Genetically Informed Longevity

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AUTHORS:

Tom Bakos, FSA, MAAA: Consulting actuary with more than 45 years' experience in the life and health insurance industry. An expert in insurance industry intellectual property and nontraditional insurance subject matter, he has focused recently on genetic research into the statistical relationships between genetic variation and disease susceptibility and the use of this new information in risk-selection processes. Mr. Bakos coauthored "Gene Knowledge," an article published in the January/February 2001 issue of *Contingencies Magazine*.

Marc Klibanow, CPA: Former chief executive officer and chief financial officer in the biotech industry with experience on Wall Street. Mr. Klibanow provides a unique perspective of both disciplines. He initiated and co-developed an early direct-to-consumer Consumer Laboratory Improvement Amendments safe-harbored genetic test for CCR5. He is also the inventor of a process (patent application pending) involving the curation of a genetic database for the life insurance industry.

Nicholas Schork, Ph.D.: Professor and Director, Human Biology, J. Craig Venter Institute. Formerly, tenured professor at the Scripps Research Institute and director of bioinformatics and biostatistics at the Scripps Translational Science Institute. An expert in statistical genetics, epidemiology and large-scale integrated data analysis, he is also a founding member of the National Institute on Aging's Longevity Consortium, a 10-year running consortium devoted to understanding the influence of genetic factors on the human lifespan.

Ali Torkamani, Ph.D.: Director of genome informatics and drug discovery at the Scripps Translational Science Institute and an expert in computational biology and genetics. He develops and applies computational techniques for the generation, analysis and interpretation of genomic data, with a focus on the discovery and interpretation of the genetic determinants of human disease and the translation of those findings to therapeutic strategies.

Ashley Van Zeeland, Ph.D., MBA: Former director, strategic partnerships at the Scripps Translational Science Institute, current CEO of Cypher Genomics. She provides the critical link between the life science industry and academia and is an expert in commercialization of life science technologies.

In addition to the above-listed affiliations, the authors are co-founders of Genecast Predictive Systems LLC. Genecast's mission is to apply the information contained in genetic variation to life and health risk selection and management processes in order to achieve superior risk assessment, mortality, medical and financial results. As a group, the authors have long-term experience and practice in the fields of actuarial science, biomedical science, biotech, business development, chemistry, finance, molecular and experimental medicine, biostatistics, statistical and computational genomics, risk analysis and risk prediction, the interpretation of DNA sequence variation, neuroscience, neurobiology and genetics of developmental disorders, and the contribution of rare genetic variants to various human diseases.

Executive Summary

Whatever else it may be, life is a chemical process the end of which, for the most part, is signaled by death. It is autonomous, self-sustaining and self-repairing until, for reasons debated herein, it fails. It has been built by natural selection but a knowledge and understanding of how those chemical processes work may inform unnatural interventions aimed at lengthening each individual's life and keeping it healthy.

Genetic information and its interpretation is rapidly becoming available to individuals directly or through their doctors because it is useful in diagnosing and treating disease and mitigating health and life risk. This inexpensive, readily available genetic information will inevitably inform and influence decision-making processes affecting life, health and longevity.

Genes code for proteins that participate in metabolic processes operating within our bodies and determine how living organisms respond to environmental exposure or change. Individual humans are genetically similar enough to be part of the same species but, nevertheless, differ in important ways such that these genetic differences can inform and be applied to make decisions regarding how specific individuals can maximize their life expectancy and remain healthy. These decisions may involve environmental change or avoidance mechanisms designed to prevent assaults on vulnerable metabolic pathways that affect aging and longevity. These decisions may also be directed toward the most biologically efficient disease treatment or intervention actions designed to prolong healthy life.

Knowledge of how metabolic pathways operate and how they are disrupted by genetic variation will lead to more effective drugs designed to address specific genetic variation. These drugs may do that by mitigating the effect of adverse symptoms created by genetic variation or by influencing alternative metabolic pathways in order to overcome the disruptions caused by adverse genetic variation.

Longevity and longer life spans are supported by genetically informed decisions that defer death.