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SCOR Review on LexisNexis Risk Classifier

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Executive Summary

SCOR recently conducted a mortality analysis using LexisNexis® Risk Solutions data to assess the effectiveness of the LexisNexis® Risk Classifier with Medical Data scores in stratifying mortality risk when compared to the LexisNexis® Risk Classifier scores and ExamOne HealthPiQture scores separately. The LexisNexis® Risk Classifier is a relative mortality score offered by Lexis Nexis Risk Solutions based on behavioral and financial features without any input regarding personal medical history or tobacco status. The ExamOne HealthPiQture score consists of a proprietary score based on labs, diagnosis code, and pharmacy data. The Risk Classifier with Medical Data score is a variation of the risk classifier score that has been enriched with the medical data obtained from ExamOne HealthPiQture and then recalibrated with this new information. Data used in the study included a combination of general applicants from the U.S (applicants with general multi-line insurance) and U.S. life insurance applicants.

Based on the dataset provided, the Risk Classifier with Medical Data score is most effective in stratifying mortality risk across population type, duration, and most combinations of gender and entry age groups. However, the Risk Classifier scores perform better than the Risk Classifier with Medical Data for males aged 18-29 where medical data have less of an impact on risk stratification. This aligned with general observed experience where males have a higher mortality in this age group due to accidental deaths, which is sometimes known as the "accident hump."

Data

LexisNexis Risk Solutions provided SCOR with a dataset comprised of 6,412,841 depersonalized lives with 96,476 deaths. This data included a combination of general applicants and life insurance applicants, all from the U.S. The data included three different risk classifiers: the LexisNexis® Risk Classifier, LexisNexis® Risk Classifier with Medical Data, and the ExamOne HealthPiQture Score (E1). Both Risk Classifier and Risk Classifier with Medical Data range from 1 (unfavorable) to 997 (favorable), and the ExamOne HealthPiQture Score (E1) ranges from -80 (favorable) to 4900 (unfavorable).

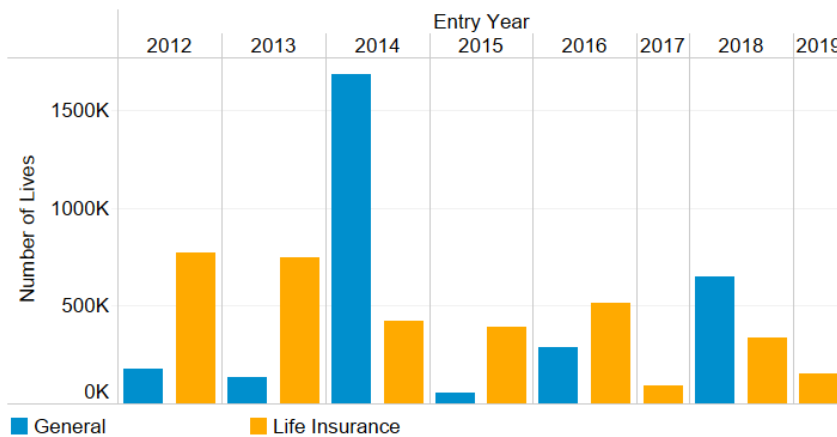**Figure 1: Number of Lives by Entry Year for Each Population Type**

Figure 1 displays the number of distinct lives in the dataset across entry year. These years ranged from 2012 to 2019, with a significant proportion of the general applicant population appearing in 2014. The number of lives from life insurance applicants was more consistent across entry year.

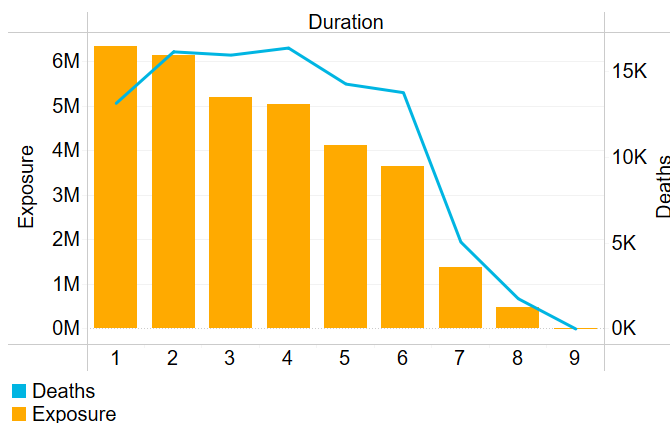**Figure 2: Number of Exposures and Deaths by Duration**

Figure 2 displays the number of exposures and deaths by duration. The majority of exposures and deaths falls within the first six durations with a significant drop for durations 7+.

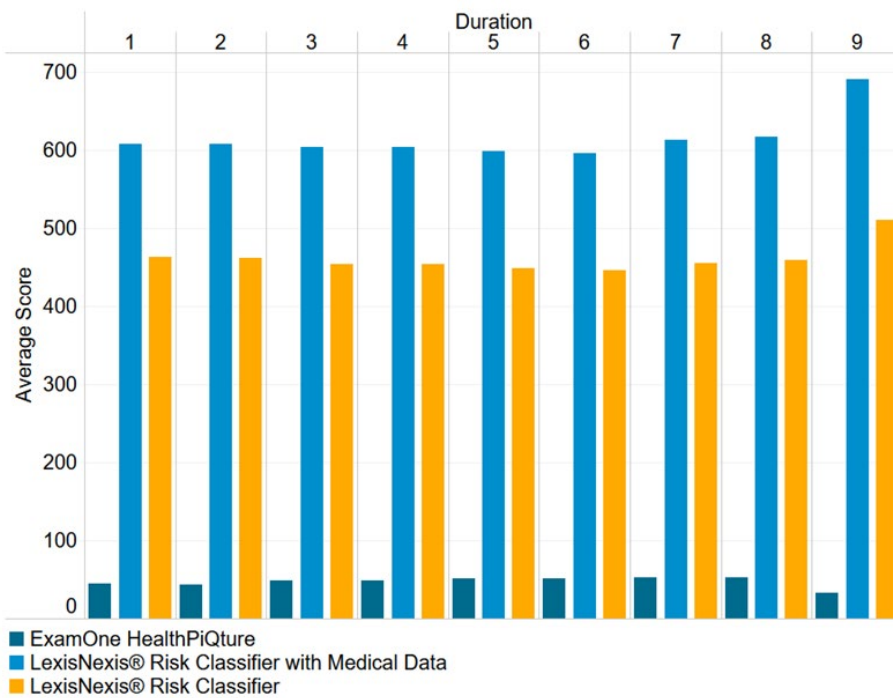**Figure 3: Average Risk Score by Duration**

Figure 3 displays the average of each risk score by duration. Each of the three scores is fairly consistent across durations. Note that LexisNexis® Risk Classifier and LexisNexis® Risk Classifier with Medical Data are directly proportional to the scores whereas ExamOne HealthPiQture score is inversely proportional to the scores.

Analysis

SCOR performed an actual-to-expected (A/E) mortality analysis for all three scores. The expected mortality was based on the 2015 Valuation Basic RR100 Table (15VBT) Smoker-Distinct Select, Ultimate, and Unismoke Age Last Birthday (ALB) tables and the Social Security Period Life Table.

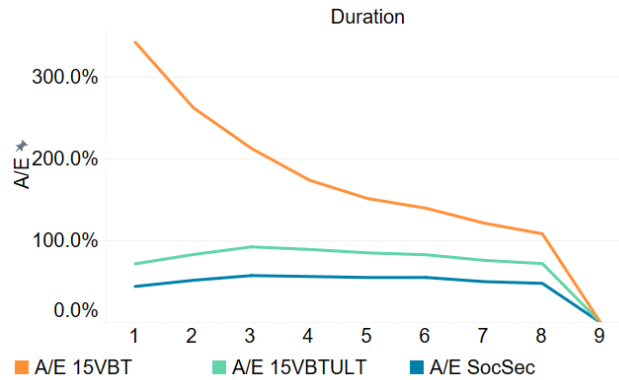**Figure 4: A/E Comparison of Bases by Duration**

Figure 4 displays the three A/Es for each duration. The 15VBT mortality table was originally developed for the insured population and thus has a select and ultimate period, whereas both the 15VBT Ultimate table and the Social Security Period Life table do not. The higher 15VBT A/Es in the early durations are caused by the inclusion of the general population applicants who would not have characteristics of this select mortality. Similarly, the lower A/Es in the early durations for the other two bases are due to the lives who are seeking life insurance and have some characteristics of select mortality. Therefore, table selection when viewing A/Es by duration needs to be considered when analyzing the impact of these scores.

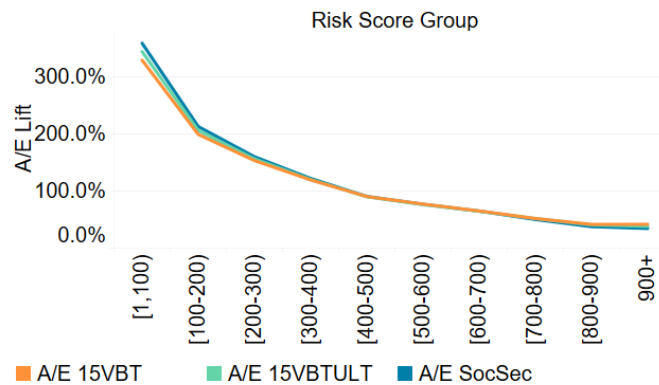**Figure 5: A/E Lift Comparison of Bases by Risk Score**

Figure 5 shows a consistent trend across mortality bases when looking at the percentage of the total A/E in each risk score group. This enables SCOR to choose any of the three mortality bases to measure the effectiveness of risk classification. The remaining views will be presented using 15VBT lift as this mortality basis is more widely used in the life insurance industry.

Lift charts were used throughout the analysis to measure the effectiveness of each risk classifier at segmenting mortality risk. The lift is calculated by setting the mortality A/E of an

overall cohort to 1 (100%) and then expressing each illustrated sub cohort in relation to that baseline. A higher lift and a steeper slope indicate better performance at segmenting risks. The lift is calculated using the formula as follows:

$$\text{Lift}(x\%) = \frac{(\text{A/E ratio for the lowest scores of the population})}{(\text{Overall A/E ratio of the dataset})}$$

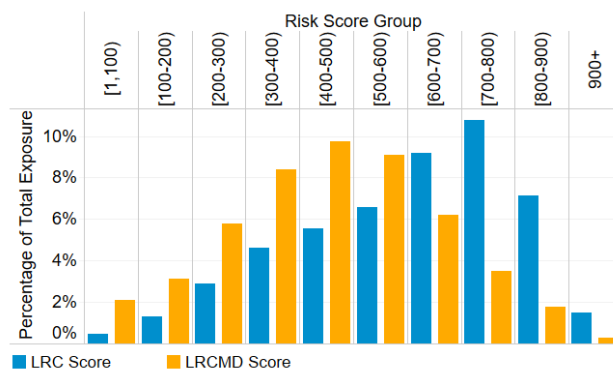**Figure 6: Exposure Distribution Comparison of LexisNexis Risk Classifiers by Score**

Figure 6 displays the exposure distribution across risk score band for the two risk classifier scores. The LexisNexis® Risk Classifier distribution was skewed toward the higher scores compared to LexisNexis® Risk Classifier with Medical Data scores. Incorporating the ExamOne HealthPiQture scores into the Risk Classifier with Medical Data scores caused a distinct shift of the distribution towards the center.

Figure 7: A/E Lift Comparison of LexisNexis Risk Classifiers by Score
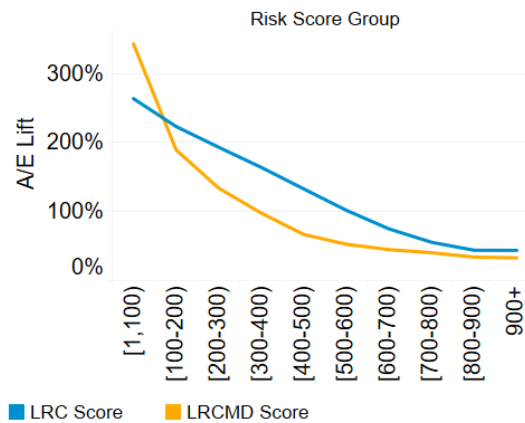

Figure 7 displays the A/E lift across the two scores band. Both Risk Classifier scores show a *negative* correlation between risk score and mortality risk, with a lower score indicating high risk and higher score indicating lower risk. The Risk Classifier with Medical Data score has a steeper slope compared to the Risk Classifier score, indicating better risk classification.

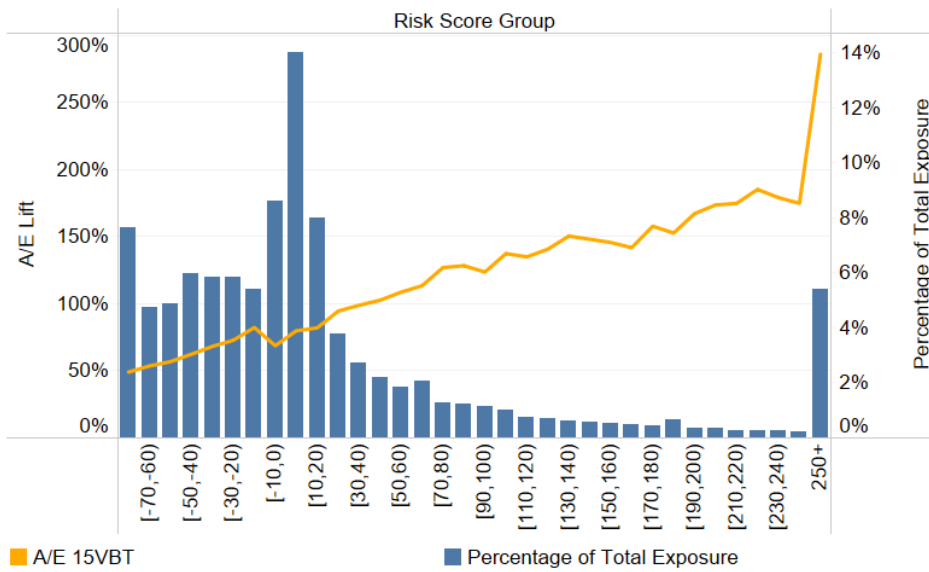**Figure 8: A/E Lift and Exposure Distribution for the ExamOne HealthPiQture Score**

Figure 8 displays the A/E lift for the ExamOne HealthPiQture scores along with the exposure distribution. There is a positive correlation between ExamOne HealthPiQture scores and mortality risk with a higher score indicating higher mortality risk and lower score indicating lower mortality risk.

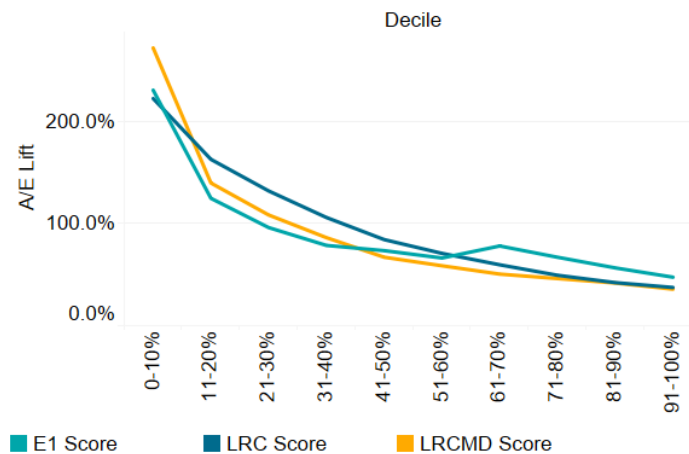**Figure 9: A/E Lift Comparison of Risk Classifiers by Decile**

Figure 9 displays the A/E lift by decile across risk classifier. The deciles were created by splitting each risk score into ten equal groups based on the number of lives. This allows us to compare all three scores on a common basis.

While the LexisNexis® Risk Classifier score and the ExamOne HealthPiQture score are both stratifying risks, the LexisNexis® Risk Classifier with Medical Data scores accomplish this more effectively than either of the other two scores separately. This is evident from the steeper slope observed for Risk Classifier with Medical Data scores compared to the standalone ExamOne HealthPiQture and Risk Classifier scores.

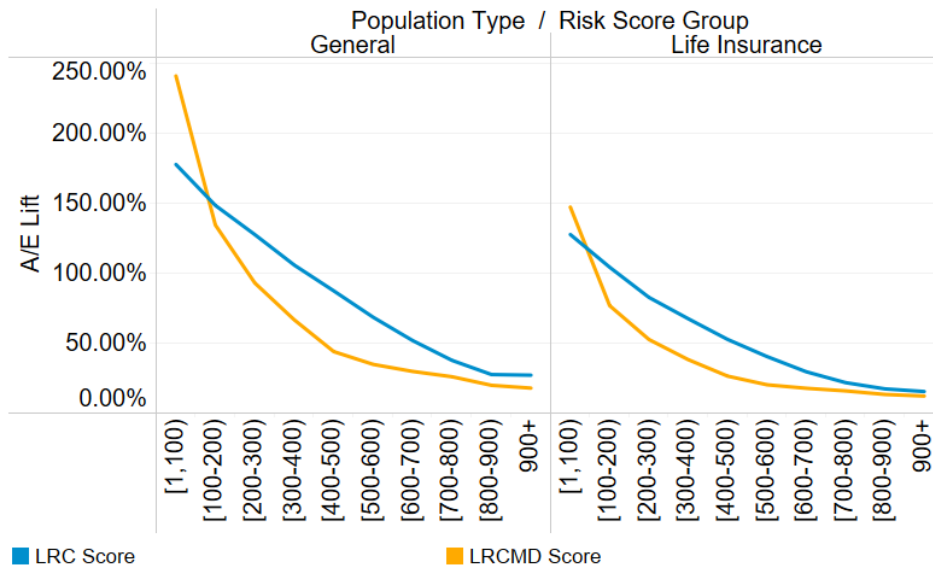**Figure 10: A/E Lift by Population Type across Risk Scores**

Figure 10 displays the A/E lift by population type. The lift for general applicants is higher than that of life insurance applicants. However, LexisNexis® Risk Classifier with Medical Data scores remain more effective at stratifying mortality risks regardless of population type.

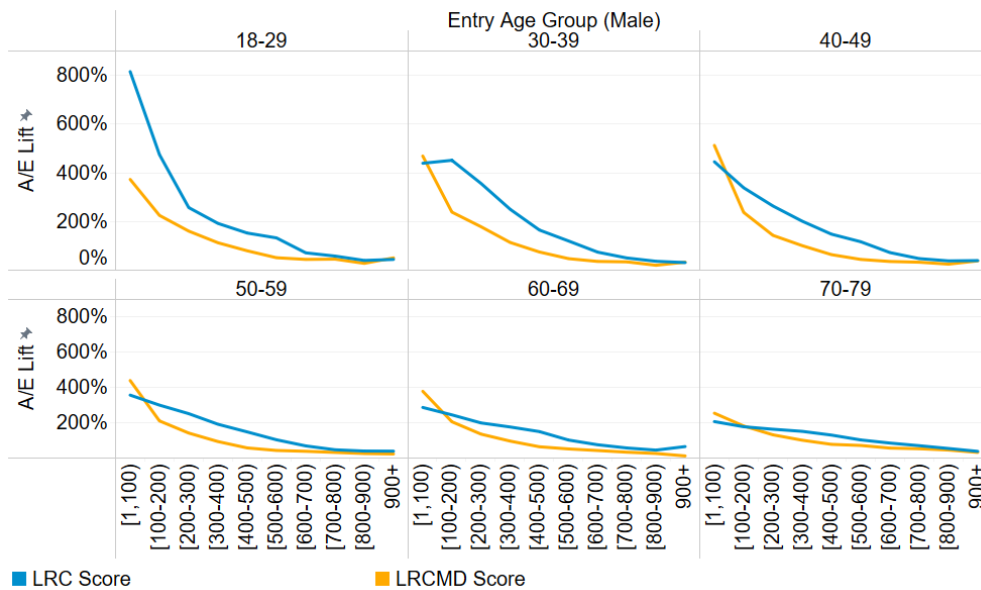**Figure 11: A/E Lift by Gender and Entry Age Groups across Risk Scores**
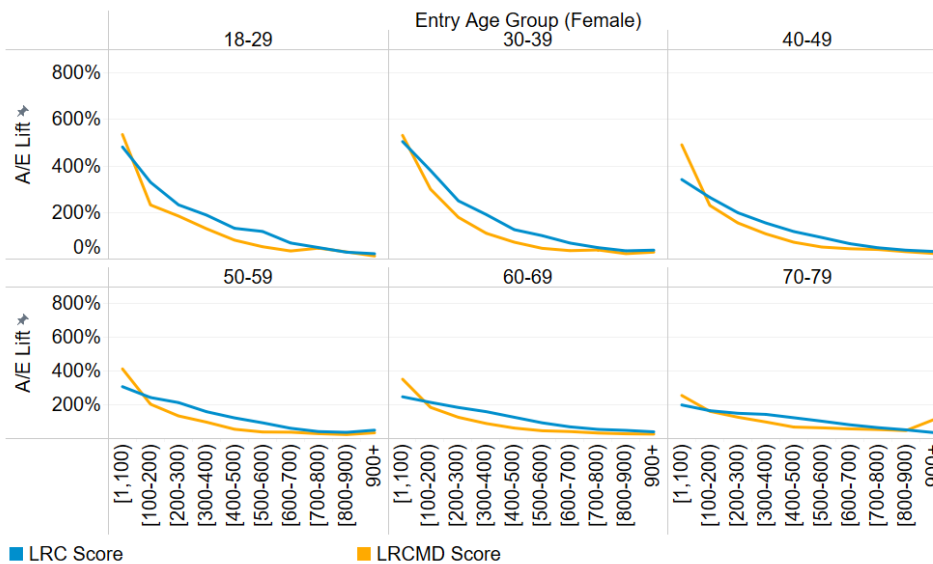
Figure 11 displays the A/E lift by gender and entry age group. A/E lift seems consistent across gender with LexisNexis® Risk Classifier with Medical Data continuing to be the better risk classifier. The lift for both risk scores decreases with increasing entry age group. The Risk Classifier with Medical Data score remains the better risk classifier for the majority of the entry age groups. However, the Risk Classifier scores seems to be more efficient for males 18-29 where a steeper slope was observed. This indicates that medical data is less available and has less of an impact to mortality risk than the credit and behavioral data alone for males in this youngest entry age group. This observation supports the idea that males are usually more risky in this age group when it comes to their financial and behavioral decisions.

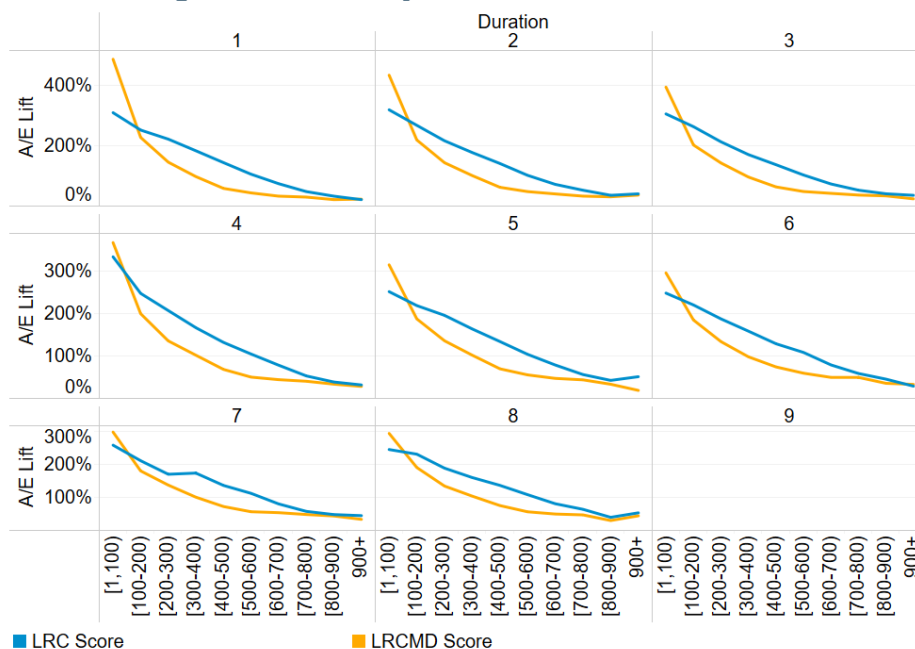**Figure 12: A/E Lift by Duration across Risk Scores**

Figure 12 displays the A/E lift by duration. The magnitude of the lift for LexisNexis® Risk Classifier with Medical Data decreases with increasing duration while it stays constant for LexisNexis® Risk Classifier. The Risk Classifier with Medical Data remains a better risk classifier at all durations as evidenced by the steeper slope.

Limitations

The provided dataset was only a representative sample of the data and not the full dataset. Results would vary slightly if a different sample of the data were provided. The dataset currently only includes entry years from 2012 to 2019 with maximum policy duration of nine years.

All provided applicants had a LexisNexis® Risk Classifier, LexisNexis® Risk Classifier with Medical Data, and ExamOne HealthPiQture score. Some applicants also had ExamOne HealthPiQture subscores for pharmacy, lab, and diagnosis code. In production, LexisNexis Risk Classifier with Medical will return a combined score if at least one of the subscores is present in the ExamOne data. Approximately 98% of the distinct applicants with an ExamOne HealthPiQture score have at least one missing subscore (44% with one missing score; 54% with two missing scores). The ExamOne HealthPiQture score included in the study is calculated as long as there is at least one subscore.

In the dataset provided, the ExamOne HealthPiQture score, and available medical subscores are combined with the LRC 2.0 behavioral attributes to arrive at the final combined score (LexisNexis® Risk Classifier with Medical Data).

Unknown smoker status was included and defaulted to unismoke when calculating mortality expected for smoker distinct mortality bases.

Conclusion

The LexisNexis® Risk Classifier with Medical Data scores are a more effective risk classifier for mortality risk than the standalone LexisNexis Risk Classifier scores. The LexisNexis® Risk Classifier with Medical Data score appears to have a steeper slope on most of the lift charts compared to the LRC score. This is observed across gender, entry age group, and duration.

As you consider new underwriting evidence such as LexisNexis® Risk Classifier or LexisNexis® Risk Classifier with Medical Data, please consider using SCOR as a resource. If you have any questions, please contact either Jean-Francois Langlois (jlanglois@scor.com) or Michelle Lerch (mlerch@scor.com).
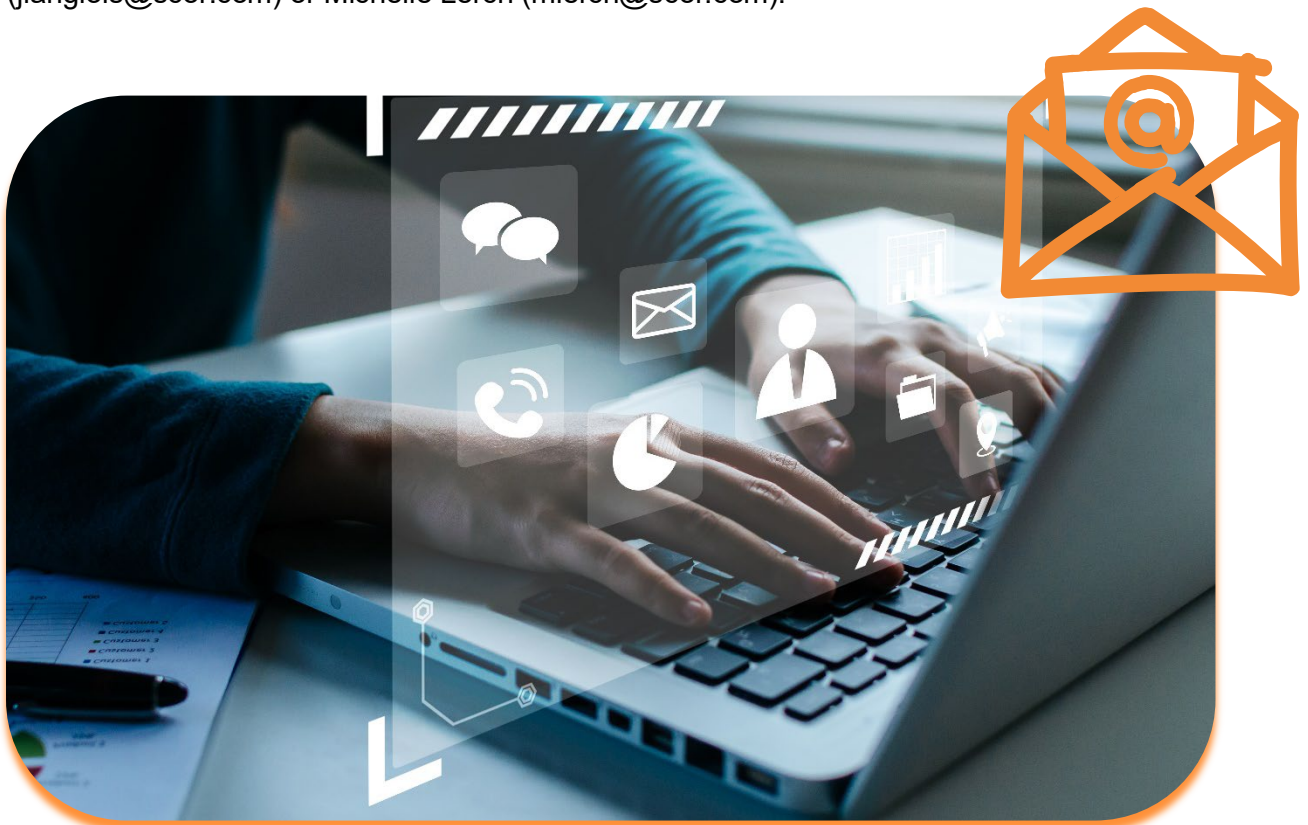
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