

# EXPLORING THE IMPACT OF LIFESTYLE FACTORS ON MORTALITY AND MORBIDITY USING UK BIOBANK DATA

## Abstract

*When underwriting life and health insurance, determining how multiple rating factors, such as lifestyle, comorbidities, and mortality, can interact with and impact one another remains challenging. To unravel this, RGA is collaborating with world-renowned researchers from the University of Leicester (U.K.) to enable scientists as well as insurers to realize the potential and limits of lifestyle information for disease and death prognostication. The research aims to bring direct and significant value to insurance medical directors and underwriters by generating critical and novel insights that will enhance medical knowledge and support the development of underwriting philosophies and strategies.*

## Introduction

Insurers have long understood that lifestyle factors thought of as “unhealthy,” such as smoking, sedentary behaviors, poor eating habits, and excessive (or inadequate) sleep, can contribute to chronic health conditions and adverse outcomes. What insurers have largely lacked, however, is the ability to quantify the influences and interactions of these activities on the health and longevity of life and living benefits insurance applicants.

Improved risk assessment, for example, could enable premium pricing that reflects individual applicant risks more precisely and ultimately strengthens insurer underwriting practices. For customers, a better understanding of how lifestyle factors can affect health, life expectancy, and quality of life (possibly coupled with financial or other incentives) could lead to behavior changes and, through insurance-linked wellness programs, greater engagement with their insurance providers as partners in health.

This research study, sponsored by RGA and conducted by the University of Leicester, a leading university in the U.K., has as its objective making enhanced risk knowledge a risk assessment reality. Using some of the best data available, from the UK Biobank, this research will help quantify how everyday life factors such as physical activity, diet, and hours of sleep, can impact chronic health conditions such as cancer, diabetes, and cardiovascular disease, and refine industry data on related mortality outcomes.

## ABOUT THE AUTHORS



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The database used for this research is the UK Biobank, a large prospective study that provides accredited researchers direct access to a comprehensive database of health metrics from half a million middle-aged participants. These data have been and are being used by researchers to conduct a variety of studies about topics related to health and longevity.<sup>1</sup>

Findings from this research, which are expected by 2023's fourth quarter, are anticipated to enhance underwriting considerations, pricing, and recommendations for insurer life and living benefits wellness programs.

This article provides a brief background to the concept of wellness as it is conceived of and utilized in the life insurance industry, introduces and highlights RGA's goals for our collaborative UK Biobank database research, and demonstrates how the findings might be utilized to enhance underwriting philosophies and pricing estimates. Lastly, it will showcase the wider industry value from this project.

## Wellness' Unexplored Potential

The incorporation of wellness, as an initiative and a goal, into life and living benefits insurance first emerged more than 20 years ago. Although it has been an accelerating trend ever since, our industry has yet to either realize the full potential of or understand the limits of wellness initiatives.

Strategically implementing wellness programs and initiatives in our products requires a deep understanding of the associations between lifestyle behaviors and health outcomes. New and more inclusive data sources, ongoing developments in technology, and advanced approaches to integrating biometric information into insurance products are all moving such initiatives beyond mere engagement and marketing schemes. Insurers now see them not only as tools for gathering additional underwriting evidence but also, importantly, as tools that can improve customer health and wellbeing.

In 2021, RGA and RGAX surveyed more than 100 life and health insurers from around the world about current and



future wellness-related products, initiatives, and strategies as well as challenges and potential opportunities.<sup>2</sup> The survey found that insurers see great potential for wellness initiatives to support their policyholders' overall physical, mental, and financial health:

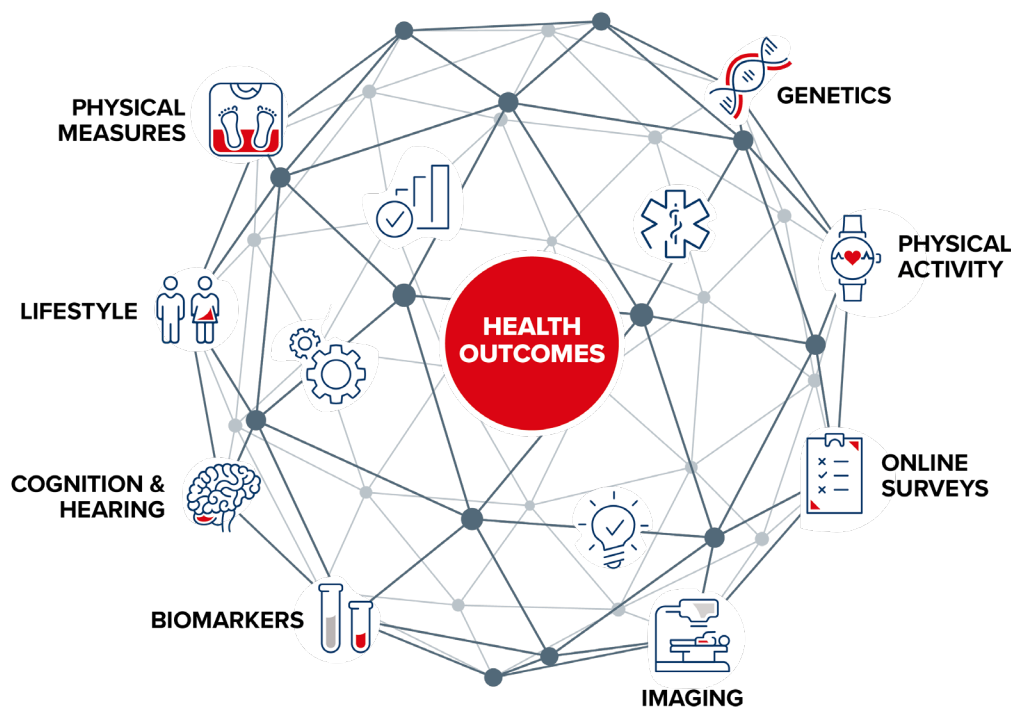
- 85% of insurers globally indicated wellness is a top priority, particularly after the onset of COVID-19.
- Wellness program implementations among insurers are increasing globally, with 57% of respondents offering wellness-related products, digital tools and services, mental health support, and/or financial planning tools.
- Top areas for growth in wellness-related products, strategies, and initiatives are in chronic disease management, mental health, and financial welfare.

Data-driven evidence will be needed to help insurers achieve the full potential of their wellness initiatives.

### Why UK Biobank Data?

The UK Biobank is a large biomedical database containing both broad and in-depth information about the health of its participants, which comprise more than half a million U.K. adults between ages 37 and 73 at baseline (2006 to 2010). The database includes not only participant routinely linked mortality and morbidity outcome data, but also comprehensive lifestyle and wellness metrics. Participants provided a broad range of biological, cognitive, demographic, health, lifestyle, mental, social, and wellbeing data, and continue to do so today (Figure 1).

Figure 1: Breadth and Depth of UK Biobank



Adapted from UK Biobank

When compiling the database, several steps were taken to ensure ethnic, geographical, and socioeconomic heterogeneity, as well as broad distribution across as many exposures as possible. This was done to allow reliable detection of generalizable relationships between demographic characteristics and health outcomes. Participant recruitment was via invitations mailed to people in the targeted age cohort – those registered with the U.K.'s National Health Service (NHS) who lived within 25 miles of one of the 22 study assessment centers located throughout England, Scotland, and Wales.

Although the UK Biobank is not necessarily representative of the general population, as it has already been shown to have “healthy volunteer” selection bias – that is, participants, who are self-selected from the overall database, are healthier than the general U.K. population.<sup>3</sup> Still, it is sufficiently illustrative of standard insured lives, making studies of this population of particular interest and relevance to insurers.

Research Goals

Life and health underwriting philosophies typically contain criteria relating to several different aspects of health, including biological, physical, mental, and lifestyle. As the UK Biobank is a sizable data resource that permits research into many of these aspects of human health, this has given RGA's underwriters, with input from our chief medical officers, the opportunity to formulate a broad range of research questions they considered to be of highest importance for the UK Biobank to be used to investigate.

Tackling these questions will help strengthen and expand RGA's underwriting philosophies and wellness strategies. A baseline normative wellness dataset, as well as other easily measured attributes within the conventional standard risk pool, is a prerequisite for assessing substandard risks. Table 1 shows some examples of how the deliverables from this study may impact the different functions of RGA's underwriting methodology.

| Table 1: Translating Potential Findings |                                                                                                                                                        |                                                                 |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
|                                         | Example                                                                                                                                                | Potential action                                                |
| Guidelines                              | In comparison to BMI, waist circumference is observed to be a better predictor of inferior health outcomes in overweight males                         | Revise the guidelines accordingly                               |
| Rating tables                           | After controlling for traditional rating factors, resting heart rate shows novel relationships with the outcomes of interest in certain subpopulations | Understand the evidence and update the appropriate rating table |
| Calculators                             | Simple, easy-to-collect metrics such as self-reported walking pace is observed to be a strong differentiator of mortality risk in older adults         | Fittingly incorporate walking pace into the relevant calculator |

## Wider Value

This collaborative research will enable insurers to focus on the utility of current and future underwriting factors such as lifestyle (including physical activity) and easily measured variables such as heart rate. The hope and expectations are that these items can complement more traditional rating factors such as age and sex, and comorbidities such as high blood pressure, to predict mortality and morbidity outcomes. There is even the potential for incorporating lifestyle factors in underwriting in ways that can supplement traditional approaches to risk. Data-driven research can help insurers identify and segment risk more effectively, calculate the impact wellness factors can have on life and health experience, and potentially optimize underwriting decisions. It will also enable us to justify, through trusted data, our approaches to risk assessment.

## Summary

Can new evidence from the UK Biobank make an impact on insurance underwriting? The answer, we trust, will be yes. The goals of this research are:

- Improve the underwriting philosophy and best-estimates for pricing
- Enhance wellness product development
- Generate additional critical insights into health and wellness, further supporting the results of the recent RGA & RGAX Global Wellness Survey Report
- Publish peer-reviewed articles on this research in medical, actuarial, and insurance journals for public interest and benefit
- Create a pool of knowledge that has sizable benefit to clinical researchers that could lead to better interventions in primary care (e.g., support healthcare providers in encouraging people to engage in healthier lifestyle choices) and significant public health implications
- Make a positive impact on society

## Conclusion

As people are living longer, more will assuredly live with multiple diseases and conditions that impair health, making a deeper understanding of how combinations of risk factors affect mortality and morbidity extremely valuable. With interest in wellness rising rapidly across the insurance industry, the output from this project has the potential to create and provide critical insights to enhance underwriting and pricing for wellness products, as well as to inform consumers on ways to improve their health and longevity. 

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## References

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