

## **The Impact of Genomics on the Insurance Industry**

*By - Dr. Philip Smalley*

### **Abstract**

Genetics, genomics and proteomics will have a dramatic impact on the practice of clinical medicine in the near future. This line of research will improve both quality and quantity of life and allow us to offer insurance to more people at more affordable rates. It will help increase the human life span and assist us in the more accurate risk stratification, thus insuring our industry's future.

Pricing actuaries need to keep abreast of these developments to better predict mortality expectations for the future. This session will discuss some of the advances in the field of genetics and how this area of research will affect health and longevity.

### **Presentation Paper**

Why do people have different life spans in different cultures? It is well known that the average adult of today lives a longer life expectancy than his or her parents or grandparents. But why is average longevity steadily rising? Is it better medicine, healthier lifestyles or the influence of genetic selection? It is important that insurance professionals continuously evaluate these questions. To maintain profitability and international competitiveness, there is a growing necessity to keep on top of current medical research that is affecting longevity. Pricing actuaries need to keep abreast of these developments to better predict mortality experience for the future.

Genetics, genomics and proteomics will have a dramatic impact on the practice of clinical medicine in the near future. This line of research will improve both quality and quantity of life and allow us to offer insurance to more people at more affordable rates. It will help increase the human life span and assist us in the more accurate risk stratification, thus insuring our industry's future.

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In the early 1900's, Mendel's laws of heredity initiated a scientific quest to understand the nature and content of genetic information. Researchers first looked at the chromosomal basis of life that led to Watson and Crick's discovery of the double helix in the 1950's. Further research revealed the role that DNA plays in making proteins. These proteins are critical for our survival. If our DNA is mutated, this can cause either a lack of a critical protein or an altered protein that can lead to disease. Not all mutations cause disease. Actually these minor variations in our DNA from generation to generation help insure our survival through evolution. Some 'mutations' protect us from disease. For example, those with the sickle cell mutation are more resistant to malaria. Also a small proportion of the population have a defect in the DNA that codes for the manufacturing of a critical cell receptor that the AIDS virus needs to enter the cell to do its damage, thus rendering immunity to HIV infection.

Our earliest and still useful assay of genetic risk is the assessment of family history. Many diseases have a strong familial component. There are rare single gene defect diseases, but the majority of mortality is made up of the more complex multi-factorial diseases such as heart disease. There are many genes that predict an increase risk of diabetes, cancer, heart attack and other important ailments. Although environmental factors still are responsible for the vast majority of the wide range of mortality that we see around the world. The interplay of nature and nurture is key to our understanding of genetic and familial risk.

The first draft of the Human Genome was published in Nature in February 2001. In 2003, the complete sequence of the G, A, T, C molecules that make up the human 23 chromosomes will be accurately completed. This will lead to the discovery of new disease pathways and new diagnostics. This also will lead to revolutionary new therapies. This line of research has already led to the discovery of medicines to treat leukemia and other diseases.

We have also recently learned that 99.9% of the human genome is the same from individual to individual around the world. The next step after decoding the human DNA will be to determine the exact function of each gene. Already we have found practical applications for assaying the abnormal gene products. We can detect these altered proteins as ultra-sensitive screening tests picking up cancer at earlier stages when it is still curable.

There are significant ethical and legal implications of genetic testing that always need to be considered. It is very unlikely that clinical medicine or the insurance industry will ever start screening the healthy population with genetic profiling. Although this line of research will allow us to better prognosticate someone with already clinically manifested disease. Gone are the days that we will get a doctor's report saying "leukemia". Now the report will contain crucial cytogenetic information that the insurance underwriter will need to understand, because

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the disease prognosis varies significantly depending on the genetic make up of the cancer cells. As will other medical prognosticating advances, this should allow us to offer more insurance and better rates to more of the public.

Pharmacogenetics will play a crucial role in clinical medicine in the next 5 – 10 years. Doctors will be using genetic information to tailor therapies to each individual patient. This will maximize drug effectiveness and also help to avoid medication side-effects.

Already early studies are showing promise that we can deliver therapeutic genes into an unfortunate individual that was born with a malfunctioning gene, thus avoiding significant pain and suffering and giving extended quality of life.

Genetics, genomics, and proteomics lead to improvement in longevity. We will be better able to prognosticate disease. This line of research will play a key role in our future ability to promote quality and quantity of life.

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### **Appendix: Presentation Slides**

To follow for presentation at conference.

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### **About the Author :**

#### **Dr. Philip Smalley**

Dr. Smalley is an Internal Medicine Specialist with 13 years of Insurance Medicine experience. He is Vice President and Medical Director of RGA International Corporation. He has also consulted for a multitude of direct insurance companies in the past. Dr. Smalley received his medical doctorate degree from the University of Toronto in 1986. He then went on to complete his specialty training in Internal Medicine from Royal College at the University of Toronto in 1990. Following his training, Dr. Smalley practiced and taught medicine at a University of Toronto affiliated teaching hospital. He is a recognized lecturer traveling extensively giving many presentations to the insurance industry on a wide range of mortality and morbidity topics.

Dr. Smalley is also the Managing Director of the Longer Life Foundation: An RGA/Washington University Partnership that funds research studying the determinants of longevity and promoting quality and quantity of life. You can read more about the Foundation and the ongoing funded projects at <http://www.longerlife.org>.