Swiss Re Institute

Active bodies, healthy lives

We all know that there's a good link between keeping fit and better health. But what makes for good exercise, and can we use this information to help keep us healthier throughout our lives?

Partnering for progress

Swiss Re has commissioned a multiyear study alongside leading researchers at the University of Oxford. Professor Aiden Doherty, specialises in biomedical informatics specifically wearables, machine learning and epidemiology. He and his team seek to deepen our understanding of the impact of physical activity and its predictive power for long-term mortality and morbidity outcomes. Swiss Re has a long-standing commitment to investing in health and promoting healthy longevity. From our research publication, 'The Future of Life Expectancy'[1] which discusses long-term mortality improvement trend developments in the past and future, to the health impacts of Swiss Re's 'Big 6 Lifestyle Factors'[2] (physical activity, mental well-being, the environment, sleep, nutrition and substance use), we have made it a priority to incorporate the latest scientific developments into our business.

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Building a picture of health

Apple®, Samsung®, Garmin®, Fitbit® and more – smartwatches and other wearable devices are everywhere, tracking our every step. Harnessing the wealth of data that is quite literally at our fingertips could vastly improve the way we monitor and develop our health. Widely available at a range of prices, the devices offer a variety of metrics, from a standard array of tracking steps and sleep hours to more involved measurements like heart rate, blood pressure estimates, and oxygen saturation. The gamification of health data, such as setting challenges that reward achievements, can motivate individuals to make better lifestyle choices, set goals and ultimately maintain healthier habits. But how can society and the insurance industry use this health behaviour data to help monitor ongoing risk and forecast healthier lives?

We engaged Prof. Doherty's team at the University of Oxford to apply their expertise to explore opportunities presented by the UK Biobank, a large-scale biomedical database and research resource to help scientists improve human health. The UK Biobank contains rich information from a cohort of just over half a million volunteers, with collected data ranging from a detailed medical history, to lifestyle factors and nutritional information. Approximately, 100 000 of those participants went one step further, by wearing a research-grade physical activity monitor to build a wider picture of their current health. So far, findings from the initial work with this sub-group have led to the creation of a machine learning algorithm with the most accurate measure of steps to date; correlating this precise measure of step count with outcomes from cardiovascular disease and all-cause mortality, to elucidate the predictive power of physical activity for health outcomes[3].

Further exploration is already underway, to examine the potential impacts of physical activity biomarkers on the progression of cancer and for a deeper dive into the effects of exercise on cardiovascular disease. The algorithm has the potential for widespread use in other studies utilising smartwatches, including research into how the more commercially available wearable devices may perform against the research-grade ones deployed in these studies.

This research inspires us to build dynamic product solutions, able to provide actionable insights to the insurance sector, as we forecast a more accurate, holistic long-term picture of the health of the population.

Everyday steps

Given that physical activity offers broad benefits, how should we go about incorporating this into our daily lives? Using the same UK Biobank dataset, with the support of Prof Doherty, another research team has recently shed light on the benefits of incorporating short bursts of physical activity into daily routine. They found that engaging in just 3–4 one-minute bouts of intense activity, from everyday tasks like climbing the stairs, running for the bus, or playing with the kids, yielded positive health outcomes.

No longer is an afternoon sweating away at the gym, going for a run or a bike ride the only way. Analysing data from self-reported non-exercisers in the same study, revealed that three short bursts of vigorous activity per day was associated with a 40% reduction in all-cause and cancer mortality risk and a 49% reduction in cardiovascular disease mortality risk[4].

Building on the high-accuracy measurement methods developed by the Doherty group, another recent study highlighted the merits of the so-called 'weekend warrior' pattern. Condensing, physical activity within one to two days, was associated with a similarly lower risk of cardiovascular outcomes, compared to more evenly distributed physical activity throughout the week[5].

Alternative applications

As technology develops, the use of smartwatches is evolving beyond basic fitness tracking and now can be used to monitor disease. Wearable data from the UK Biobank has seen a novel application in the early identification of Parkinson's disease. Encouraging sports and physical activity may be associated with limiting disease progression in both Parkinson's and Alzheimer's disease, as high levels of lean muscle mass may be related to prevention[6]. Researchers from Cardiff University in conjunction with the UK Dementia Research Institute have also suggested that smartwatches may serve as a screening tool, aiding in the detection of earlier Parkinson's symptoms potentially up to seven years before clinical diagnosis[7]. Combining high-accuracy step detection methods, the Doherty group is applying cutting-edge deep learning models to extract further meaning from wearable data to improve screening performance of preclinical Parkinsonism.

Wearables are being considered well beyond the tracking of physical activity, given their potential to address other health challenges. Outside of the academic sphere, Apple is investigating non-invasive glucose monitoring techniques with their Apple Watch which would eliminate the need for a traditional finger prick test. The new system is expected to not only assist people to manage their glucose levels but also alert those who are at risk of developing diabetes, a risk factor for many other major diseases. Similar approaches from a range of manufacturers are also investigating clinical uses to check for heart rate issues, breathing difficulties and sleep disturbances[8].

How can the insurance industry use this information?

The findings from the research collaboration between Swiss Re and the team at the University of Oxford are already generating valuable insights and driving advancements in the field of health. This will enhance our understanding of the relationship between physical activity and health, and also inform the development of innovative risk management strategies and interventions.

Swiss Re experts are already investigating how alternative data collected by wearables can best be incorporated into insurance products to improve underwriting[9]. Findings from Prof Doherty's team can be used to further inform strategies to improve health outcomes and promote healthier lifestyles globally. Wearable data indicates insurers can explore the area of offering personalised health assessment, and there is hope for the future where and coverage options can be tailored around to policyholders that follow healthier lifestyles.

Notes

[1] The future of life expectancy, *Swiss Re*, 2023.·
[2] „The Big Six" Lifestyle Factors, *Swiss Re*, 2020.
[3] Small, S. et al., 'Development and Validation of a Machine Learning Wrist-worn Step Detection Algorithm with Deployment in the UK Biobank', *medRxiv*, 2023.
[4] Stamatakis, E. et al., 'Association of wearable device-measured vigorous intermittent lifestyle physical activity with mortality', *Nature Medicine*, 2022.·
[5] Khurshid, S. et al., 'Accelerometer-Derived "Weekend Warrior" Physical Activity and Incident Cardiovascular Disease', *JAMA*, 2023.
[6] Higher levels of lean muscle might protect against Alzheimer's disease, *BMJ Medicine*, 2023.
[7] Schalkamp, A-K. et al., 'Wearable movement-tracking data identify Parkinson's disease years before clinical diagnosis', *Nature Medicine*, 2023.
[8] „With Cardiogram's AI, Apple Watch can detect sleep apnoea, hypertension, study shows" *MobiHealthNews*, 2017.
[9] Getting practical with wearables, *Swiss Re*, 2023.