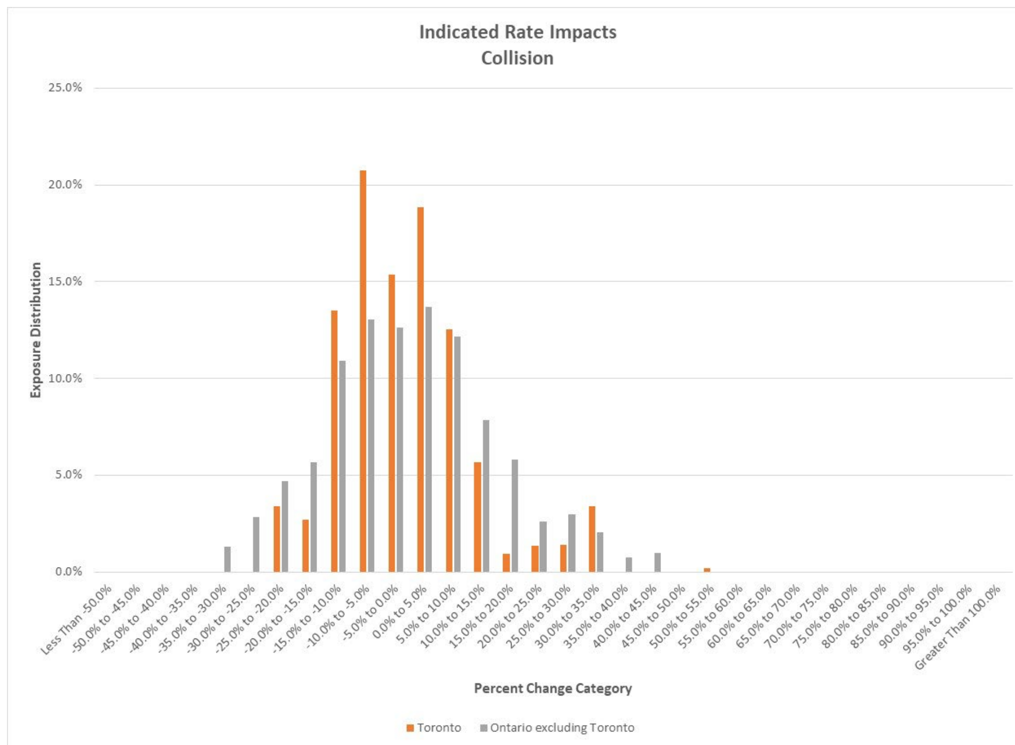


Chart 15: Comprehensive Estimated Rate Impacts

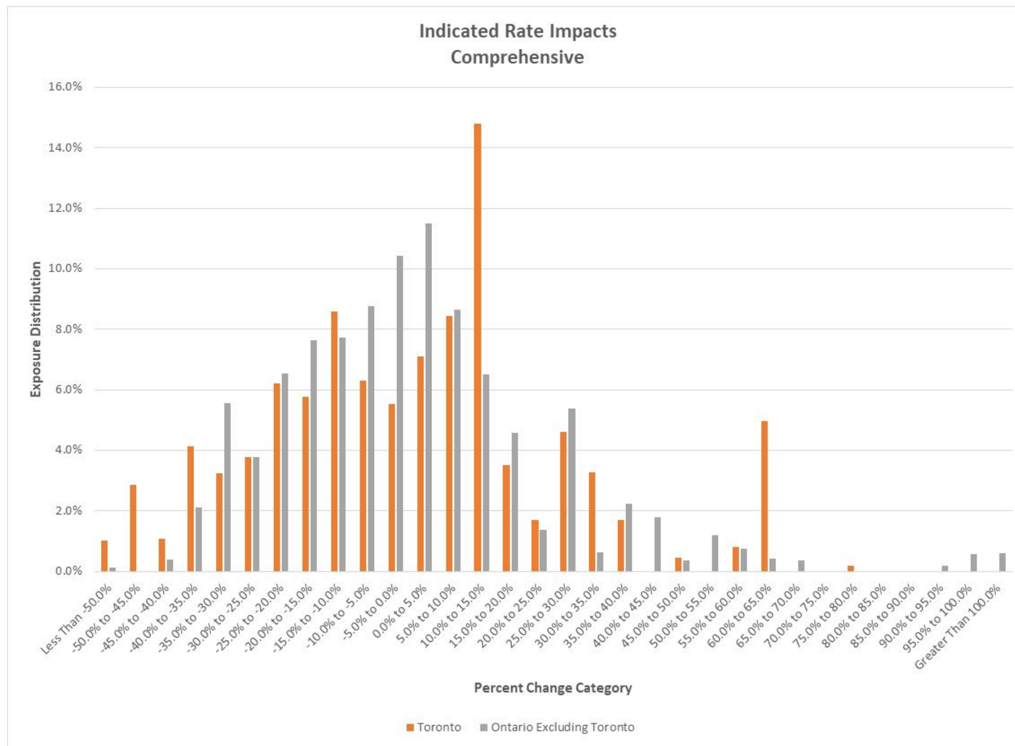


Chart 16: Accident Benefits Estimated Rate Impacts

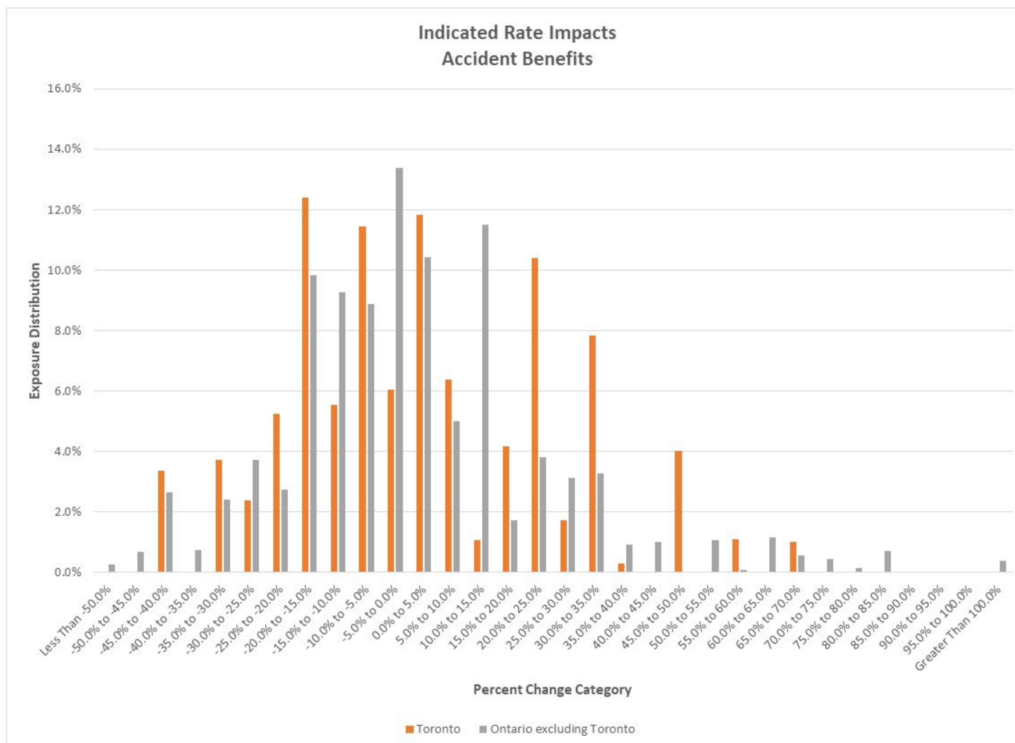


Chart 17: Third Party Liability Estimated Rate Impacts

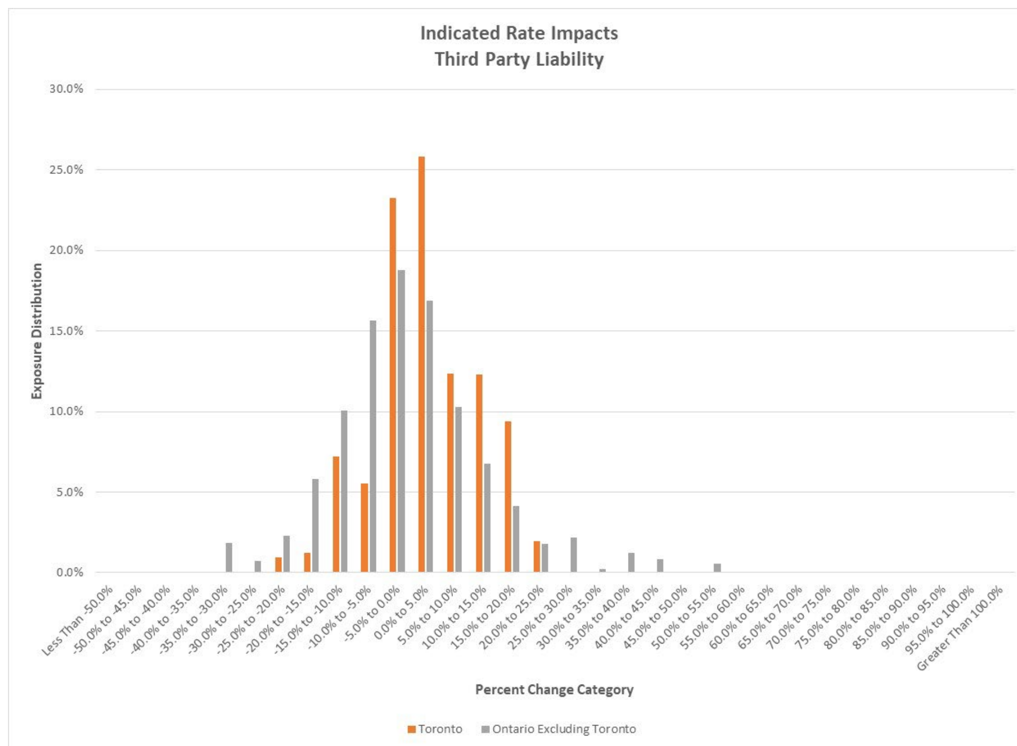
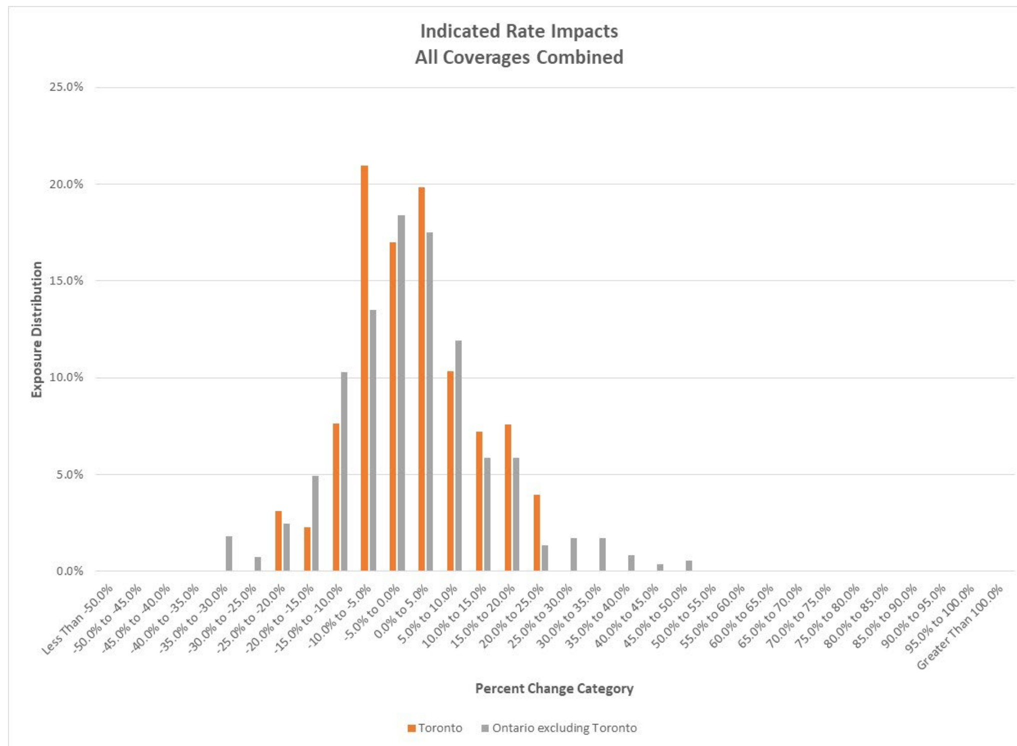


Chart 18: All Coverages Combined Estimated Rate Impacts



As can be seen from the charts above, while the impact does vary by policyholder, the majority of policyholders are within a reasonable minimum and maximum percent change range, and the range of impacts in the city of Toronto is not significantly different than the range of impacts overall.

For FSAs excluding the city of Toronto for all coverages combined, 83% of exposures have an indicated change of +/- 15%, and 94% of exposures have an indicated change of +/- 25%. For third party liability, the coverage with the most exposures, 83% of exposures have an indicated change of +/- 15%, and 95% of exposures have an indicated change of +/- 25%. The maximum all-coverage increase is 49%.

For FSAs in the city of Toronto and all coverages combined, 91% of exposures have an indicated change of +/- 15%, and 100% of exposures have an indicated change of +/- 25%. For third party liability, the coverage with the most exposures, 96% of exposures have an indicated change of +/- 15%, and 100% of exposures have an indicated change of +/- 25%. The maximum all-coverage increase is 23%. The distribution of indicated changes for the city of Toronto is lower than it is for the province of Ontario.

Given the range of indicated changes, most policyholders would see a change that is lower than the maximum change allowed under the current territory requirements, which is +/- 10%. For policyholders that have a significant indicated increase, using overall rate caps, as discussed earlier in the report, would allow for a smooth transition as current territory requirements are removed.

Limitations

The impacts estimated here, while representative of what we believe might happen in the market if current territory requirements are removed, will not represent the impact on each individual company's book of business. There are several reasons for this:

1. Insurance companies use different territory definition algorithms, and so the impacts will vary based on the approach used to define territories.
2. Some of the inefficiencies that result from the current territory requirements may be picked up by other rating characteristics. This will depend on the approach the company uses to establish indicated rating factors for non-territory rating variables.
3. This data reflects industry information, and data from each individual company may result in different impacts.