



Actuarial Model for Wellness

RESEARCHER INTERVIEWS

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Actuarial Model for Wellness — Researcher Interviews

The Society of Actuaries engaged Sibson Consulting, a division of Segal, to facilitate a collaborative process with the actuarial, vendor and research communities to develop a conceptual actuarial model for wellness as a first step toward the possible development of a computational actuarial model.

The first step in this process was to perform an initial literature review of research and clinical studies to determine if this type of model was feasible (if the data were truly available), and to get a sense of what such a model would need to include, and what it would look like. From this first step, we were able to develop a starting point for the conceptual model supported by the studies reviewed and available data. We tested an initial model with the actuarial and vendor community and revised the model to test with the research community. The following illustrates the model shared with the researchers and to which they provided comment:

PROGRESSION OF HEALTH IN AN ACTUARIAL MODEL FOR WELLNESS¹

Environmental Factors	Lifestyle Factors	Risk Conditions (measures)	Disease States	Actuarial Outcomes	Actuarial Impact
Personal Traits (willingness to change behavior, income, age, emotions, gender)	Diet/Nutrition/Healthy Eating	Obesity (Body Fat/BMI/Waist Circumference)	Diabetes/ Asthma/COPD	Complications/ Morbidity	Health Cost
Genetics	Exercise/Physical Activity/Fitness	Hyperlipidemia (Elevated Cholesterol/LDL Level)	Heart Disease/Heart Attack	Presenteeism/ Engagement/ Satisfaction	Productivity Impact
Physical Environment (work, residence, geographic)	Stress	Hypertension (Elevated Blood Pressure)	Depression	Absence	Absence Cost
Socio Economic Status	Addictive Behavior (Smoking/Tobacco/ Alcohol/Other Substance Consumption)	Hyperglycemia (Elevated Blood Sugar/Glucose)	Stroke/Kidney Disease	Litigation/Accident/ Property Loss	Property/Casualty Cost
Education	Risky Lifestyle Behavior	Hypertriglyceridemia (Elevated Fatty Molecule/ Triglycerides)	Cancer	Workplace/Traumatic Injury & Return to Work	Workers' Compensation Cost
Culture (geography, work, home, industry, incentives, providers)	Sleep	Anxiety	Other Chronic and Non-Chronic Conditions	Disability	Disability Cost
Each column represents a stage of the progression of health, from the environment in which we live and the lifestyle we choose, to the actuarial outcomes and impact that results. While it is understood that the model may have an intricate web of interdependencies, some of which may impact factors in the same or prior columns, for simplicity sake, it may be best to approach building the actuarial model by applying the prevalence, probabilities, and impact (severity) from left to right. The model can follow the progression reflected in the red timeline (which are the column labels). Note it is not intended to imply any specific dependence across each row.				Loss of Activities of Daily Living	Long Term Care/ Custodial Care Cost
				Mortality	Life Insurance, Retirement, Retiree Health

The rate of progression of health is influenced by and one's condition influences psychosocial factors such as self-efficacy/confidence, readiness to change, level of social isolation, motivation and one's perception of health.

¹ The conceptual model displayed is the actual model presented to survey participants. The conceptual model in the Study Report has been revised to reflect feedback received from this survey.

In this third phase, Sibson interviewed the following three key researchers and actuarial modelers:

- Ron Goetzel - Ron is a researcher with Johns Hopkins Bloomberg School of Public Health (recently moved from Emory University) and is employed by Truven where he conducts ROI modeling of wellness programs. Ron is the author of five of the included research studies and he is associated with a comprehensive data set (<http://truvenhealth.com/your-healthcare-focus/government/health-and-productivity-research>);
- Alan Mills – Alan is a physician and actuary. Alan conducted two research studies for the SOA on Complexity Science (<http://www.soa.org/research/research-projects/health/research-complexity-science.aspx>) and Simulating Health Behavior (<http://www.soa.org/Research/Research-Projects/Health/Simulating-Health-Behavior-A-Guide-to-Solving.aspx>), which included the development of an agent-based model for wellness; and
- Don Morris and Tuan Dinh of Archimedes – Researchers involved in the development of the Archimedes clinical model (<http://www.archimedesmodel.com>), recognized for its comprehensive and research based approach to modeling potential clinical outcomes associated with different treatment alternatives. Archimedes, Inc. is a wholly owned subsidiary of Kaiser Foundation.

There are dozens of others that have a perspective on this matter and additional input should be sought. The objectives of the interview were to gain perspectives on

1. The conceptual model;
2. Model alternatives;
3. Methodology; and
4. Data sources.

Conclusions

The researchers provided great insight on the development of both our conceptual model and a potential computational model. Based on the interviews with the researchers, the conceptual model could benefit from:

- Separating personal vs. environmental factors,
- Reflecting a time element within and between stages,
- Considering that a continuum exists for each factor in the model,
- Considering co-morbidities and interdependence of factors and conditions,
- Recognizing the impact of interventions on progression and time within each factor's continuum,

- Determining how best to reflect the “risk measures,” which are not really a risk factor, but a measure of one’s health condition at various points in time throughout the continuum, and
- Revisiting some of the factors included under the different stages on the progression of health.

In discussing model alternatives, each researcher provided input reflecting their modeling experience. Discussions addressed potential approaches for modeling potential program design effectiveness, behavior, ROI and long term impact. Following are three models discussed by the researchers:

- “Agent-based” simulation which models behavior within a simulated environment,
- Mathematical population simulation which models potential outcomes for different treatment interventions based on physiology and diseases (based on literature review),
- Data simulation which models wellness outcomes based on large linked databases to study the results of interventions.

While these are only three of the universe of model types discussed, they each used very different methodologies. The feedback indicated that a computational model may be feasible building upon one or more of these approaches.

Leveraging insights from this study, actuaries may consider building a model to support the needs of society and the health industry. The initial focus of the model should be on where there is available data and research to support credible analysis. Data sources can include: publicly available databases such as National Health and Nutrition Examination Survey (NHANES), the National Ambulatory Medical Care Survey (NAMCS), and National Hospital Ambulatory Medical Care Survey (NHAMCS), private databases such as MarketScan data, population models based on clinical trials, observational studies and population studies and private statistical sampled surveys such as Gallup-Healthways Well-being Index.

Each data source has limitations and it is useful to weave together several sources of information to support wellness model development. In order to set the model parameters within a reasonable scope, minimum levels of significance on the impact of each co-morbidity would need to be set so that the model only includes a certain degree of significance. The model can be constructed leveraging best practices from software engineering and “agent-based” modeling (see chapters 13 and 14 of Alan Mills’ research report titled “Simulating Health Behavior”).