

A long-exposure photograph of a multi-lane highway at night. The image shows light trails from vehicles, with white and blue trails on the left side of the road and red and yellow trails on the right side. The road stretches into the distance under a dark sky. A semi-transparent blue rectangular overlay is positioned in the upper right corner of the image.

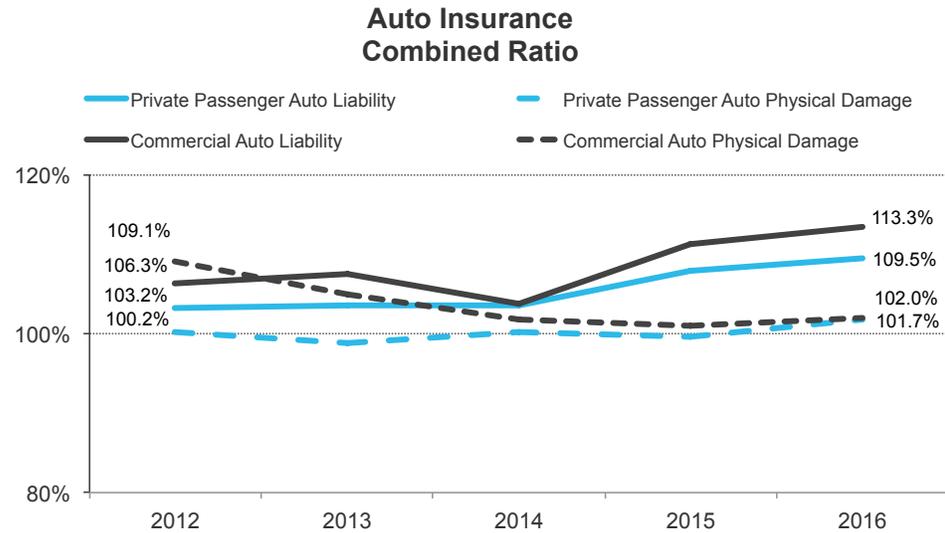
Improve Auto Insurance Profitability With Location-Based Crash Risk Intelligence

September 2017

Crash location information and its derived intelligence can play a crucial role in providing an incremental understanding of risk assessment and pricing within the auto insurance industry.

Introduction

The highly competitive \$230-billion auto insurance industry has continued to face increasing losses, as indicated by their combined ratio measures being greater than 100% for both private passenger and commercial auto lines of business. This ongoing financial pressure is forcing these insurance companies to explore new ways of improving both their pricing accuracy and bottom line.



Source: National Association of Insurance Commissioners (NAIC)

This is why the utilization of enhanced technologies, as well as new data sources and measurements, has become commonplace for the auto insurance industry in response to the mounting financial pressure. In fact, the growing wave of information collected through mobile technologies, apps, and dongle devices is already providing the industry new and more accurate ways of measuring actual mileage use and driving behaviors. Many insurance companies have continued to integrate such information into their customer-centric services and pricing.

A majority of the new data and measurements is largely focus on driving behaviors. From the authors' experience in the data and analytics industry, it is apparent that crash location information and its derived intelligence can play a crucial role in providing an incremental understanding of risk assessment and pricing within the auto insurance industry.

The purpose of this white paper is to introduce this new fundamental data, and outline the logic and empirical evidence for its usefulness to auto insurance companies.

Only a small set of locations consistently accounts for a very large portion of total traffic crashes. Hence, it is crucial to know where these crashes occur.

Crash Locations: A Crucial Piece of Missing Information

Logically, crash-related auto insurance claims such as property damage liability, collision, and bodily injury are mostly a subset of automobile crashes. But, by understanding the driving forces behind these ongoing traffic crashes, we are able to apply a more robust body of knowledge to the understanding of auto insurance claim frequency. Whereas, in the past, crash locations have been a crucial piece of missing information.

“The first step in reduction of the frequency of accidents is to determine whether the cause of an accident belongs to the system or to some specific person or set of conditions. The split is possibly 99 per cent from the system, 1 per cent from carelessness”

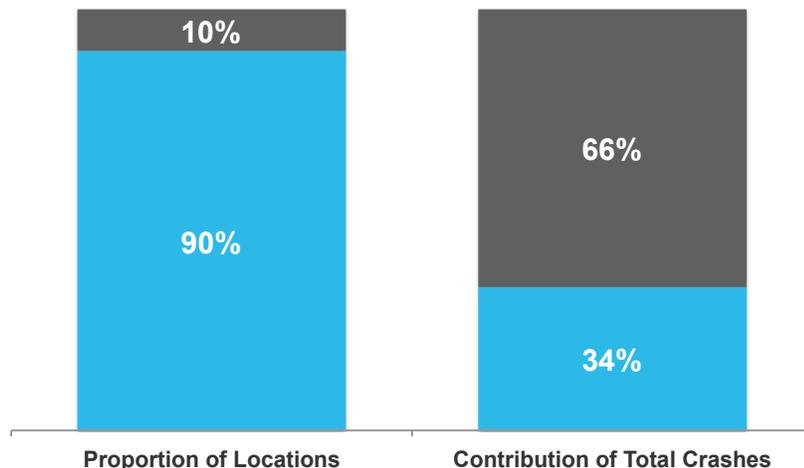
W. Edwards Deming,

a highly accomplished American physicist turned statistician, *Out of Crisis* book

A fundamental insight from Deming’s teachings is that process design drives outcomes more than behavior of the individuals. We, the authors, have seen this fundamental insight be proven correct, repeatedly, over more than a decade of practice in the industry.

An implication of this fundamental insight into the context of traffic crash analysis is that only a small set of locations consistently accounts for a very large portion of total traffic crashes. Hence, it is crucial to know where these crashes occur.

Approximately, the top 10% of crash locations account for more than 66% of all crashes.



Source: TNEDICCA’s analyses

Once the crash data has been well-curated and governed, we are able to transform it into actionable insights at scale.

Turning Data into Actionable Insights

Often, readers only discover fatal crash statistics through local media channels—a number which was around 32-thousand reported crashes in 2015. However, few have ever heard or seen the statistics on all reported crashes, which the National Highway Traffic Safety Administration (NHTSA) estimated to be 6.3-million in that same year. It has been a time-consuming undertaking to gather such comprehensive historical crash data from every state, while also organizing it for usability purposes. Once these processes are well defined, we then dove deeper into the data, in order to properly geo-code each individual crash location. Finally, after the data has been well-curated and governed, we are able to transform it into actionable insights at scale.

Due to this past difficulty in accessing and utilizing crash data, auto insurance companies have not yet fully utilized crash location information in their risk rating process. But, now the availability of crash data has largely been solved. This allows us, as a company, to focus on understanding the usefulness of the crash data and the insights we can derive from it.

Since we know the crash details and frequency over a period of time at each location, we can more precisely define location-based crash risk and derive the numerical measurements that allow us to test its usefulness. Therefore, we define *location-based crash risk score* as the weighted summation of crash frequency around a given address; usually a residential/garaging address.

Here are the two fundamental questions we aim to answer:

- 1. Can auto insurance carriers use the location-based crash risk intelligence to predict the frequency of crash-related insurance claims?*
- 2. Have these location-related risks been incorporated into carriers' current pricing through other sources of information?*

To answer these two questions, it will require performance data—such as actual vs. predicted claim losses—as well as actual coverage premium information from insurance carriers. Fortunately, this sound concept of retro-testing has been a standard practice within the insurance industry for decades. In fact, insurance companies have been using “Big Data” long before the term was ever coined and popularized.

Based on our two, recent retro-tests, we are presenting you the empirical findings that address these very questions.

The actual retro-test results indicate very strong signals that location-based crash risk scores can be used to predict claims frequency for collision, property damage liability, and bodily injury claims.

Repeating sound empirical evidence is the ultimate judge of truth of an idea

Within the retro-test process, insurance carriers provide us with a database of relevant identification numbers for the units of analysis (e.g. vehicle level within a policy/term/major peril) and their associated garaging address. We then geocode the given addresses and provide the location-based risk score associated with each location. These scores can then be combined with the carriers' performance data to complete the analysis.

1. Can auto insurance carriers use the location-based crash risk intelligence to predict the frequency of crash-related insurance claims?

If the answer to this question is "yes", we should observe a positive trend in claim frequency per policy when plotting location-based crash risk scores.

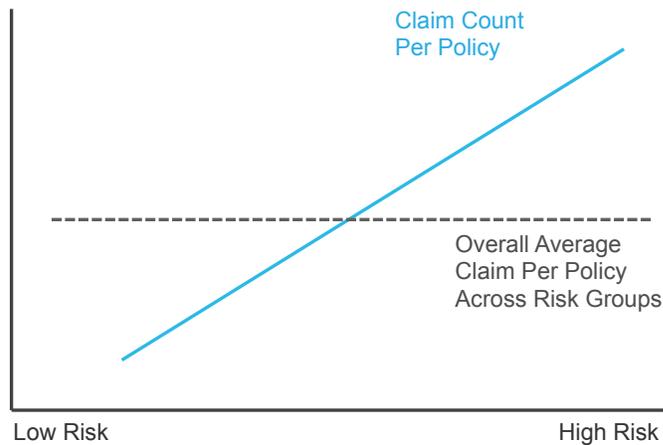
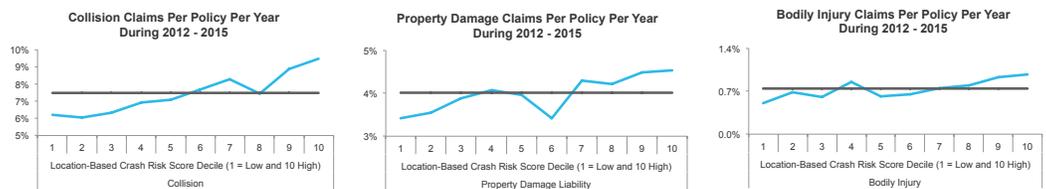


Illustration: location-based crash risk scores vs. an insurance carrier's claims frequency. The higher the location risk, the higher the claims frequency.

The actual retro-test results indicate very strong signals that location-based crash risk scores can be used to predict claims frequency for collision, property damage liability, and bodily injury claims. It is intellectually gratifying to see that the inference from our logic panned out in such a way, as to be empirically true via strong repeating signals across states, insurance coverage, times, and insurance carriers.



Anonymized actual results from a retro-test with a regional carrier: the higher the location risk, the higher the claims frequency.

Focusing on the incremental information value of this insight

We can now move onto a more business-oriented question.

2. Have these location-related risks been incorporated into carriers' current pricing through other sources of information?

For insurance carriers, it's all about the incremental value of new information. Had the location-based crash risk fully incorporated into the current pricing through the use of other factors, the prices and losses would look much like the charts below (i.e., you would see them as parallel).

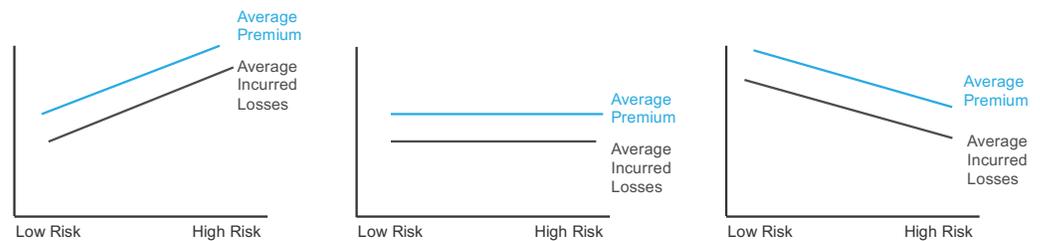
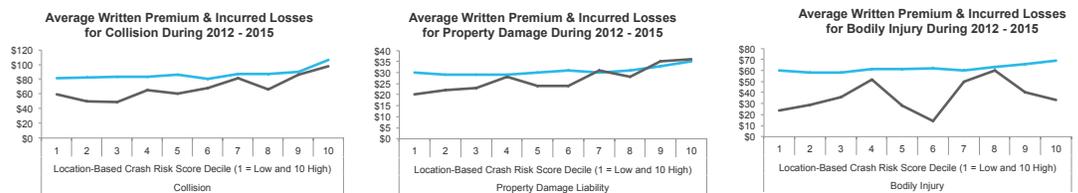


Illustration: Cases when the insurance carriers have fully incorporated the location risk into their current pricing.

Empirical results indicate that the claims risks represented through location-based crash risk scores have not yet been fully incorporated into the current pricing processes. Hence, there are opportunities for rate modifications to further improve overall profit.



Anonymized actual results from a retro-test with a regional carrier: lack of parallel pattern between premium vs. incurred losses indicated that potential incremental value from this new information.

The profit improvement opportunity ranges from 3% - 20% depending on types of coverage and geography. This conservative estimate is assuming the carrier only takes action on opportunities for the rate increase given the nature of customer behavior. The actual realized benefit will, of course, vary based on the strategy and actions of the carriers.

Allow the sound and repeating empirical evidence to guide your product and pricing decisions. Then Pivot from appropriate risk assessment to risk mitigation.

Pivoting from a focus on appropriate risk assessment & pricing to proactive risk mitigation

Given the rising interest in “Big Data” and “InsureTech”, many insurance carriers have been searching for other innovative ideas that can help further improve their businesses and bottom lines. Based on the insights from the above-mentioned, location-based crash risk intelligence, we see opportunities for auto insurance carriers to pivot their focus from appropriate risk rating and risk selection to more proactive crash/claim risk mitigation.

There is an old adage that states, “You want to know where you will be trouble, so you won’t go there”. And we believe it to be true— at least probabilistically. Since traffic crashes concentrate on a very small and identifiable set of locations, this location-related risk information can be served to drivers through mobile apps and provide a relative safety assessment of their actual and/or planned trips.

For consumers, this safety-based route navigation will be appealing not just on a safety point-of-view, but also an economic one as there are practical ways for insurance carriers to work with drivers, in order to further reduce actual crash and claim risks.

This goal for risk mitigation may sound far reaching, but it’s actually within our capability to achieve it today. We encourage auto insurance carriers to start by retro-testing this location-based crash risk intelligence with their own performance data. Allow the sound and repeating empirical evidence to guide their product and pricing decisions. We believe that once carriers see the empirically proven value of this new information, the applications in usage-based type insurance and safety-based route navigation capability will be proven to be an important extension of the very same idea.

About Us

Founded in March 2015 and headquartered in Columbus, Ohio, TNEDICCA®'s mission is to improve traffic safety through the use of data and analytics.

TNEDICCA® acquires and curates comprehensive traffic crash data and provides location-based crash intelligence through its cloud based analytical platform. The company's initial focus is in the auto insurance industry in which its unique and proprietary location-based crash risk scores are proven to help auto insurance companies improve profitability by 3 to 20% through better pricing and risk selection. In addition to improving pricing accuracy, TNEDICCA® also offers risk mitigation services via safety-based route navigation mobile app RouteWise™ and related APIs to telematics service providers, usage-based-insurance carriers and drivers.

Besides, the auto insurance industry, the company also works with navigation service providers, transportation planning agencies, and automotive manufacturing companies.

For more information on TNEDICCA®, please visit the company's website at www.tnedicca.com.

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