ADAS Analysis Creates Path for Auto Insurance Rating

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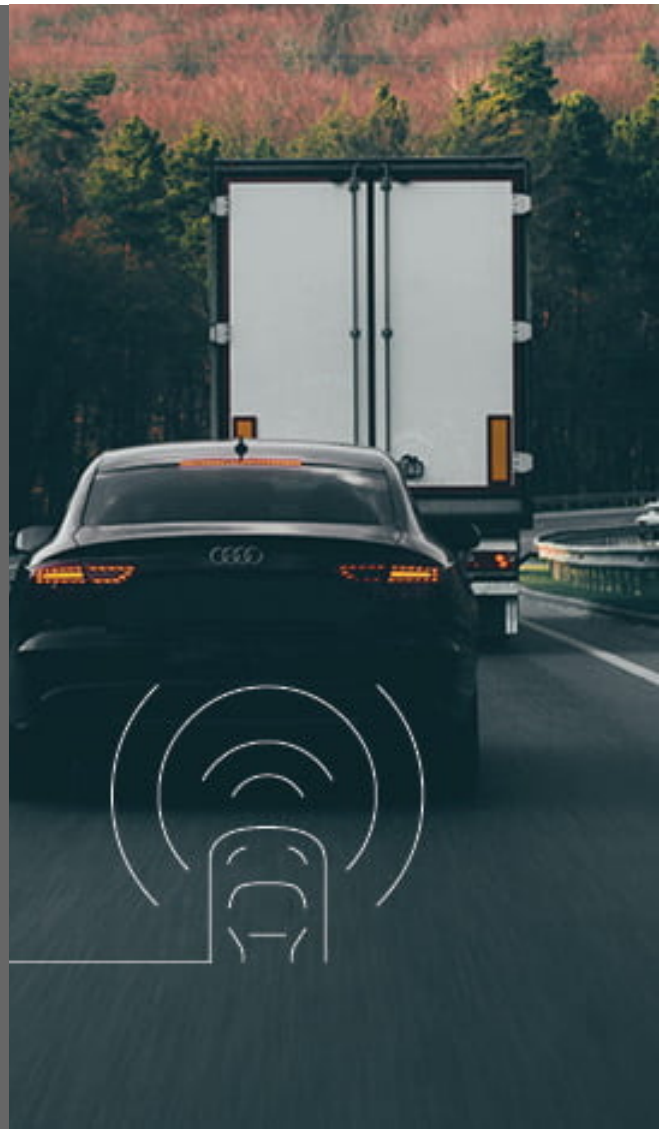
INTRODUCTION

Advanced Driver Assistance Systems (ADAS) are becoming increasingly prevalent in newer vehicles. At LexisNexis® Risk Solutions, we consider vehicle model years 2014 or newer to be of the ADAS Era.

Most vehicles older than 2014 are not likely to have ADAS because these technologies were not yet widely adopted by vehicle manufacturers. As of August 2020, industry data indicated that 40% of insured U.S. vehicles were from the ADAS Era, with a 6% annual percentage point increase driven by the introduction of new model years.

Because independent research has shown that ADAS features can be linked to a reduction in collisions, the insurance industry has shown keen interest in understanding their impact on loss cost. Historically, the inability to determine ADAS feature information at a VIN level has been a major challenge in determining impact to loss cost. Carriers can overcome this challenge with LexisNexis® Vehicle Build.

As part of our research to develop Vehicle Build, our team gathered critical insights that will help carriers better understand the impact of ADAS on insurance loss cost using VIN-level ADAS feature information. This research is based on a random selection of more than 11,000,000 vehicles from model years 2014 to 2019 compared against industry-wide claims loss data.



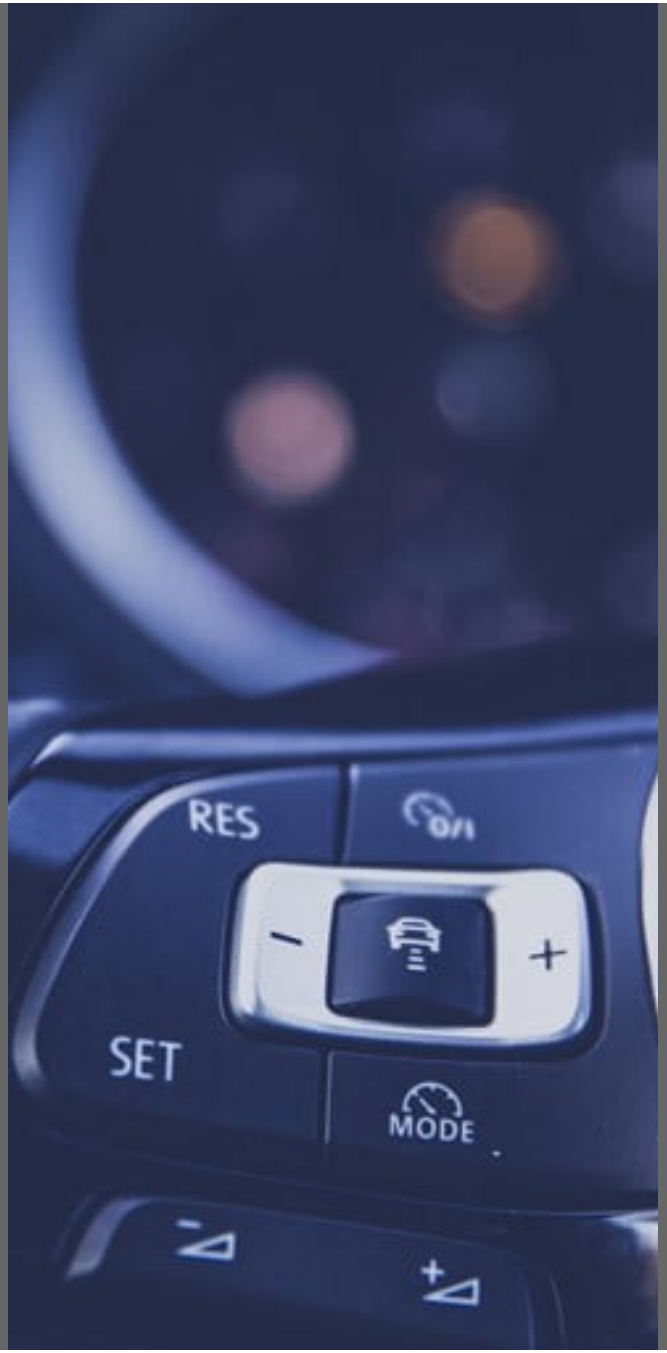
Core ADAS Features

CORE ADAS FEATURES

The LexisNexis ADAS classification system standardizes vehicle safety features for auto insurers. It is no industry secret that there are multiple sets of proprietary ADAS features and their diversity is further complicated by automotive manufacturer naming conventions.

The logical sequencing and classification of hundreds of these variations into a common taxonomy enables insurers to more easily ascertain how these features affect a vehicle's risk profile. From these many variations, the classification derives approximately 60 unique features, all of which are delivered through LexisNexis® Vehicle Build.

Classification of each core ADAS feature was driven by prevalence of the feature. Based on the representative industry sample, 38% of vehicles, model years 2014 to 2019, had at least one core ADAS feature.



We were able to identify 10 ADAS features that have shown to have the highest correlation to impact on loss cost. We refer to these 10 as core ADAS features. The core ADAS features include:

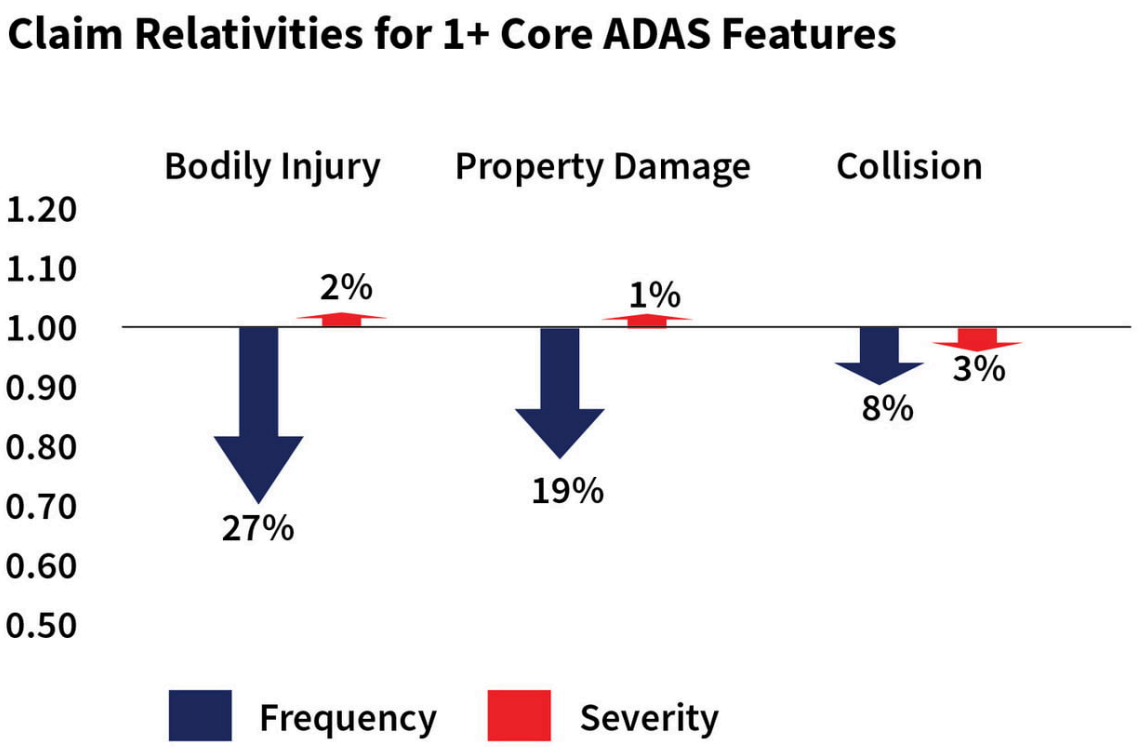
- Adaptive Cruise Control
- Blind Spot Warning
- Blind Spot Mitigation
- Driver Monitoring
- Forward Collision Warning
- Forward Collision Mitigation
- Lane Departure Warning
- Lane Departure Mitigation
- Rear Collision Warning
- Rear Collision Mitigation

Univariate Loss Cost Impact

UNIVARIATE LOSS COST IMPACT

After controlling for the main effect of commonly used rating factors, our team compared vehicles with one or more core ADAS features to similar vehicles without any core ADAS features. Results showed that vehicles with at least one core ADAS feature resulted in 27% fewer bodily injury (BI) claims, 19% fewer property damage (PD) claims, and 8% fewer collision claims. In contrast, claim severity saw minimal movement, increasing 2% for BI claims, 1% for PD claims, and decreasing 3% for collision claims.

Reduction in claim frequency is intuitive, as ADAS equipped vehicles should result in fewer collisions and therefore fewer claims. Market perception around severity has been that severity could possibly negate the benefit resulting from frequency reduction. However, our research suggests that change in claim severity is minimal and improvement in loss cost is attributed overwhelmingly more to reduced frequency.

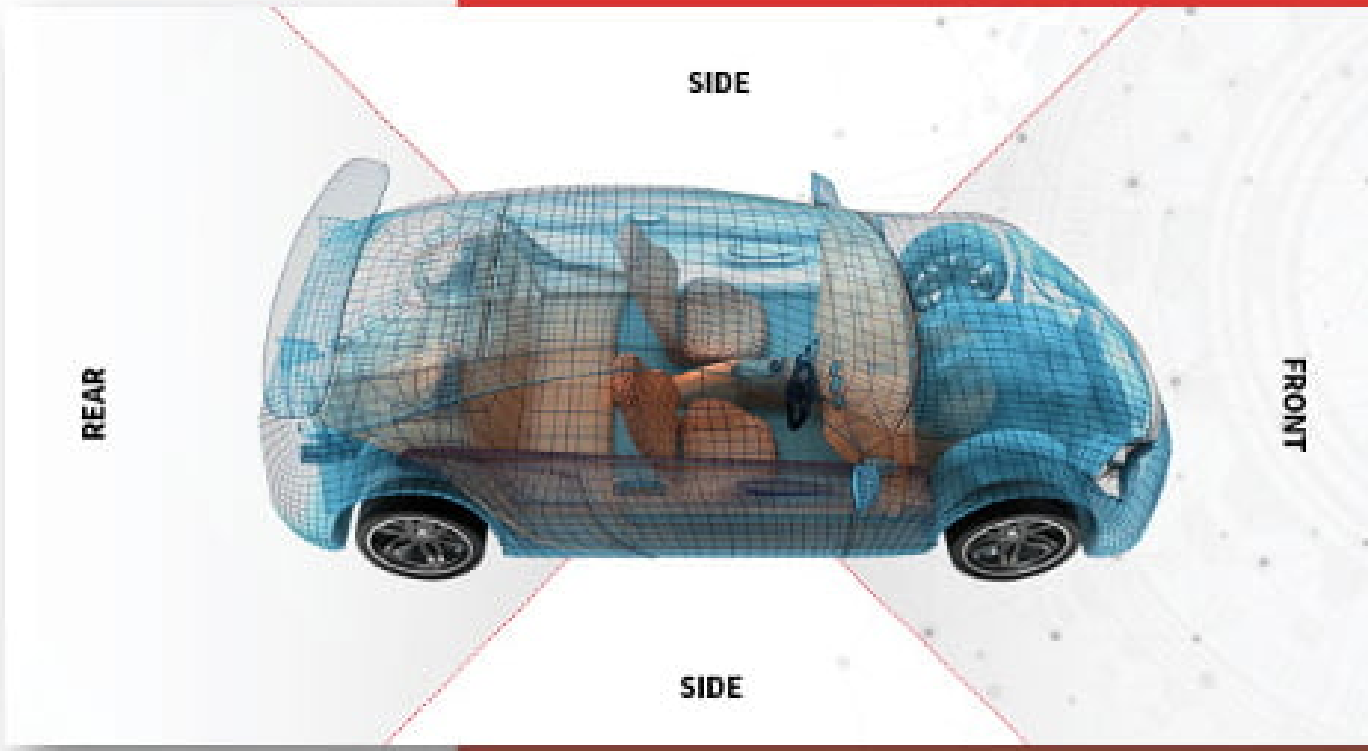


ADAS Feature Area of Influence

ADAS FEATURE AREA OF INFLUENCE

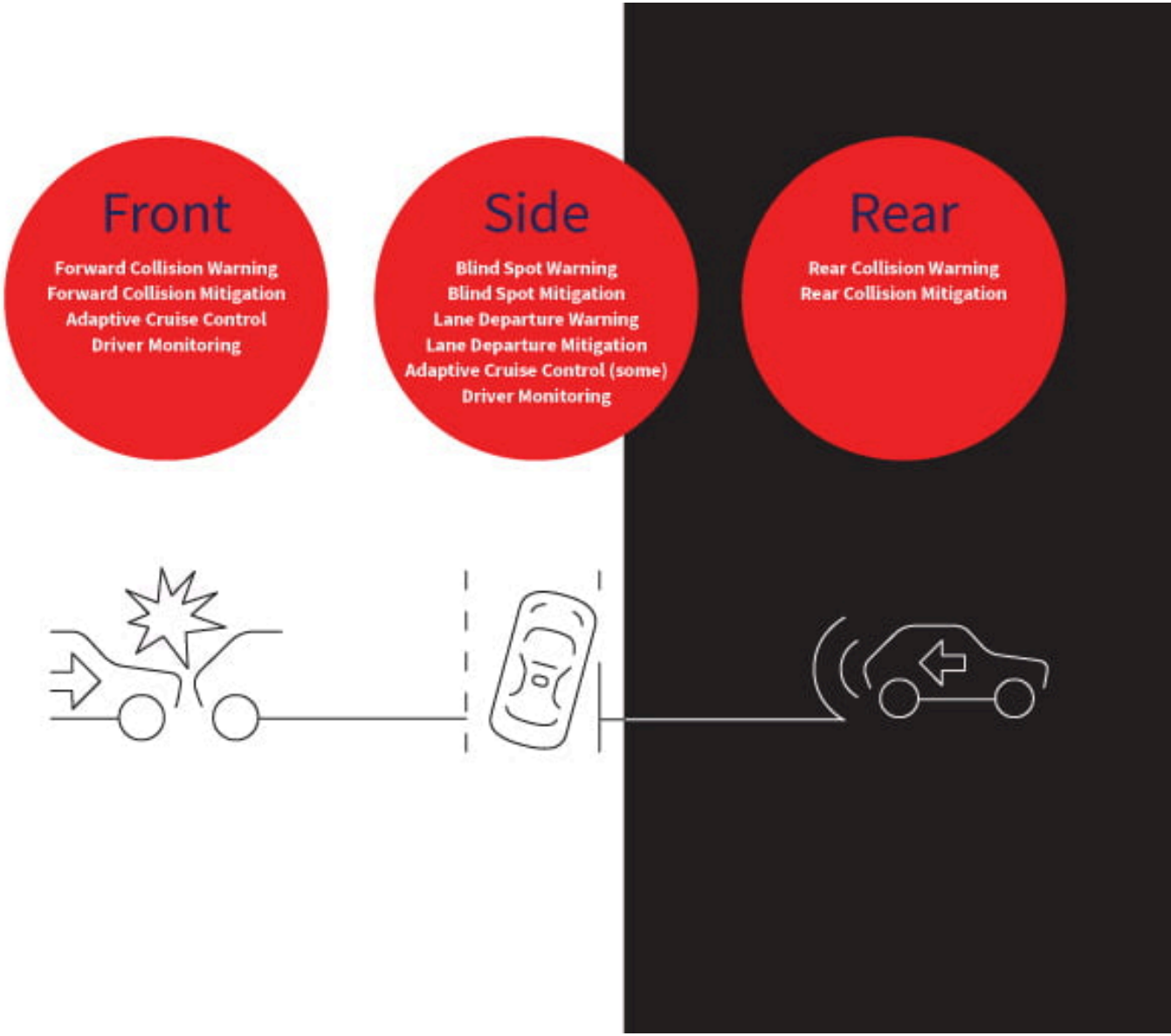
A univariate analysis is a reasonable indicator of the impact core ADAS features have on overall loss cost. However, it does not capture the interaction between different ADAS features. More often than not, a vehicle is equipped with multiple core ADAS features. In fact, 92% of the vehicles with a core ADAS feature from our industry sample have multiple core ADAS features. Therefore, additional factors need to be considered. For this, we conducted a more thorough multivariate analysis focused on frequency.

Among those additional factors is the area of influence an ADAS feature has over a vehicle to protect it against different types of collisions. We defined three areas of influence for a vehicle: front, side and rear. ADAS features with front influence protect the vehicle from hitting something in front of the vehicle and avoiding front-to-rear collisions. Side influence monitors road markings, lane markings, and vehicles in the adjacent lane to prevent running off the road or side swiping other vehicles.



Rear influence attempts to prevent the vehicle from backing into something or to mitigate the impact of being hit from behind. Each of the core ADAS features has some form of area of influence over a vehicle as can be seen in the adjacent graphic. Driver monitoring and some forms of adaptive cruise control are examples of features that have influence over the front and side of the vehicle.

The level of protection that is provided to each vehicle's area of influence may be magnified depending on the level of technology that exists on a given vehicle. For example, forward collision warning provides the basic level of protection to the front by providing an alert when approaching an object in front of the vehicle too quickly. In vehicles that have the more advanced forward collision mitigation feature (aka automatic emergency braking), greater protection is provided to the front because the vehicle applies the brakes automatically if the driver does not respond quickly enough. More advanced vehicles may also have adaptive cruise control and/or driver monitoring to provide even greater protection to the front.

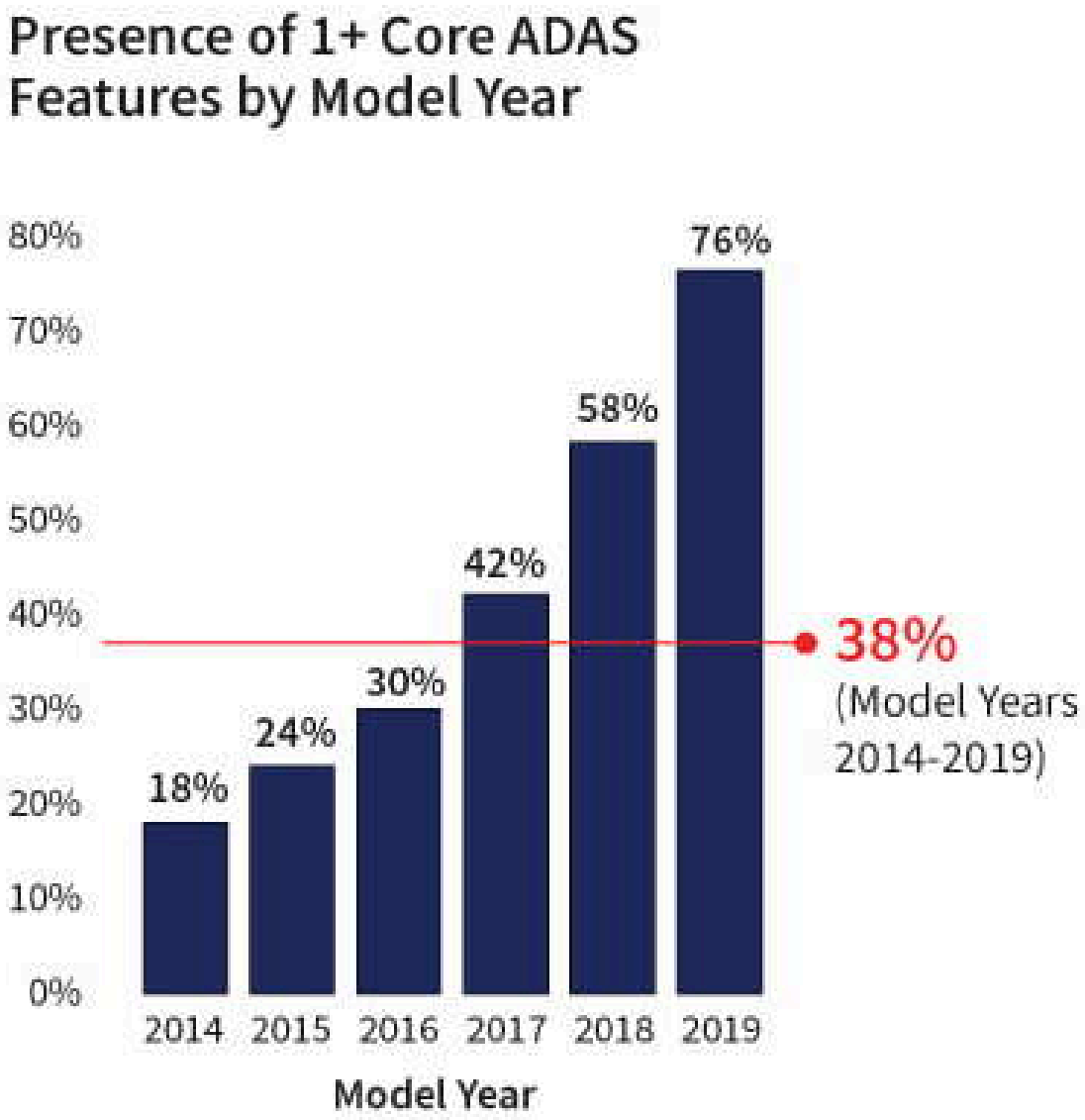


Statistical Methodology

Vehicles tend to have multiple core ADAS features installed. Many automobile manufacturers offer ADAS features as part of a package. Often times this is based on the complementary technology. It can be cost effective to combine and deploy separate features such as adaptive cruise control and forward collision that rely on similar sensors. It can also be a marketing policy to offer a more comprehensive set of safety features to appeal to the consumer.

By using a tree-based algorithm, our team was able to capture the interactions between core ADAS features and quantify the claim frequency differential across various combinations of those features.

Our research has shown a consistent increase in the presence of one or more core ADAS features over time, and we expect this industry trend to continue for future model years.



We grouped the “equipped status” of each core ADAS feature into three distinct levels: Yes (equipped), No (not equipped), and Unknown. Due to the underlying differences in how ADAS technology affects the claim outcome for a given coverage, we built separate models for bodily injury, property damage, and collision coverage.

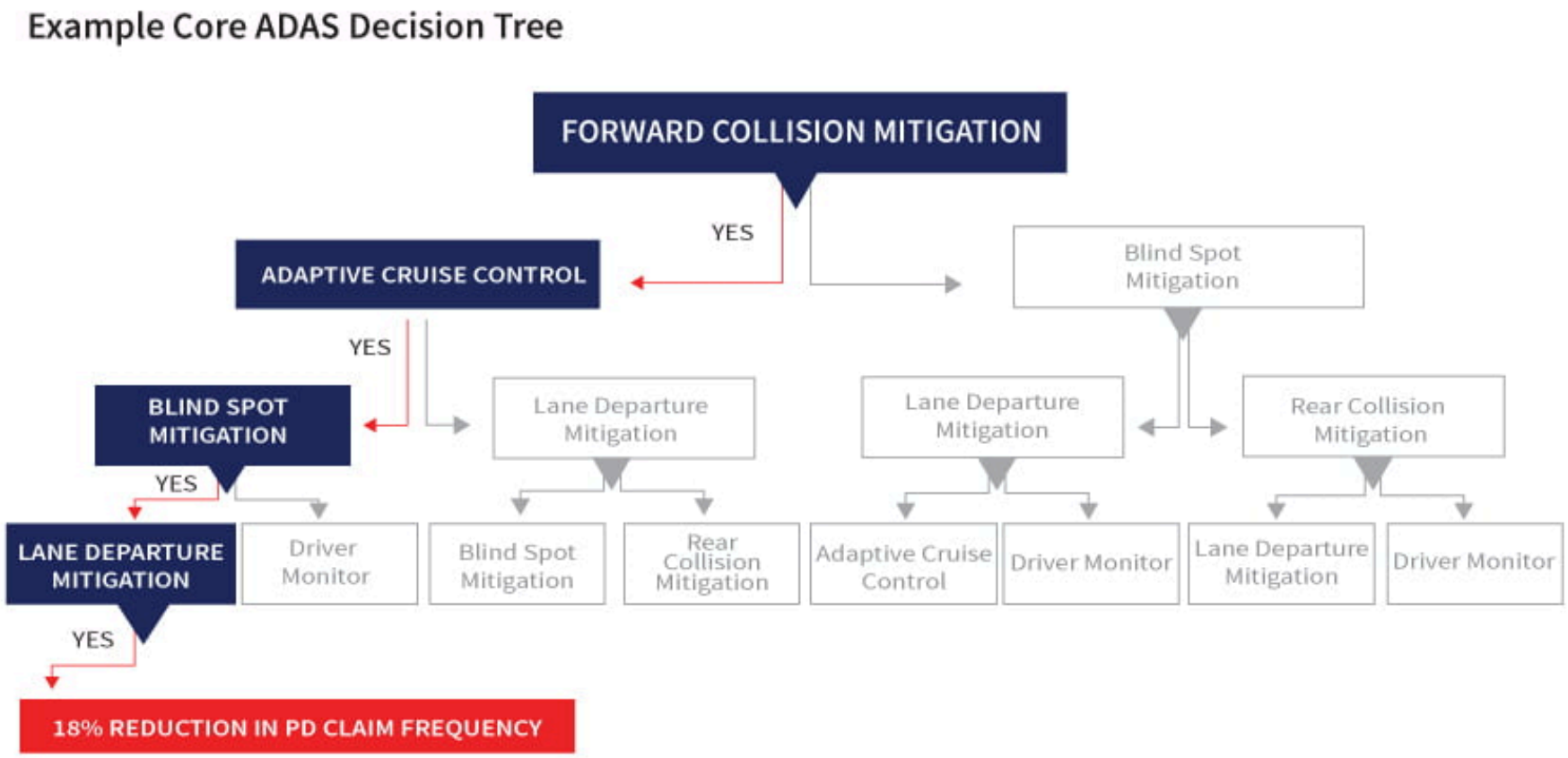
We then adjusted the underlying claim frequency to account for covariates such as policy year written, liability limit, vehicle symbol, vehicle age, and past claims. In addition, we used a proxy score to control for the main effect of credit history. Only vehicles where the equipped information was definitive (no Unknowns) were included in the final model. This adjustment allowed us to compare the true effect of core ADAS features on claim frequency and reduce “noise” in the modeled predictions.

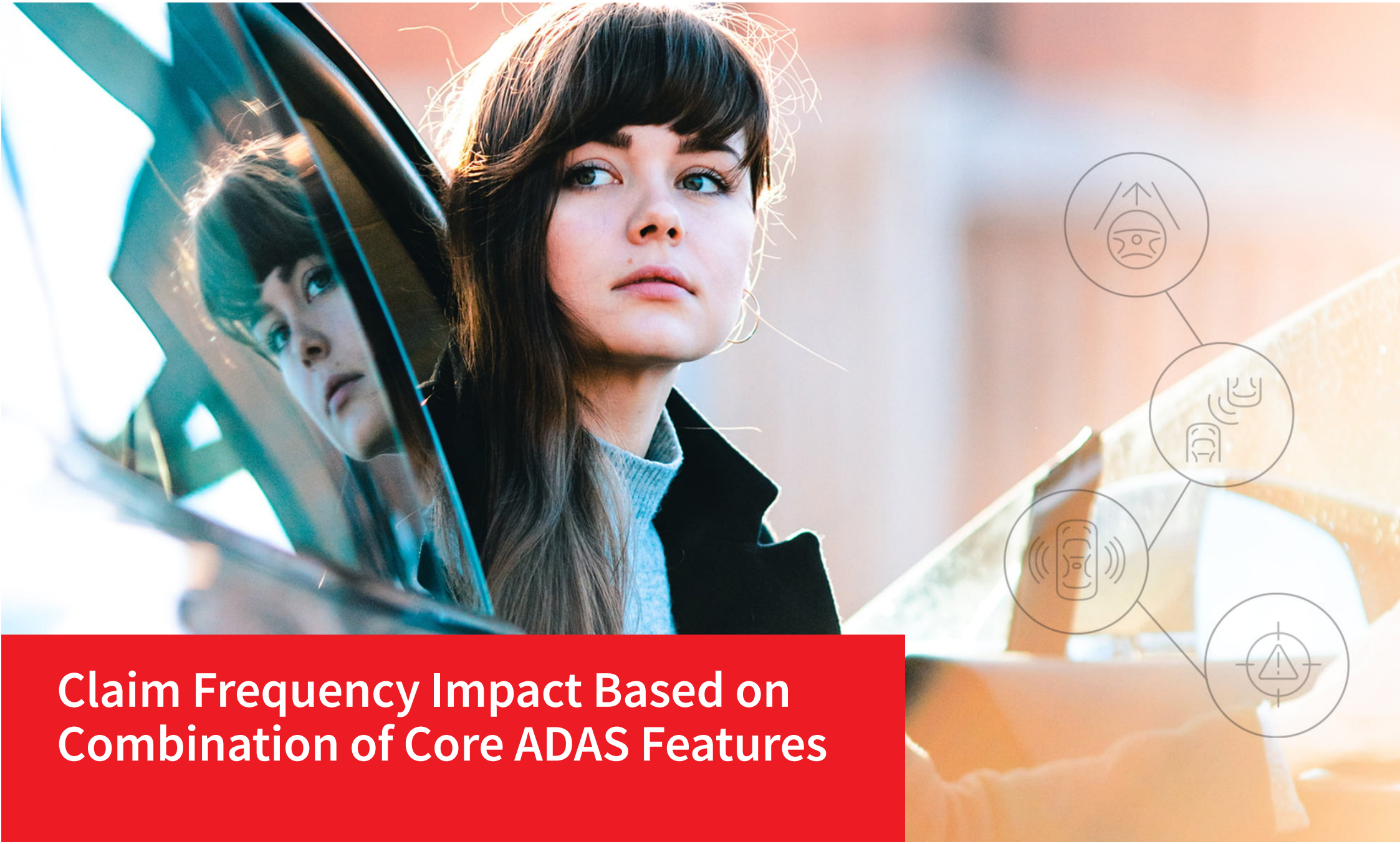
Certain business consideration constraints were applied to improve the predictive performance of the model. Core features with both a warning only and mitigation version (eg. forward collision) are a great example. Holding all other factors constant, the raw predictions were smoothed to ensure that mitigation class was no worse than the warning only class. Our team adjusted the model predictions by using an iterative smoothing approach to account for such considerations.

In a decision tree, the estimated effect of a combination of core ADAS features on underlying claim frequency can be quantified by following a decision path. We can track the relative frequency difference at each decision node based on the core ADAS features that are equipped on a vehicle.

For example, if a vehicle has forward collision mitigation, adaptive cruise control, lane departure mitigation and blind spot mitigation, the estimated reduction in property damage claim frequency is 18% as compared to the base class. Upon request*, LexisNexis Risk Solutions can provide a table showing the bodily injury, property damage, and collision claim frequency reduction for each possible combinations of core ADAS features.

*Conditions apply.

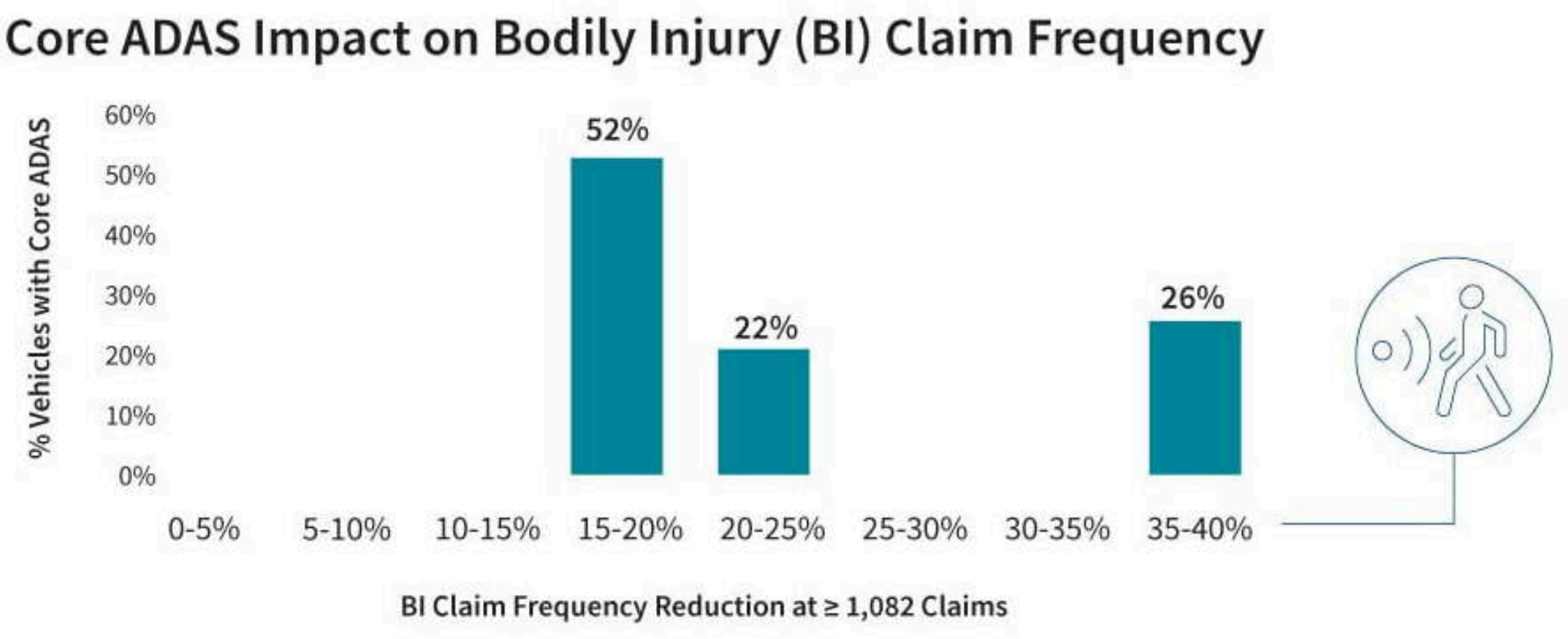




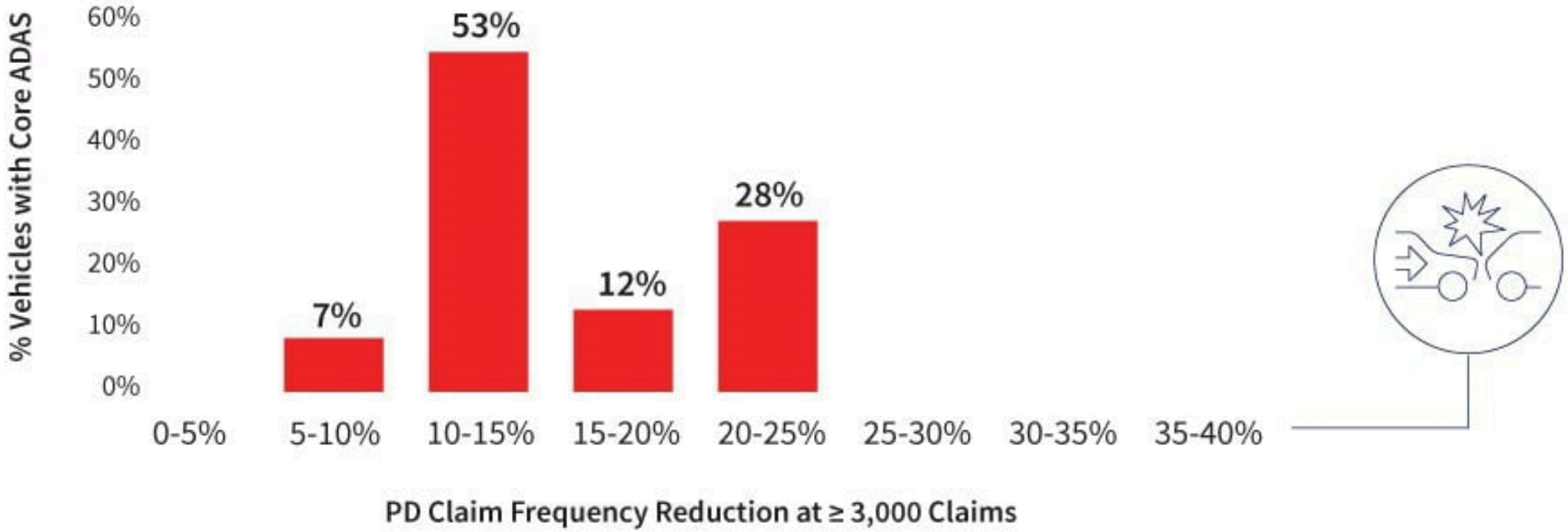
Claim Frequency Impact Based on Combination of Core ADAS Features

CLAIM FREQUENCY IMPACT BASED ON COMBINATION OF CORE ADAS FEATURES

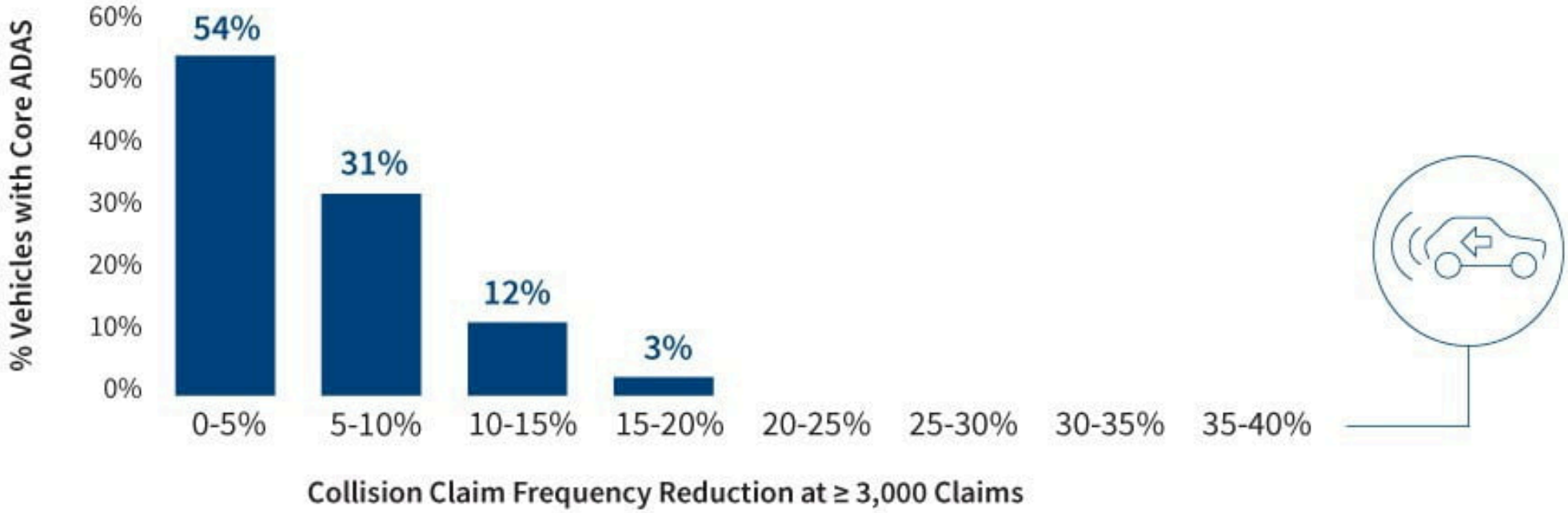
When comparing the percentage of vehicles with core ADAS features against claim frequency reduction, it is clear from the following graphs that there is an opportunity for further segmentation – particularly for liability coverages.



Core ADAS Impact on Property Damage (PD) Claim Frequency



Core ADAS Impact on Collision Claim Frequency



Conclusion

CONCLUSION

The results of this research show a clear opportunity to create significant pricing segmentation for vehicles equipped with core ADAS features. It is important to understand not only when certain core ADAS features are equipped on a vehicle, but also their combination with other core ADAS features. The combination of features collectively forms a safety zone around the vehicle based on areas of influence, level of technology and type of coverage considered. Insurance carriers have the necessary tools to create an ADAS rating plan by leveraging Vehicle Build information along with the claim frequency reduction data details available through LexisNexis® Risk Solutions.

Although the findings of this research are enough to warrant a rate discount program for core ADAS equipped vehicles, our team at LexisNexis Risk Solutions is continually looking at opportunities to enhance its findings. At the time of this research, Vehicle Build data is able to provide definitive equipment information (no Unknowns) across all core ADAS features for 73% of vehicles in the ADAS Era.

As market coverage for Vehicle Build continues to expand and as we include newer model years such as 2020 and newer, LexisNexis Risk Solutions will continue to look for opportunities to supplement these findings.

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LexisNexis Risk Solutions

John Kanet has been with LexisNexis Risk Solutions since 2014. John is responsible for analyzing advanced vehicle technologies and identifying opportunities to acquire and add value to data for auto insurers, as well as ensuring organizational alignment around new initiatives. Prior to joining LexisNexis Risk Solutions, John spent six years in sales and product roles at Trimble Navigation working with heavy machine automation, telematics, and data management solutions. John earned a bachelor's degree in civil engineering and a master's in business administration from Clemson University. He also holds a Professional Engineer certification from the Texas Board of Professional Engineers.

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Prince leads a team of industry experts to develop Big Data analytics and modeling solutions for auto, homeowners and commercial insurance lines. Prince has more than 10 years of experience in insurance pricing, underwriting, and reserving. Prior to joining LexisNexis Risk Solutions, he held actuarial positions at GEICO, Towers Watson, and AIG. He is an Associate of the Casualty Actuarial Society and holds an M.S. in statistics from University of Akron.

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Thank you for reading

Detailed Data Tables Available on Request*

* Conditions apply. Contact your account manager for more info.