



SOCIETY OF ACTUARIES

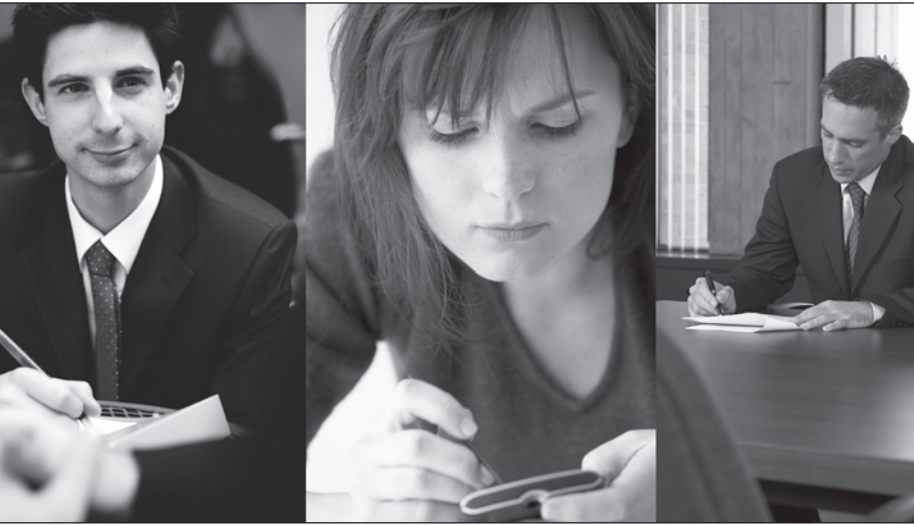
Article from:

Health Watch Newsletter

May 2006 – Issue 52

What We Have Learned in the Last 50 Years—and Aren't Using

by Chris E. Stehno



I recently attended an underwriting conference in predictive modeling where one of the speakers stated, “The way we underwrite has not changed since 1957.” I expected to hear gasps from the crowd but instead, I saw most everyone’s heads nodding in approval. Why is this? Why have underwriting, pricing and other health risk assessment techniques stayed so consistent?

The obvious answer would be that the analysis of historical medical information combined with simple demographic information like age, sex, geography and industry provide an accurate representation of health risks. However, over the last 50 years, the health care industry has collected mounds of data and produced hundreds of reports that challenge the above beliefs. A thorough review of the data and literature points to one conclusion: in short, we have fallen behind the times.

Our Unhealthy Lifestyles

It is nearly impossible to open up the newspaper or watch the evening news without seeing or hearing some reference to the unhealthy lifestyles of Americans. This comes to us in the form of obesity/overweight estimates, diabetes and

cardiovascular trends, lack of exercise statistics, amounts of tobacco, junk food, fast food and soda consumed and a variety of other indicators. In fact, reports released by the U.S. Surgeon General and the Center for Disease Control and Prevention show that more than 70 percent of diseases in the United States are the results of the lifestyles we lead, which in turn accounts for more than 75 percent of the health care costs.¹

One significantly alarming statistic reported by the CDC states that of U.S. children born in the year 2000, one in three will become diabetic. If this holds true, diabetes will be a health care epidemic unlike any ever seen before in the United States and possibly the world.

Yet today, the health care industry still looks to the past as a predictor of the future. Trend rates are drawn from historical medical experience. Both new and renewal underwriting is judged on current and historical medical analysis. And even disease management and wellness applications are derived from current and past medical indicators.

A great example of new medical research can be found in the 2004 INTERHEART study by Salim Yusuf et al., published in the Sept. 11, 2004, issue of the *Lancet*. This study showed that nine lifestyle-based risk factors like smoking, obesity and exercise made up more than 90 percent of the risks associated with a heart attack. The study also concluded that family history of a heart attack, which is thought by many to be the major factor, only accounted for 1 percent when added to the other nine factors. In other words, it is not a hereditary event, but a lifestyle-based relationship. If your father had a heart attack, you are not necessarily more at risk for having one because of your genes, but because you are more apt to be overweight and lead an inactive lifestyle just as your father probably did.²

Similarly, the American Cancer Society has reported that more than 80 percent of the risk for developing cancer in the United States is correlated to lifestyle-based factors including diet, smoking,

¹ Center for Disease Control and Prevention. 2004. The Burden of Chronic Diseases and Their Risk Factors, U.S. Department of Health and Human Services . 3, 29.

² Yusuf, S., Hawken, S., Ôunpuu S., et al. 2004. Effect of Potentially Modifiable Risk Factors Associated with Myocardial Infarction in 52 Countries (the INTERHEART study): Case-Control Study, *Lancet*. 364: 937-52

physical exercise, sexual behavior, occupation, alcohol and sun radiation.³ Numerous studies on Type II diabetes have shown that nearly all cases can be prevented and, in many cases, reversed through proper nutrition and exercise.

Lifestyle-Based Analytics

So what can we do about this? A good start would be to begin evaluating lifestyles and their relationships, impact and correlations to medical conditions and expenses. We are just beginning to see this happen through a new and emerging field called lifestyle-based analytics. In short, lifestyle-based analytics combines the worlds of clinical medicine with statistics and actuarial science to develop measurable health risk parameters tied to lifestyle-based traits.

One of the first questions commonly asked about lifestyle-based analytics is where do you get the data? The answer is that it is all around you and can be easily obtained. One available and overlooked source is right under your nose. Applications used for insurance products often contain gems of information that have significant correlations to early disease/condition detection. Tobacco usage is often a question on the application and is directly tied to several cancers. Height and weight are other components that can be tied to diabetes and cardiovascular events. As another example, the number and ages of children within a family are highly correlated with future pregnancy.

Other lifestyle-associated measurements can often be derived. For example, stress and obesity measures have strong correlations to commute time. Thus, calculating the distance between home address and work address provides a valuable element for several pre-disease models.

Health Risk Appraisals (HRAs) are another source of lifestyle-based data. In general, about one half of the questions asked are lifestyle related. This includes elements such as tobacco and alcohol consumption, exercise and nutrition.

Finally, lifestyle-based data can be purchased from third party vendors for relatively inexpensive fees—usually about \$0.10 per name. Currently, more than 95 percent of the households in the United States have significant amounts of consumer data tied to their addresses. Many of the 1,000-plus data elements that can be found in the

marketplace today revolve around “lifestyle”-based descriptors.

Examples of lifestyle-based data elements include food purchases (fast food, diet food, vegetarian, gourmet), self-improvement (health/fitness, dieting/weight loss), fitness activities (aerobics, running, walking, tennis, golf), physical inactiveness (television time, computer time, board games, stamp collecting), tobacco preferences, travel, occupation and vehicle type.

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Applications for Lifestyle-Based Analytics

So now that we have the data and developed these new correlations between lifestyles and diseases, where are the applications? The first and most obvious comes in the form of a new health risk factor for underwriting. Current underwriting techniques focus on simple demographic factors like age, sex, industry, geography, etc. Where detailed medical data is available, medically based underwriting techniques focus on who currently has a disease or condition and/or use past medical experience to look at co-morbidities. However, little else is ever done to predict who will be next.

There will be an estimated 1.2 million heart attacks in the United States this year.⁴ Of that number, 700,000 will be first-time events. Currently 7 percent of the U.S. population is diabetic. However, almost one-third of that population is undiagnosed. Even more alarming is the additional 15 percent of the U.S. population that is pre-diabetic; most of whom do not even know it. When asked to report on known diabetes incidence rates, most health care organizations can only account for 2 to 3 percent of the population and usually less than that for pre-diabetes. Lifestyle-based analytics

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³ American Cancer Society data. Detailed Guide: Cancer – What Are the Risk Factors for Cancer.

http://www.cancer.org/docroot/CRI/content/CRI_2_4_2x_What_are_the_risk_factors_for_cancer_72.asp?sitearea=. Accessed March 1, 2006.

⁴ Thom T, Haase N, Rosamond W, et al. 2006 Update. Circulation - Heart Disease and Stroke Statistics, American Heart Association 2006; 8

is providing a means to help determine who the next will be.⁵

As a functional underwriting measure, lifestyle-based analytics is used to develop independent underwriting factors or it is combined with current medical underwriting techniques as another component to the overall underwriting factor. In its independent state, lifestyle-based analytics provides an underwriting measure where data is limited or unavailable. An excellent example of this is in the mid-sized group marketplace, where claims experience both on an individual and group basis is often missing.

In this situation, armed only with an employee census containing names and addresses, lifestyle-based analytics uses consumer datasets to evaluate the health of the individuals and the group as a whole. This provides significantly increased accuracy and lift to the traditional measure that looks at age, sex, industry and geography.

Also used as an independent variable, lifestyle-based analytics is helping streamline underwriting operations by providing guidance on follow-up recommendations such as APS, tele-underwriting and fraud detection. Many applications are followed up by underwriters because they do not think it feels right or they think something may be missing. And many of these follow-ups are coming from clean applications. Lifestyle-based analytics can help with this process by identifying not only who to follow up with, but what questions to ask. In addition, it is being used to identify possible fraudulent applications including the reporting of tobacco usage, height-to-weight ratios or past medical conditions.

Beyond a determiner of unhealthy risk, Lifestyle-based analytics is providing a look at the overall health of an individual. Medical underwriting techniques were never designed to find healthy individuals. A clean application is a clean application. However, we know that there is a large amount of variability within clean applications. Lifestyle-based analytics uses factors like exercise and nutrition to determine overall health of the individual.

In combination with current medical underwriting techniques, Lifestyle-based analytics provides an extra level of detail not found in medical information. For example, a current clean application may result in an underwriting factor of 0.8. However, as noted before, there is a wide

variation in clean applications. By using lifestyle-based analytics, we see that the first clean applicant is an avid runner, works out regularly and generally speaking, eats well. Whereas the second clean applicant eats fast food on a regular basis, smokes and rarely gets any physical exercise. In this situation, applicant one will have a new underwriting factor of 0.65 whereas applicant two's factor may now be over 1.0.

This works not only on the healthy, but on the diseased as well. For example, there are two major courses of treatment for diabetics; one is through medications, and the other is through weight loss and proper nutrition. In fact, a study by The Physicians Committee of Responsible Medicine found that more than 90 percent of patients on oral diabetic medications and 75 percent of patients on insulin were able to get off of their medications after 26 days on a proposed diet and exercise program. Yet, for underwriting purposes, a diabetic is a diabetic. Even worse, medically based predictive models often punish individuals who stop taking medications no matter the cause.

Disease management and wellness applications are proving to be another excellent use for lifestyle-based analytics. Current disease management programs can be best described as "late stage disease management." That is, rarely do today's disease management programs focus on the early or pre-disease stages even though it is well documented that intervention in the early stages has both beneficial health and financial outcomes. One of largest and least addressed issues within disease management today is the speed at which disease management can recognize a candidate.

What is the main obstacle to early detection? The answer lies in the data, or more specifically, lack of data that can be correlated to early disease detection. Current modeling techniques utilized in the industry rely primarily on historical medical data to fuel their predictions. Unfortunately, most of the conditions that disease management focuses on today have few or no associated medical precursors. For example, the first alert a model will give us that someone is at risk for being diabetic is not until the person's record includes the ICD-9 code for diabetes.

Alternatively, lifestyle-based analytics can be programmed to detect the individuals or groups of individuals who are most likely to become diabetic in the near future. Finding these individuals in the

⁵ Centers for Disease Control and Prevention. 2005. National Diabetes Fact Sheet: General Information and National Estimates on Diabetes in the United States. U.S. Department of Health and Human Services.

pre-diabetic stages can result in significant savings through greatly increased success rates with intervention programs as compared to later state disease onset programs.

Retention issues are becoming a major factor in the determination of health risk status. The combination of employee turnover and employers moving business has brought the average length of time a member is enrolled in a plan to an all-time low. This is now somewhere around 18 months. These retention issues are resulting in even less medical data to work with for both underwriting and disease management applications.

A Time for Change

It amazes me to still see in presentations and in literature the 20/80 rule (20 percent of the people account for 80 percent of the costs) and the expressed need to focus entirely on this 20 percent high-cost population. Medically based health risk assessment would hold true if the 20 percent high-cost individuals were the same individuals year after year. However, upon our analysis, we found that three-quarters of the 20 percent group was not there the year before. In fact, 60 percent of the high-cost individuals were not in the high-cost group in any of the previous five years.

	Current Year	Prior Year	Prior 3 Years	Prior 5 Years
% Generating 80% of Costs	19%			
% of Those in Prior Year	100%	23%	37%	40%

However, this retention issue also brings up the question of lifestyle-based analytics' value as a near-term predictor of medical expenses. Although it would seem that lifestyle-based analytics is more forward looking, the prediction time frame can be adjusted to the situation at hand. In the life insurance underwriting arena, we may look at a three to five year time frame. However, in the health care underwriting arena we rarely look out past the next 12 to 18 months.

Lifestyle-based analytics' models can be adjusted to account for this. For example, clinically we know that once diagnosed with diabetes, the first (and many times only) behavior change an individual makes is to start purchasing diet food. Therefore, using diet food purchaser as a flag in our modeling we can often distinguish between individuals who have been diagnosed with diabetes and individuals who might be on a collision course with diabetes in the future.

In the disease management arena, it is not uncommon for it to take six to 12 months for enough medical data to be accumulated before predictive models can begin to work. By this time, you have lost almost one-half of the average length of time a participant is enrolled. Using lifestyle-based analytics in combination with real-time consumer databases, disease management and wellness applications can take place on day one.

Similarly on the underwriting side of the equation, real-time applications are now allowing for desktop versions of lifestyle-based analytics that can sit on an agent's desk allowing for instantaneous underwriting, which significantly increases the close ratios.

In the short term, we will see insurance companies that embrace lifestyle-based analysis gain competitive advantages as they will be able to underprice their competition on the healthiest populations. In addition, they will have the added benefit of additional risk measures that will enable them to avoid or properly price those groups posing the greatest health risks, thereby shifting much of the worst risk to their competitors.

Disease management companies that embrace lifestyle-based analysis will have a tool that will aid in the detection of early or pre-disease diagnosis. At this point, it is well known that intervention provides positive results both for the individuals in terms of their health and the insuring company in terms of ROI. Companies that embrace this technology may finally be able to get over the industry hurdle—do late-stage disease management programs really provide positive ROIs?

In the longer term, we see all companies embracing some form of lifestyle-based analysis as employers are now demanding population health management. The days of managed care appear to be numbered as employers are quickly realizing that what they need to control costs is not managed care, but managed health.

It is true that the job and tools for health risk assessment have remained relatively stagnant over the last 50 years. Now is a time for change. Armed with mounds of clinical literature, proven statistical correlations and a barrage of new data sources, it is time to incorporate lifestyle-based parameters into the evaluation of health risks. 📱



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