

NHS breast cancer screening: how does it affect accelerated critical illness experience?

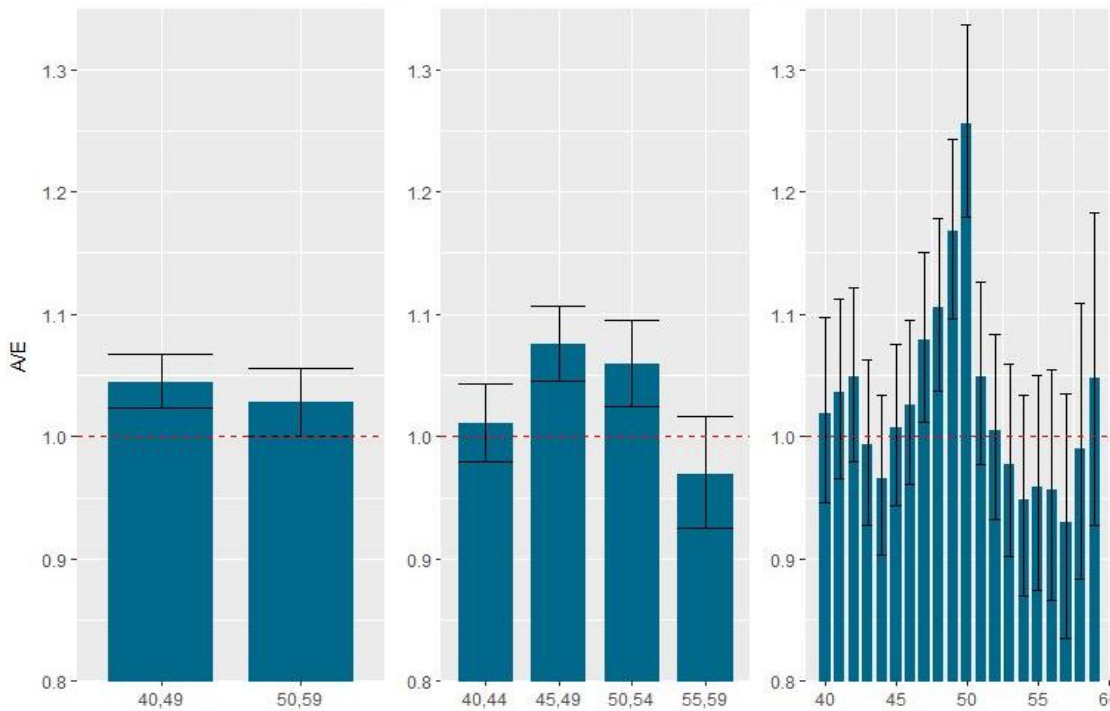
An insight into accelerated critical illness experience

In actuarial experience analysis, continuous variables such as age are often combined into banded variables to tighten confidence intervals and avoid interpreting noise. The downside to this approach is that real age-specific effects may not be noticed. A good example of overlooked effects when plotting by age band is the accelerated critical illness (ACCI) peak in females at ages 47–50.

Overlooked real age-specific effects

ACCI data from the July 2019 CMI data release¹ and the accompanying CMI expected basis² were extracted. The dataset contained a total of 14,127 ACCI claims for females aged 40–60 during 2011–2016. The A/E for the CMI basis is plotted in **Figure 1**. Although the 5-year age bands show heavy experience in 45–49 and 50–54 year-old females, it is only the granular data in the right figure that shows the true pattern: a gradual increase over ages 47–50 up to A/E 1.26 (95% CI 1.18-1.34) at age 50, followed by a steep drop at ages 51 and over.

Figure 1: A/E by AgeBand10 (left), AgeBand5 (middle), and Age (right) for females



Source: CMI July 2019 data

¹ See Continuous Mortality Investigation. (2019)

² See AC08 series, Continuous Mortality Investigation. (2016)

The gradual and statistically significant increase of the A/E across ages 47–50 is strong evidence for a real phenomenon. This is particularly the case since claims at each age include different lives. There is also biological plausibility for a rise in ACCI claims for females at ages 47–50 as NHS breast cancer screening takes place at age 50.

Additionally, from 2009 onwards, there has been a trial to start offering breast cancer screening starting at age 47. This could potentially explain the trough in ACCI claims at ages 51 and older since breast cancer diagnoses are brought forward.

Adjusting for breast cancer screening

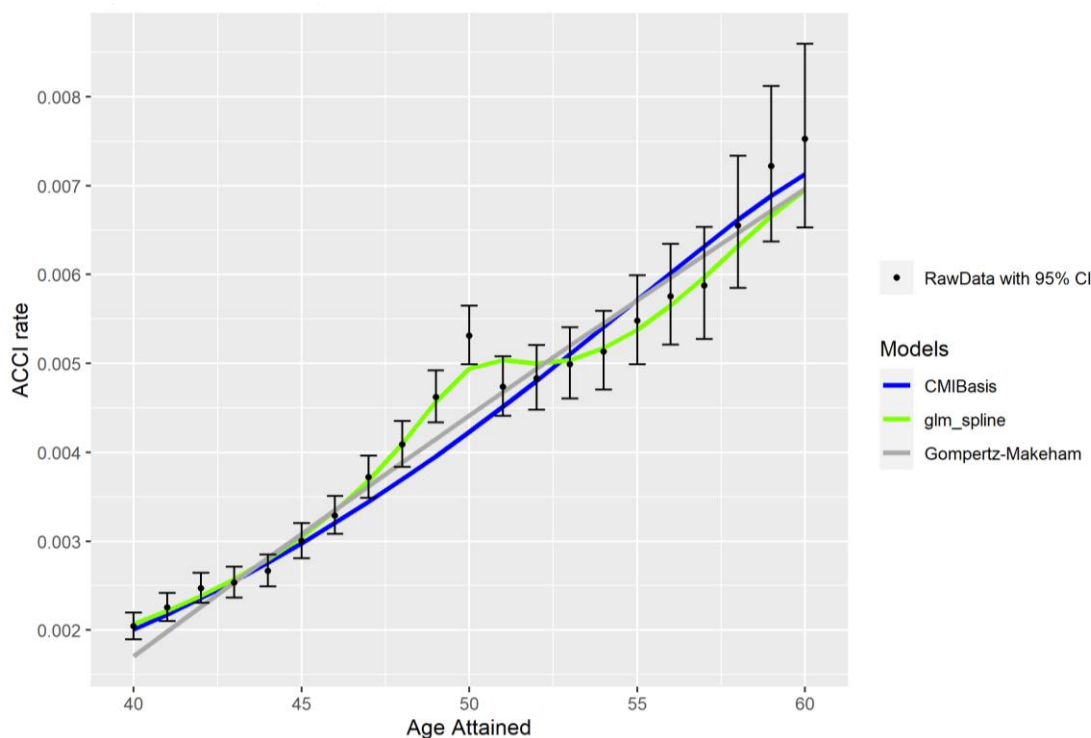
A key difference between critical illness and life protection is that screening programmes can affect the age-specific incidence of critical illness, bringing the diagnoses forward. For this reason, local peaks and troughs can occur in critical illness incidence by age (i.e. **Figure 1**).

A consequence of this is that distributions such as Gompertz-Makeham, which assume exponential increases in rates with increasing age, may not fit the data well. **Figure 2** shows the raw ACCI claim rates (black) with 95% confidence intervals as well as the CMI AC08 series basis (blue)².

The ACCI claim spike at ages 47–50 can be modelled using spline terms, which can be incorporated into generalised linear models (GLM). Spline terms are flexible polynomials that can be customised by specifying locations of knots. Knots are places within the data range where the adjacent functional pieces join. The green line in **Figure 2** shows a GLM model incorporating a spline function for age.

Figure 2 also contains a Gompertz-Makeham basis fitted exclusively on ACCI data for 40–60 year old females. The GLM-based basis incorporated a spline function to model the relationship between age and ACCI claim rates and is the only basis that captures the (assumed) effect of breast cancer screening reasonably well.

Figure 2: ACCI raw rates (95% CI) and modelled rates for females



Source: CMI July 2019 data

Discussion

Contrary to mortality experience, national screening programmes such as the NHS breast cancer screening can cause local peaks and troughs in critical illness experience. Since these peaks and troughs can be highly localised, they can be missed in age-banded experience analysis. Models used in mortality analysis assuming exponential growth may be too limited to take these into account.

The NHS offers breast cancer screening up to age 70; indeed, the breast cancer incidence is higher at age 65–69 compared to 70–74³. It is conceivable that similarly to a spike in incidence at the age where a screening programme is initiated, due to diagnoses being brought forward; there will be a trough in incidence when a screening programme ends, due to diagnoses being delayed.

Unfortunately, CMI ACCI data is too limited to explore this hypothesis. It is highly likely that the data for 2020 will look different: close to 1 million women in the UK, across all age groups, missed breast cancer screening due to COVID-19⁴. This could also potentially result in lighter ACCI experience in 2020 and heavier experience when breast cancer screening resumes.

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³ See Cancer Research UK

⁴ See Breast Cancer Now.

Changing the digital landscape

The waves of digital innovation have taken longer to affect the insurance industry than many other sectors. We knew that 2020 would launch the digital decade for our industry, but COVID-19 has accelerated the pace of digital change even more than anyone could have anticipated.

The growing universe of innovation and digital players presents insurers with many opportunities: accessing new risk pools; selecting better underwriting and pricing risk via new data-driven tools and techniques; and supporting customers' risk management activities. However, client feedback from across the Hannover Re Group reveals that insurers are struggling to keep on top of this dynamic landscape.

We have developed the hr | equarium platform to address this client need. The platform enables insurers to locate digital innovations across the value chain more efficiently, e.g. digital distribution tools, consumer engagement platforms, and policy administration and claims management systems. There are approximately 150 global solutions on the platform with 2-3 new solutions added every week. Solutions are searchable across the value chain and trending topics.

About

hr | equarium is an exclusive and free service for our clients and the digitally powered companies on the platform. Over 600 clients regularly use the platform.

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Over the past year, several insurers have started integrating hr | equarium into their ideation and innovation activities. Clients have shared the following use cases with us.

Systematically source digital innovations.

Rather than the hit and miss process of talking with many companies to find a promising few, hr | equarium significantly speeds up the process of locating suitable partners. One client highlighted that its success rate via hr | equarium is much higher than its previous process of attending insurtech conferences.

Draw inspiration for internal ideation activities and assess the uniqueness of internal ideas.

Following an in-house ideation competition, one client decided to offer customers a digital health and wellness solution. It initially planned to build a platform in-house, but decided to deploy a suitable off-the-shelf solution it sourced via hr | equarium. This approach was less expensive and quicker to market, avoiding the need to reinvent the wheel!

Understand the evolving 'art of the possible'.

Many insurers have been reluctant to approach genomics due to regulatory constraints amongst other factors. The growth in digital health and wellness solutions, however, is creating opportunities for insurers to begin offering limited genomics-related services to customers. Several clients have broadened their thinking on this nascent area using hr | equarium material.

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