Gen Re®

Gen Re's Review of a New Mortality Score from LexisNexis® Risk Solutions

FOR LIFE UNDERWRITING

Gen Re can help our clients analyze the new mortality score from LexisNexis® Risk Solutions – and how best to incorporate it into insurers' underwriting workflow to improve their business results.

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CONTENTS

Evaluating LexisNexis® Risk Classifier With Medical Data – And How We Think It Could Help

LexisNexis® Risk Solutions has created a mortality model for use in the underwriting of individual life insurance. This model combines data inputs from the current **LexisNexis® Risk Classifier** model (public records, credit attributes and driving behavior data) with **ExamOne**'s historical clinical laboratory testing, prescription information and medical diagnosis codes to create an integrated predictive mortality score: **LexisNexis® Risk Classifier with Medical Data**.

Gen Re's study evaluates and compares the relative effectiveness of the LexisNexis Risk Classifier and LexisNexis Risk Classifier with Medical Data scores in stratifying the mortality risk of a U.S. population dataset provided by LexisNexis Risk Solutions.

DATA

LexisNexis Risk Solutions created a deidentified dataset of applicants for Auto, Homeowners or Life insurance on whom medical scoring data exist. Applicants without sufficient ExamOne medical data are excluded from the sample. The dataset contains 2,174,301 lives and 48,994 deaths. It is important to note that this study is not an independent validation because the dataset was provided by LexisNexis and is a sample from the data used to build the LexisNexis Risk Classifier with Medical Data scoring model. The sample Gen Re obtained is a 50% random sample and is representative of that data.

Summary Statistics

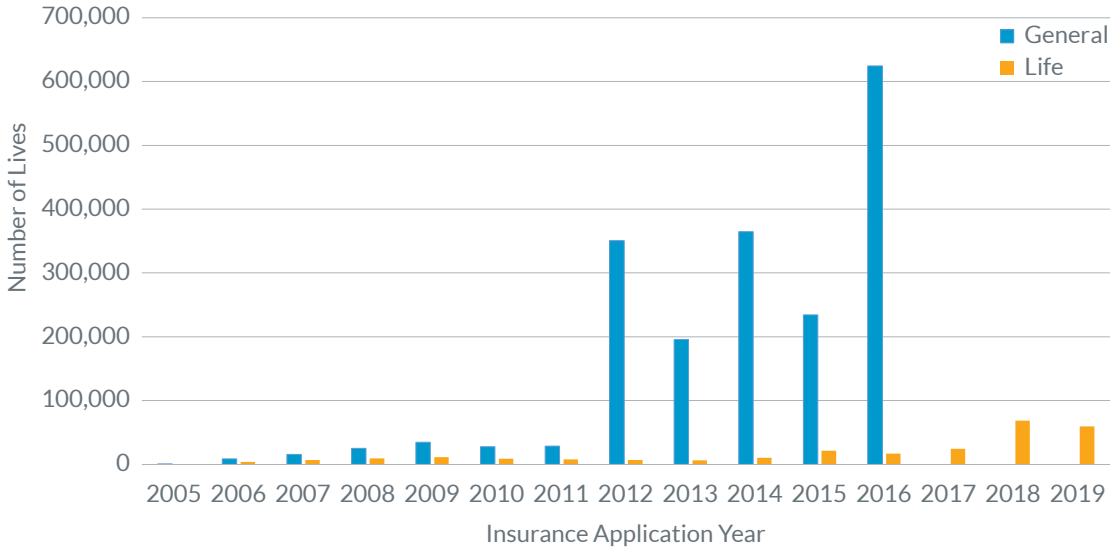
Table 1 – Study Population

	Female	Male
Number of Lives[1]	1,115,858	1,058,418
Population Type, N (%)		
General Insurance Applicants	985,765 (88)	925,276 (87)
Life Insurance Applicants	130,093 (12)	133,142 (13)
Entry Age Group, N (%)		
18-39	459,678 (41)	327,036 (31)
40-59	436,296 (39)	493,840 (47)
60-79	219,884 (20)	237,542 (22)

[1] *25 lives with zero person-years of exposure were excluded from this study population.*

The insurance application date marks the start of the observation and ranges from 2005 to 2019, with a substantial proportion between 2012 to 2016.

Figure 1 – Number of Lives by Insurance Application Year for Each Population Type



The end of observation is either the date of death or the study end date, whichever comes first. Vital status query marked the study end date and varied by data source. The average observation period is 4.8 years.

Figure 2 – Proportion of Lives by Study End Date

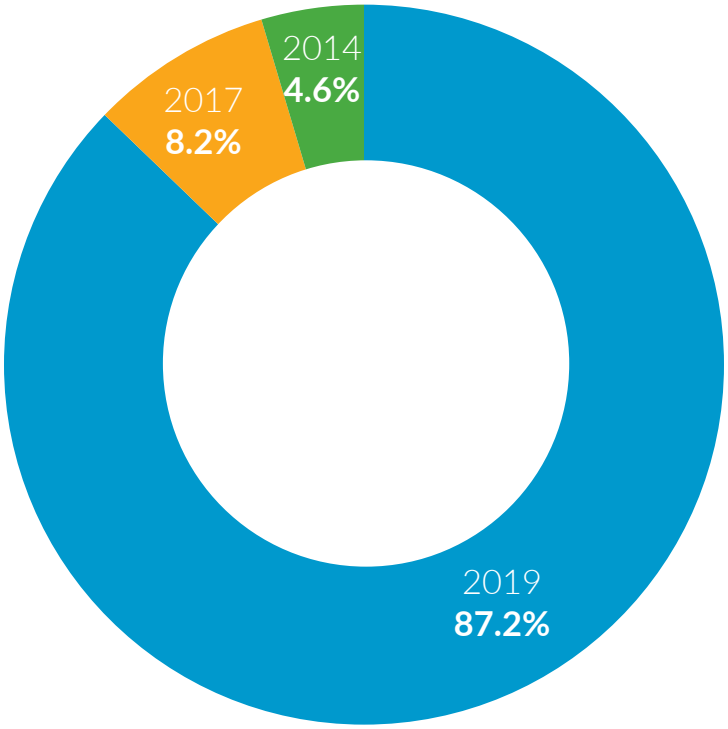
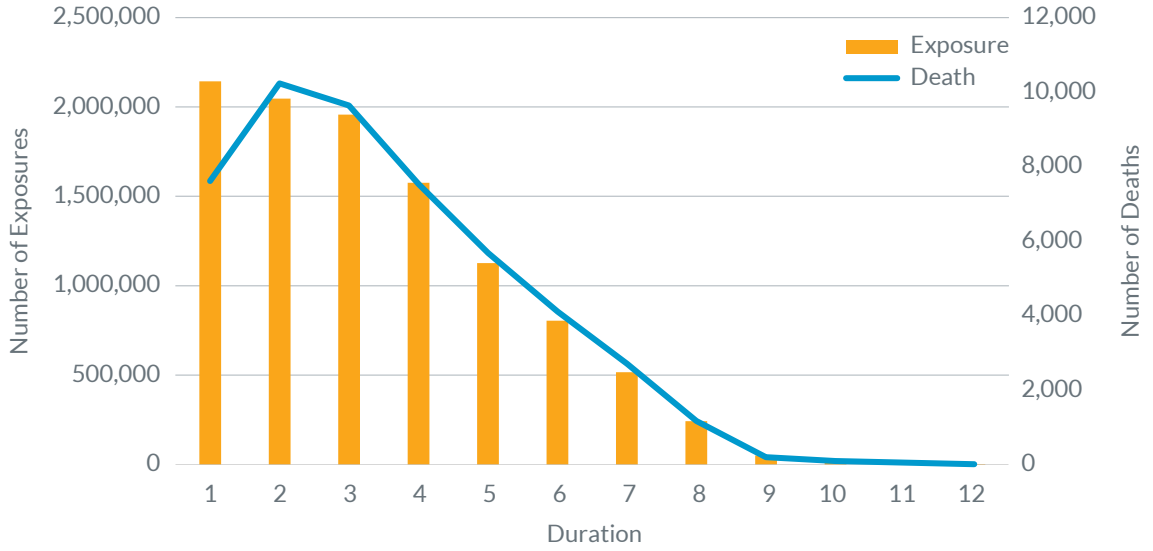


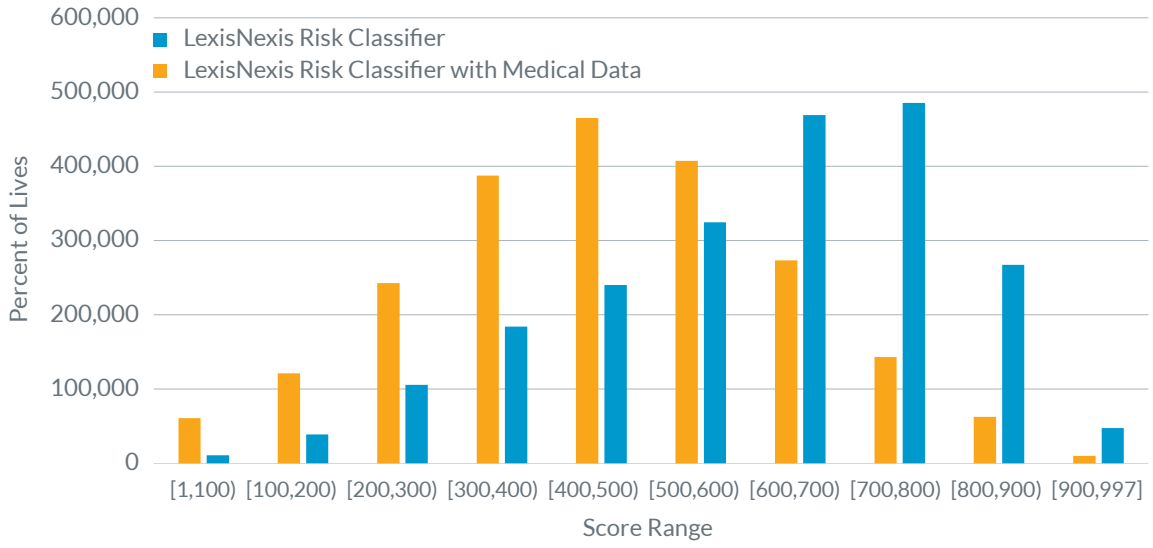
Figure 3 shows the distribution of exposures and deaths. The first 5 durations represent more than 80% of the total exposure and deaths.

Figure 3 – Distribution of Exposures and Death by Duration



Both LexisNexis Risk Classifier and LexisNexis Risk Classifier with Medical Data scores range from 1 to 997. The higher the score, the lower the mortality risk is. Figure 4 shows the distribution of lives by the two scores. The peak shifted to the left when comparing the distributions of LexisNexis Risk Classifier with Medical Data to LexisNexis Risk Classifier. The median scores were 459 and 641 for LexisNexis Risk Classifier with Medical Data and LexisNexis Risk Classifier respectively.

Figure 4 – Distribution of Lives by LexisNexis Risk Classifiers



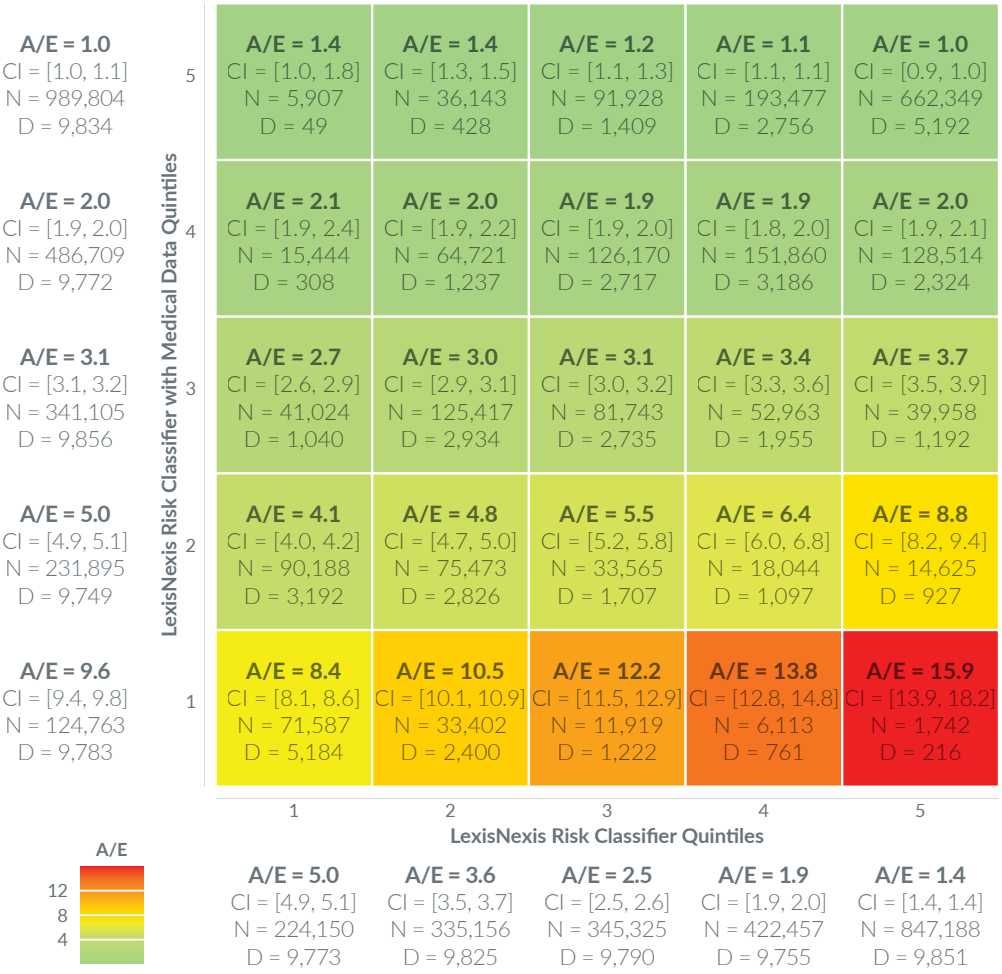
ANALYSIS

Gen Re performed an actual-to-expected (A/E) mortality analysis for both the LexisNexis Risk Classifier score and the LexisNexis Risk Classifier with Medical Data score. The expected mortality was based on the 2015 Valuation Basic Table (VBT) Smoker-Distinct Select & Ultimate ALB Tables, if the smoking status was available, or Unismoker if it was not. We included a 95% confidence interval based on the Poisson distribution as a benchmark for statistical significance.

Comparing the LexisNexis Risk Classifier Score to the LexisNexis Risk Classifier with Medical Data Score

We divided the sample population into five quintiles containing around 10,000 deaths each by both LexisNexis Risk Classifier and LexisNexis Risk Classifier with Medical Data scores. Figure 5 shows A/E of each pair of scores.

Figure 5 – Heatmap Comparing LexisNexis Risk Classifier with Medical Data Quintiles to LexisNexis Risk Classifier Quintiles



Note: CI is confidence interval. N is number of lives. D is number of deaths.

Figure 5 is composed of three parts:

- A five-by-five grid for each combination of scores
- A horizontal row of 5 cells at the bottom, which represents the A/E for the LexisNexis Risk Classifier score by LexisNexis Risk Classifier score quintile
- A vertical column of 5 cells on the left representing the A/E for the five quintiles of LexisNexis Risk Classifier with Medical Data

Although the A/Es for the middle quintiles are similar, the first quintile (worst risk) per LexisNexis Risk Classifier with Medical Data score has an A/E of 9.6 compared to a A/E of only 5.0 in the first quintile by LexisNexis Risk Classifier score. Similarly, in the best quintiles, LexisNexis Risk Classifier with Medical Data scores produce an A/E of 1.0 compared to 1.4 for LexisNexis Risk Classifier. We can see that LexisNexis Risk Classifier with Medical Data does a better job of mortality risk differentiation through the whole spectrum of risks than LexisNexis Risk Classifier does.

In each quintile of LexisNexis Risk Classifier, LexisNexis Risk Classifier with Medical Data produces significant differentiation of the risk. However, in each quintile of LexisNexis Risk Classifier with Medical Data, LexisNexis Risk Classifier provides minimal additional differentiation. At the extreme, in the top row, we see that the fifth (and best) quintile of LexisNexis Risk Classifier with Medical Data score has A/E varying between 1.0 and 1.4. If we contrast that to the fifth (and best) quintile of LexisNexis Risk Classifier score, the range of A/E varies from 1.0 to 15.9.

By including medical information, the LexisNexis Risk Classifier with Medical Data score recognizes bad risks that LexisNexis Risk Classifier alone misses. This is found consistently in the entry age groups 18-39, 40-59 and 60+ as well as for both genders.

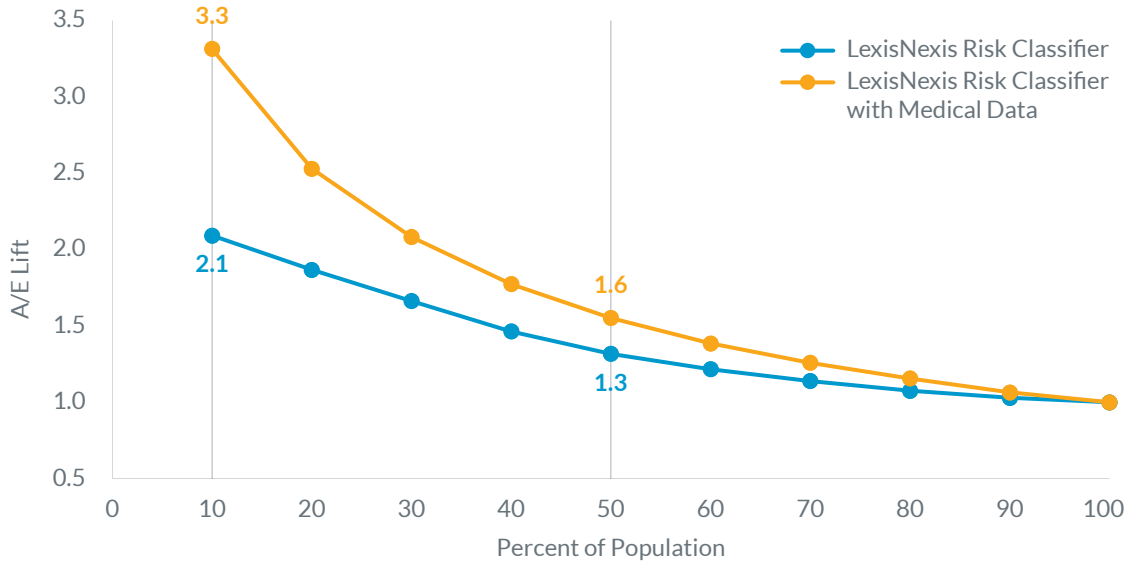
A/E Lift Results by Age, Gender and Duration

A lift chart is a visual representation of the "lift" or the value that each score brings. In the context of this study, lift is calculated as follows:

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

As illustrated in Figure 6, the LexisNexis Risk Classifier with Medical Data score differentiates mortality more effectively than the LexisNexis Risk Classifier score throughout the range of risk scores.

Figure 6 – A/E Lift Chart

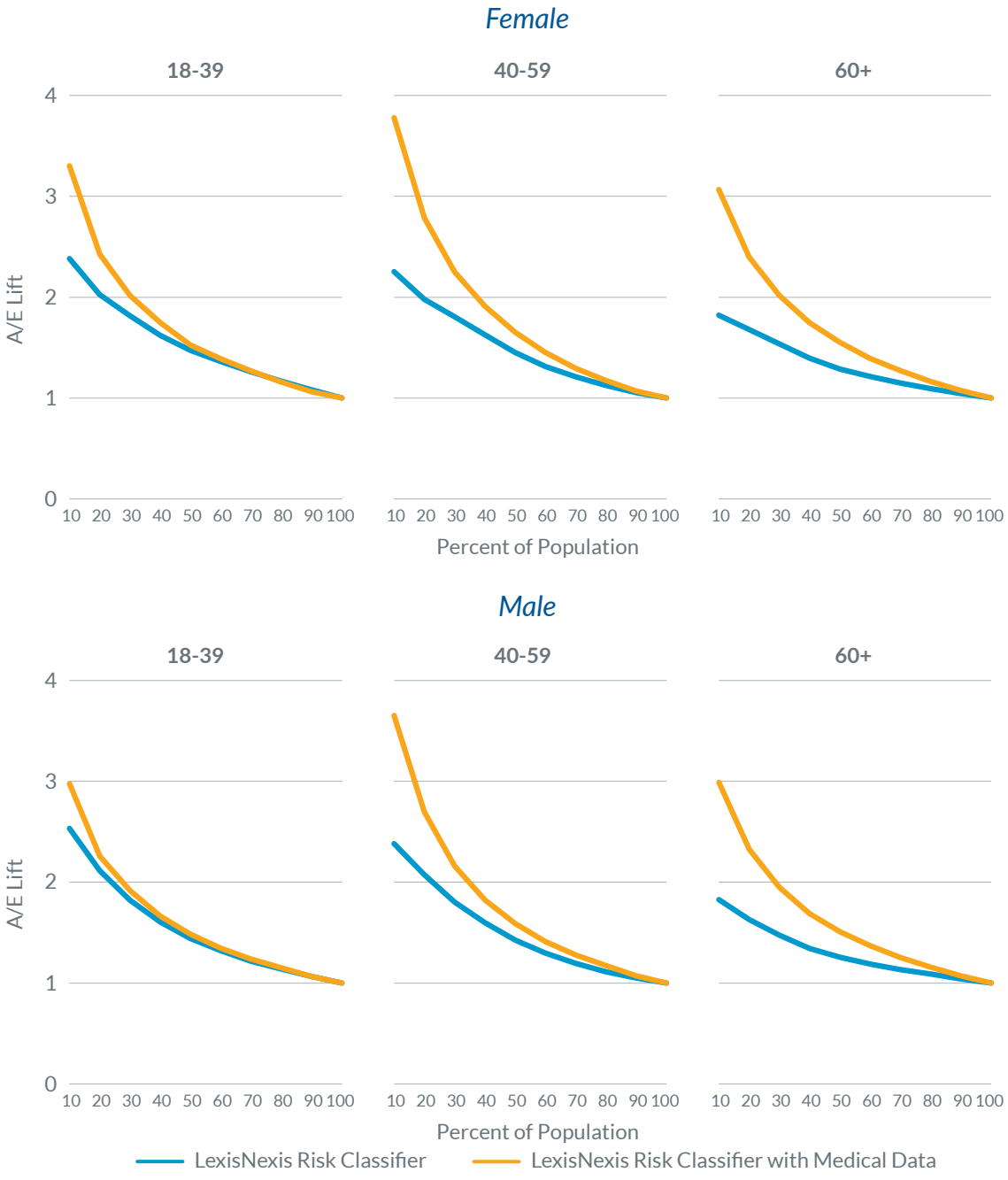


For example, the 10% of the lives with the lowest LexisNexis Risk Classifier scores have an A/E ratio of 5.0. The overall A/E ratio of the study population is 2.4, so the lift that the LexisNexis Risk Classifier score provides is 5.0 / 2.4 = 2.1. In contrast, the 10% of the population with the lowest LexisNexis Risk Classifier with Medical Data scores have an A/E ratio of 7.9, and therefore produce a lift of 7.9 / 2.4 = 3.3.

Similarly, the 50% of the population with the lowest LexisNexis Risk Classifier with Medical Data scores have a cumulative A/E ratio of 3.7 and produces a lift of 1.6, compared to an A/E of 3.2 for the 50% of the population with the lowest LexisNexis Risk Classifier scores with a lift of 1.3.

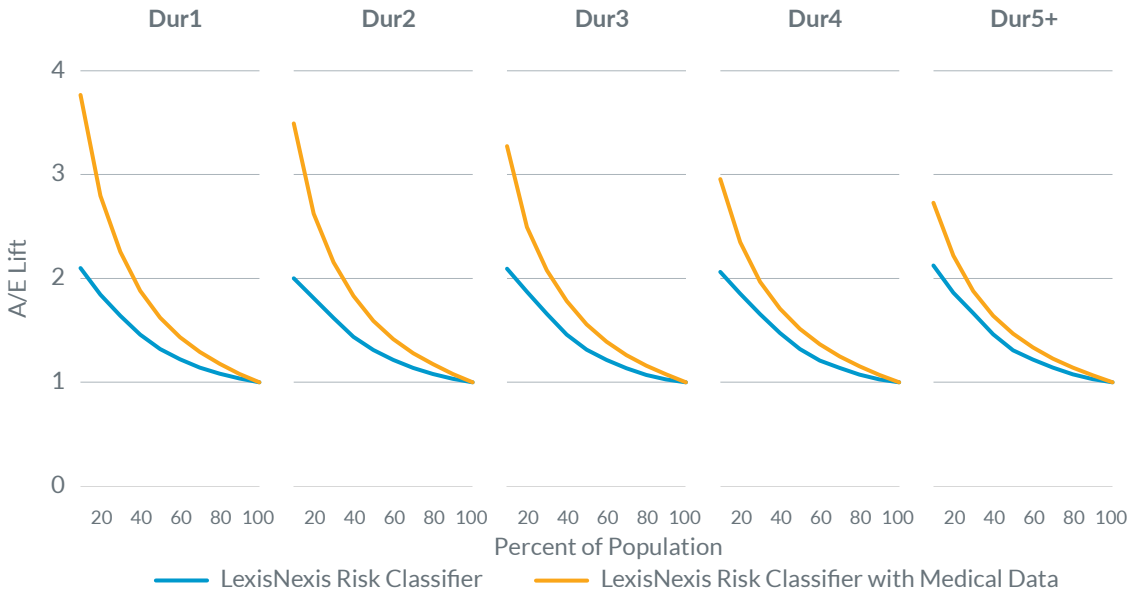
There are some differences in score performance between gender and entry age groups, but generally the LexisNexis Risk Classifier with Medical Data score produces more lift and therefore better risk stratification than the original LexisNexis Risk Classifier score.

Figure 7 – A/E Lift Chart, by Gender and Entry Age Group



The lift of LexisNexis Risk Classifier with Medical Data decreases with increasing duration while LexisNexis Risk Classifier lift is constant by duration. LexisNexis Risk Classifier with Medical Data lift remains better than LexisNexis Risk Classifier at all durations.

Figure 8 – A/E Lift Chart, by Duration Group



LIMITATIONS

There are some aspects of our analysis of this new product from LexisNexis Risk Solutions worth noting. The dataset is not based exclusively on a life insurance applicant portfolio. The maximum observation duration is 12 years. Finally, we used the dataset sample provided by LexisNexis and are unable to provide independent verification.

CONCLUSIONS

The new LexisNexis Risk Classifier with Medical Data differentiates mortality risk more effectively than the current LexisNexis Risk Classifier by more accurately identifying risks at the extreme of the mortality curves. Risk Classifier with Medical Data retains the ability of Risk Classifier to differentiate risk in the mid-range mortality.

The improvement of Risk Classifier with Medical Data persists across gender, age group and durations. Although Risk Classifier with Medical Data performs better than Risk Classifier through all observed durations, the advantage decreases over time. In contrast to Risk Classifier with Medical Data, the Risk Classifier lift is constant by duration.

Existing Risk Classifier customers will need to shift their thresholds as part of Risk Classifier with Medical Data adoption and consider that impact on their existing underwriting process.

Because unique company-specific factors may affect the model's impact, LexisNexis Risk Classifier with Medical Data should be evaluated for actual performance on individual carrier portfolios. Gen Re is ready to assist our clients in addressing these factors in coordination with LexisNexis Risk Solutions. ■

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