



Actuaries
Institute

The Impact of Big Data on the Future of Insurance

GREEN PAPER





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Executive Summary

Insurance provides financial protection to the community by pooling resources to manage risks. That approach is now being significantly refined by insurers' increased capacity to examine risks in greater detail through the analysis of large volumes of granular data. The outcome is that increased individual risk pricing will make premiums fairer in that they will be more reflective of that risk.

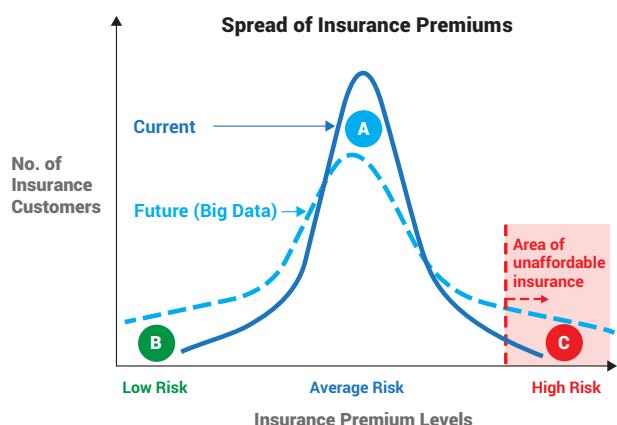
"Big data" refers to the massively increasing volume, velocity and granularity of data sets that are being accessed and linked. The ability to compile and analyse those very granular data sets is now transforming the way insurers see large pools of consumers and how they price risks. This will have implications for the cost and availability of insurance for all consumers.

The good news is that many consumers will benefit from this new technology. Premium pricing will more accurately reflect risk behaviour – good young drivers will pay less than risky young drivers (or risky older drivers). In practice, price signalling can be used to drive better behaviour and reduce risk. However, there will be a smaller group of consumers that have to pay more for insurance because they are considered higher risk, even though they may not be able to control the risk they seek to insure. This paper outlines the potential impact of 'big data' analysis on consumers and considers some of the resultant public policy issues that will face society.

The key findings presented in this paper are:

1 Greater risk transparency facilitates better behaviour

Increased analysis of granular data has many benefits for insurers and their customers. By better understanding customer's risk profile, insurers will be able to provide closely tailored, and more accurately priced, products. By flattening the curve in the diagram (above right) granular data analysis will reduce insurance premiums for many, but for a minority, premiums will rise significantly. Overall, there will be fewer insureds treated as "average"



risk (area A) who pay average premiums. They will increasingly be classed as either lower or higher than average. Greater numbers of insureds will therefore be recognised as being lower risk and given lower insurance premiums (area B). Conversely there will be an increase in consumers falling into the higher risk category, ultimately reaching the "unaffordable" levels of insurance premiums (area C).

Importantly, more acute analysis of data provides insurers with a lens to identify the risks that individual customers may be facing and to use price signals to change behaviour. Early client warning can provide an incentive to undertake risk mitigation. However, the insurer's responsibility to disclose risk information to the consumer, especially health-related material is not clear and may prove contentious.

"The most imminent effects of disruption will be felt in the banking sector; however, the greatest impact of disruption is likely to be felt in the insurance sector."

WORLD ECONOMIC FORUM, "THE FUTURE OF FINANCIAL SERVICES" REPORT, JUNE 2015

2 Government may need to tackle risks not controllable by consumers

Increasing the sophisticated analysis of large data sets will create significant issues of insurance access and affordability for society and for policymakers. A key issue is whether society wants individuals to pay a 'fair price' for insurance that reflects risk or does it want everyone to have affordable access to insurance regardless of the risk. Government may have a role to play when competitive insurance markets do not deliver adequate cover at an affordable price. This is especially so when the underlying risk is beyond the consumer's control.

Determining how to protect consumers whose increased risk profiles are becoming more transparent by virtue of new data will be a critical public policy issue for government. Some policy considerations to establish protection for consumers with uncontrollable risks (e.g. genetic factors), include:

- Impose restrictions on pricing as happens with CTP.
- Develop new risk sharing mechanisms akin to the health risk equalisation scheme.
- Confirm Government as 'insurer of last resort' as it is for uncertain potentially expensive risks such as terrorism events and longevity (which includes Age Pension costs).

3 Risk reduction -v- Privacy: the consumer's dilemma

Increased awareness of consumer behaviour, gleaned from the capture and analysis of higher volumes of detailed data, allows service and product providers to improve their offerings to individuals. Individuals will also get the opportunity to receive tailored information from their insurer about the risks they face. Insurers can develop services which give customers signals about how to reduce their risk levels and hence their insurance premiums. This will lead to a society-wide risk reduction benefit.

Nevertheless, the increase in the volume of data held on people and the way it is used (or perceived to be used) may lead to an increase in privacy and discrimination concerns. Government will need to consider the adequacy of currency privacy rules and rules for access, ownership and use of personal data.

As new types of data (sourced from social media, supermarket and credit card transaction data, for example) are gathered and used by insurers in the normal course of doing business, consumers may not be aware that the insurer has accessed this information. This may be considered an invasion of privacy by some (despite the fact that people often reveal their private data voluntarily through social media or by agreeing to accept contractual terms and conditions that allows sharing of their personal information). The availability of new data and its use will test society's willingness to accept the efficiency benefits compared to privacy considerations. Insurers have a responsibility as part of their business-as-usual to protect any consumer information they collect, hold or use, but are also exposed to increasingly sophisticated and persistent cyber breaches.

In addition, questions will arise around who owns the information, what personal data might be used for and to whom it may be passed. These are important issues for society and will require deep consideration by policymakers.







Big data will allow consumers and insurers to see and understand risks more clearly. It offers enormous insurance benefits for society such as improved risk management and fairer premiums. Many will benefit, but government will need to tackle issues such as privacy, discrimination and uncontrollable risks to protect society, particularly the vulnerable.

Background

1

1.1 What is big data?

Data is any piece of information, fact or statistic that is collected. It can be structured or unstructured, self-provided information, published reports, or logs of all internet searches. So much that we do in the modern world leaves a digital trace (i.e. data), which can be analysed and used to provide insights. The data volumes are exploding; more data has been created in the past two years than in the entire history of the human race. Yet at the moment, less than 0.5% of all data is ever analysed and used¹.

The phrase “big data”, is now commonly used across many industries. It has arisen from rapid advances in technology and the digital connectedness of society. It is often described using the multiple Vs definition, as data that brings challenges in volume (size), velocity (speed), variety (formats), veracity (accuracy), as well as visualisation, value etc. For the insurance issues considered in this paper, it is these ever increasing volumes and granularity of data and their use in revealing patterns, trends and associations, especially between human behaviour and events that occur, that is being explored.

The 2014 Financial System Inquiry concluded that the effective use of data is increasingly integral to the efficient functioning of the economy. Improved availability of reliable data, combined with the tools to use it, is creating new economic opportunities. Increasing availability of data can facilitate development of new products and services, enhance consumer and business outcomes, better inform decision-making and policy development, and facilitate greater efficiency and innovation in the economy².

1.2 What is insurance?

Traditionally, the basis for how insurers help the community to protect itself from the financial consequences of risk, is by pooling across a large number of policies. This allows the sharing of the risks of whether and when an undesired event would occur, and the size of the event if it occurs. A few examples of such events include the death and/or loss of income of a breadwinner, a costly medical procedure in hospital, or damage to one's property (car or house). Insurance is primarily a means of protection from the financial consequences of such misfortune.

Some insurance policyholders will suffer from such events and call on their insurance policy to support their financial loss. For many other policyholders, those adverse events will not happen. Risk pooling spreads the costs amongst a group of policyholders so that the claims of the few can be paid for out of the premiums of many. As such, the premium for each policyholder is based on the expected amount of risk that the individual brings to the pool.

1 Antonio Regalado, "The Data Made Me Do It", *Big Data Gets Personal*, MIT Technology Review (2013).

2 Productivity Commission, A.G. (2016) *Data Availability and Use*. Available at: <http://www.pc.gov.au/inquiries/current/data-access/issues/data-access-issues.pdf> (Accessed: 29 July 2016).

3 General insurance is any insurance that is not covered by life and health insurance, such as motor and household insurance

4 Australian Bureau of Statistics (2016). Australian National Accounts: National Income, Expenditure and Product, Mar 2016 Available at: <http://www.abs.gov.au/ausstats/abs@.nsf/mf/5206.0> (Accessed: 29 July 2016).

**“For the first time,
(we are) increasing
rates for a small
number of drivers
whose driving
behaviour justifies
such rates.”**

The following statistics illustrate the importance of the insurance industry in Australia:

- Insurance claims paid under life, general³ and health insurance were \$92B in 2015⁴. That was 6% of GDP.
- 11.3 million people had private hospital cover as at December 2015, which is 47% of the Australian population.

The insurance industry is expected to change rapidly in the coming years due to technology and innovation.

PROGRESSIVE CORP., US, 2015

1.3 How is data currently used in insurance?

Insurers rely on data and statistics to determine the cost of risk and to set prices for their insurance policies. The principle of disclosure requires consumers to disclose all information that the insurer determines is relevant to pricing their risk – this aims to ensure that no information asymmetries exist between the consumer and the insurer. In most lines of insurance, insurers are free to choose the factors they will use for setting their prices. They are able to charge different prices by age and gender if there is a proven actuarial/statistical basis to do so but not by race or sexual preference, where anti-discrimination law otherwise applies. Insurers rely on data to identify the relevant pricing factors and the differentials between those factors. They charge consumers accordingly, based on the risk they pose as well as other business considerations.

There are nuances between general insurance (e.g. motor and household) which is considered short-term (i.e. can be underwritten and re-priced each year) and individual life insurance which is long-term (i.e. underwritten only once, when the policy is first taken out). Life insurers cannot change the price of their policies on the basis of the insured's changing state of health.

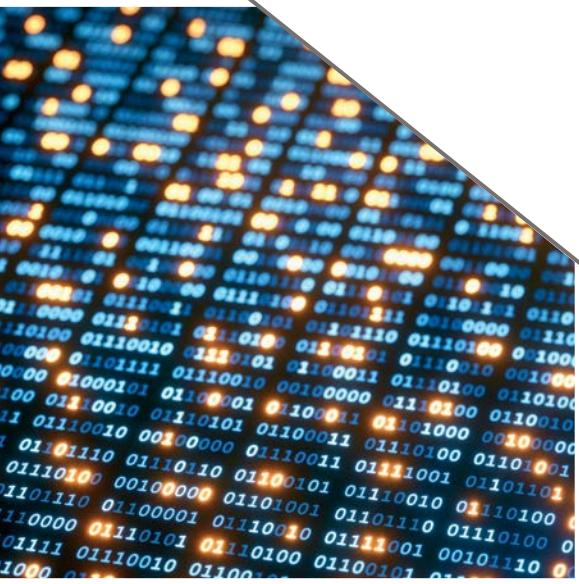




Regulation has restricted the use of data by insurers in pricing “compulsory classes of insurance” – such as Compulsory Third Party (“CTP”) and Workers’ Compensation – and health insurance. While insurers may collect and use data as they wish, they are restricted about how they translate this data into premiums. For other classes of business, such as life or motor insurance, insurers have had freedom to use data in pricing. Across all forms of insurance, the extent of freedom given to insurers can be split broadly into the three levels shown in the table below.

Table 1: Levels of Pricing Freedom Within Insurance

- | |
|--|
| 1. Community rating – where Government does not allow the insurer to vary the price between policyholders on grounds of risk e.g. <i>health insurance</i> . |
| 2. Restricted rating – where Government allows insurers to vary the price, with restrictions to ensure insurance premiums stay within a band and remain affordable to both low and high risk policyholders e.g. <i>CTP, Workers’ Compensation</i> . |
| 3. Unrestricted rating:
a) At a grouped level – where insurers have the same the price for like members of a group, such as those of the same age, gender and smoking status, e.g. <i>most elements of motor, life and home insurance</i> .
b) Individual rating – where the insurer has access to enough relevant individual policyholder data to enable it to price insurance specifically for that individual e.g. <i>motor insurance where the car is fitted with a telematics device</i> . |



Apart from pricing, there are many other areas where insurers use data, including marketing, analytics and valuations etc. One of the more encouraging uses of data, explored further in section 3 with examples, is the use of data to influence policyholder behaviour and reduce risk.

Some examples where improved data is increasing the understanding of pooled risks include:

- Improved accessibility and availability of personal medical information (e.g. through wearables like Fitbits we can obtain data such as exercise, activity, sleep etc.) reveals how an individual’s medical condition might impact future health and longevity.
- Consumers’ information such as family status, spending patterns and choices, income/wealth can be used to predict behaviour and lifestyle.
- Continuous and immediate motor vehicle information including location, driver behaviour and engine information.
- Natural disaster event information allowing a better understanding of locations and level of future events e.g. flood mapping information across Australian residential areas.
- Information from internet connected devices in the home or business such as smoke detectors or water usage monitors.

2

Future insurance premiums will more closely reflect the risks of an individual, as premiums are tailored to an individual's profile.

What are the implications for society?

2.1 Overview

This section explores the societal implications of the use of increasing amounts of data.

A survey of Australian and New Zealand insurers⁵ found that many insurers see big data as a medium term opportunity, and most insurers will be using big data in some form in the next two years. 97% said that big data initiatives were on their organisation's agenda.

Insurance is changing as insurers are increasing their access to and use of data to price policies on a more individualised risk basis. Premiums will more closely reflect the risks of an individual, as premiums are tailored to an individual's profile.

The conclusions drawn in this section are:

- Analysis of the data will help the insurer understand risks better, lowering premiums for the low risks and increasing them for the high risks.
- It brings the opportunity for a more far-reaching role for insurers, that of risk signalling and helping consumers and society to reduce their risks.
- The competitive advantage that data brings means that insurers that choose not to use available data will end up with the unsustainable position of only insuring the higher risks. Hence big data usage is likely to become widely adopted.

2.2 What will increased data usage lead to?

The availability of new and informative data (including social media posts and internet browsing history) will increase insurers' understanding of individual consumers' risks.

As a result, there are potentially at least two major insurance outcomes:

- Better risk signalling.
- Greater premium dispersion.

2.3 Better risk signalling

The more insights that insurers are able to draw from data about an individual, the more they will understand the risks to which the insured is exposed, and potentially how to mitigate them.

⁵ Finity Consulting (2016) Big data survey results. Available at: <http://finity.com.au/pages/big-data-survey-results/> (Accessed: 29 July 2016).

Insurers may then take a pro-active role to reduce risk rather than their current reactive role of compensating for the cost, if an event occurs. Individuals will get the opportunity to receive tailored information from their insurer about the risks they face. Insurers can develop services around this risk reduction, so that their customers will get signals about how to reduce their risk levels and hence their insurance premiums. For example, wearable devices can provide health information that can prompt insurers to reduce an individual's life insurance premium. This is explored further in section 3.

2.4 Greater premium dispersion

Improved data will allow insurers to price more precisely, ultimately down to the individual insured. Current pricing factors used in insurance to price a group of insureds will be replaced by more accurate predictors of individual risk characteristics. For example, an insurer that currently charges extra for all drivers under age 25, can shift to charging using the specific driving behaviour of each driver under age 25. Some under age 25 drivers will be worse than the average and some will be better. The insurer will be able to price them differently. The reckless under-25 driver who is constantly on the road may not be able to afford insurance without changing his or her driving behaviour to reduce the risk.

In this way, bigger data will lead to a broader spread of premiums between the lower and higher risks. While some will enjoy lower premiums, others will face higher premiums that in some cases may be unaffordable. Other high risks may find insurance is not available to them, or available at a price which is so high it is effectively unavailable unless risky behaviour is modified. Already, new data is making previously insured customers uninsurable and this outcome is likely to continue. See section 4.2.



2.5 Other consequences

2.5.1 Risk pooling still relevant

While the insurer may have a more precise assessment of the risk factors for an individual, it will still not be able to predict with certainty which insured events will happen, when and with what impact. The basis of insurance that the claims of the few are paid out of the premiums of the whole pool, will not change. Insurers will continue to have a role in pooling risk across many individual risks and this will continue to be a valuable service to the community.

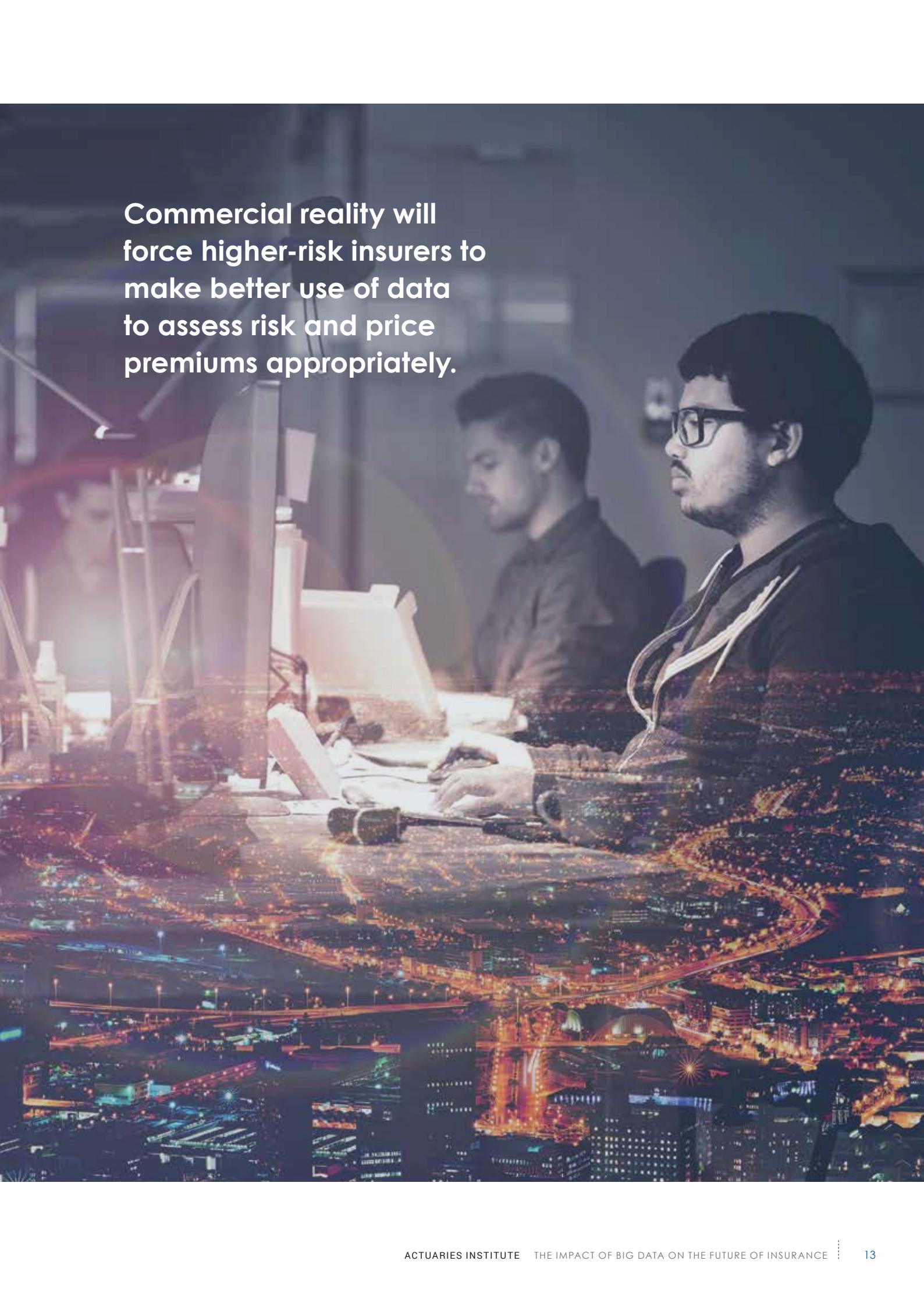
2.5.2 Privacy considerations

The use of big data can potentially create consumer uncertainty about how premiums have been determined. Black boxes can sometimes lead to premium anomalies and insurers will need to continue to understand how data gets translated to premiums and be able to communicate this to insureds. Another key question that arises from the holding and using of more data on an individual is the increased threat to privacy. This is discussed further in section 4.3, together with some other potentially adverse consequences.

2.6 Is it inevitable that insurers will use big data?

As one insurer uses more data to select and price its risks for competitive advantage, it will be able to offer lower premiums to attract lower risks. Simultaneously it will increase the premiums for the higher risks. Those individuals will then seek out an insurer that offers unadjusted pricing. Those insurers will find their business deteriorating as their higher risk pools lead to higher claims without compensating premium adjustment. Commercial reality will force them to make better use of data to assess risk and price premiums, appropriately.

However, it does not follow that bigger data will be used for pricing all risks. Some risk pools are inherently small e.g. Stradivari instruments, and some have practical constraints such as superannuation group life policies where there is little information about individual fund members.



**Commercial reality will
force higher-risk insurers to
make better use of data
to assess risk and price
premiums appropriately.**



3

How might society benefit?

3.1 Overview

There are a number of potentially positive societal outcomes from the application of bigger and more granular data, including cheaper insurance for some, better customer service, relevant products improved underwriting efficiency and all the benefits from reduced risk to society at large (e.g. fewer car accidents, healthier population, fewer developments on flood plains).

As indicated in section 2, one of the key positive societal outcomes that we explore in this paper is better risk signalling. This is where the insurer makes sense of the data available to them on an individual (or their asset), identifies risks and advises the consumer of mitigation options. This feedback loop allows the consumer to alter their behaviour to reduce their risk exposure (such as their risk of having a car accident or of succumbing to a particular disease).

In the era of big data, consumers will be given specific suggestions on how to alter their driving habits to reduce their risk and hence their insurance premiums.

We expect incentive-based risk reduction to become more common. Behavioural economics shines a light on why various incentive programs work and are expected to change the risk profile of the insured population:

- People have a “present bias” – they prefer an immediate benefit to a much bigger payout in the future.
- “Nudge theory” is employed to encourage consumers to make positive changes to their behaviour and risk levels.
- People are overly optimistic about their health and risks, meaning they don’t believe they need to lead a healthy lifestyle to remain healthy. They need to be provided with incentives to do so.

There are many instances of insurers already adopting technologies and means of accessing increasing volumes of data on individuals, for a variety of purposes (refer to the Appendix for more detail). The following section highlights just a few such cases, as a means of demonstrating where and how big data is currently being used in insurance to drive these positive outcomes. The more data that becomes available and the more insurers embrace it, the better the outcomes are likely to be for society.



6 Basak, S. (2015) *Progressive to charge risky snapshot drivers more in shift*. Available at: <http://www.bloomberg.com/news/articles/2015-03-24/progressive-to-charge-risky-snapshot-drivers-more-in-new-plan> (Accessed: 29 July 2016).

3.2 Recent developments in risk monitoring and reduction

3.2.1 Information on specific driving habits

Car insurance is being transformed by the use of telematics devices that measure various aspects of how, when and where a car is driven. They collect data such as time of day, vehicle speed and braking tendencies of the driver. Some devices also use GPS technology to assess vehicle location, whether the driver takes breaks on long journeys, total mileage and number of journeys. These devices open the potential for insurers to offer usage-based insurance (“UBI”) products, as well as to determine an insurance premium that more accurately reflects an individual’s risk (or risk for a vehicle).

As a result, previous motor insurance proxies for risk are now being replaced by a more accurate assessment that doesn’t rely on a generalisation. For example, a particular 21-year old may actually be a safer driver than their 55-year old counterpart, in contrast to general ratings, other things being the same, and shouldn’t be penalised simply due to their age being used as a proxy for individual driver risk. Aside from possible rate savings for better drivers, users benefit from:

- Transparency – consumers are allowed to view their driving reports and projected insurance savings or penalties based on their driving behaviour.
- Feedback – consumers are given suggestions on how to alter their driving habits to reduce their risk and hence their insurance premiums. This has potential to create safer roadways and fuel savings (given less aggressive driving behaviours), with flow on positive effects to society.

Riskier drivers will, however, be penalised, as demonstrated by Progressive Insurance in the US. It has announced that “for the first time, [they will be] increasing rates for a small number of drivers whose driving behaviour justifies such rates”⁶.

The current pricing restrictions within CTP in Australia reduce the incentives for telematics adoption. However, a recent independent review of the NSW CTP Scheme recommended having a risk rating system which incorporates both free rating and risk pooling elements.

As much as telematics and pay-as-you-drive initiatives are changing the way that risk is assessed for motor insurance, self-driving cars (or cars with features like automatic steering, automatic braking etc.) are becoming available. In the future, insurance may indeed shift from insuring the driver (based on their behaviour) to product liability insurance for the car manufacturer.

Data reveals that engaged members of wellness programs are more likely to take up and maintain physical activity with fewer visits to hospitals and for noticeably shorter periods.



3.2.2 Increasing lifestyle and health information

Lifestyle and health data collected by insurers is being used to influence behaviour and to reduce the risk to which both the individual and the insurer is exposed. In a Future of Insurance Survey report, more than half of insurers surveyed believe that big data, analytics and wearables will collectively have the biggest impact on insurance and be the biggest focus of innovation in the future.

Lifestyle based programs involving the use of wearables like smart watches, are increasing in popularity⁷. These programs involve insurers collecting personal data of individuals, and tracking a number of policyholder behaviours including the number of steps taken, the number of minutes of activity throughout the day, resting heartrate and number of hours and quality of sleep. They are designed to positively influence policyholder behaviour through goal setting and incentives. This also produces more appropriate insurance premiums that more accurately reflect the risk of the policyholder. Research suggests that 93% of retail customers (in Australia, France, Germany, the UK and U.S.) are willing to share personalised data if they can save money or receive customised offers⁸.

Insurers and customers alike can benefit from using this data by:

- Customer rewards— rewards through third party partners (e.g. cash back on groceries, discounts on flights, vouchers) and reduced premiums in some circumstances.
- Reducing the risk profile of the insurer's portfolio, with consequent capital reductions. This can be achieved by:
 - Reducing the risk of customers, whether high or low risk initially, by setting goals or norms for individuals, tracking behaviours and updating customer profiles.
 - Selling to lower risk customers, who are attracted by the incentives for healthier lives / safer drivers.

These wellness programs have been pioneered by a large South African insurer, which has been partnering with multiple health and life insurers around the world. In Australia, its adoption is in its infancy (including MLC's *On Track* program, AIA's *Vitality*, Medibank's *Active Rewards* and Qantas' *Assure*), but will likely gather pace. On the health insurance front, its adoption may be limited due to community rating restricting the ability to feed back pricing reductions to customers, but other rewards can be offered to the customer.

7 Shifting Gears (2016) *Future of Insurance Survey Report*, pp. 2. Available at: https://gallery.mailchimp.com/0642bef74d75ab6a529d451d1/files/FST_Report.pdf (Accessed: 29 July 2016).

8 Fiorletta, A. (2013) 93% of consumers would share personal data in exchange for customized offers. Available at: <http://www.retailtouchpoints.com/shopper-engagement/2769-93-of-consumers-would-share-personal-data-in-exchange-for-customized-offers> (Accessed: 29 July 2016).

9 Vitality (2016) *Vitality on fortune's first 'Changing the World' list*. Available at: <http://www.thevitalitygroup.com/vitality-on-fortunes-first-changing-the-world-list/> (Accessed: 29 July 2016).



According to one insurer, independent studies⁹ show that engaged members are more likely to take up and maintain physical activity with fewer visits to hospitals and for noticeably shorter periods.

Those who respond to the programs and reduce their risk will be rewarded. The insurance industry is still determining what will happen to those who don't engage or where their low engagement leads to them being classified as a high risk, but to an extent they are already being penalised if they are not receiving the available discounts.

3.2.3 Improved genetic information

Genomics uses DNA to better understand the function and structure of genomes (the complete set of DNA within a single cell of an organism). Genetic testing can be used by insurers to better understand the risks to which individuals are pre-disposed. A useful clarification here is that despite being pre-disposed to a risk, it doesn't mean the risk is certain to eventuate, just more likely.

As these types of tests are becoming increasingly more affordable (as low as \$US99), people are more likely to seek their own genetic information to improve the precision of diagnosis and treatment of many conditions. The insurer's ability to combine test information with other client data and medical expertise can assist the individual to recognise and reduce their health risk.

There is further discussion on genetics testing, in terms of potentially adverse consequences and solutions, in sections 4.4.2 and 5.3 respectively.

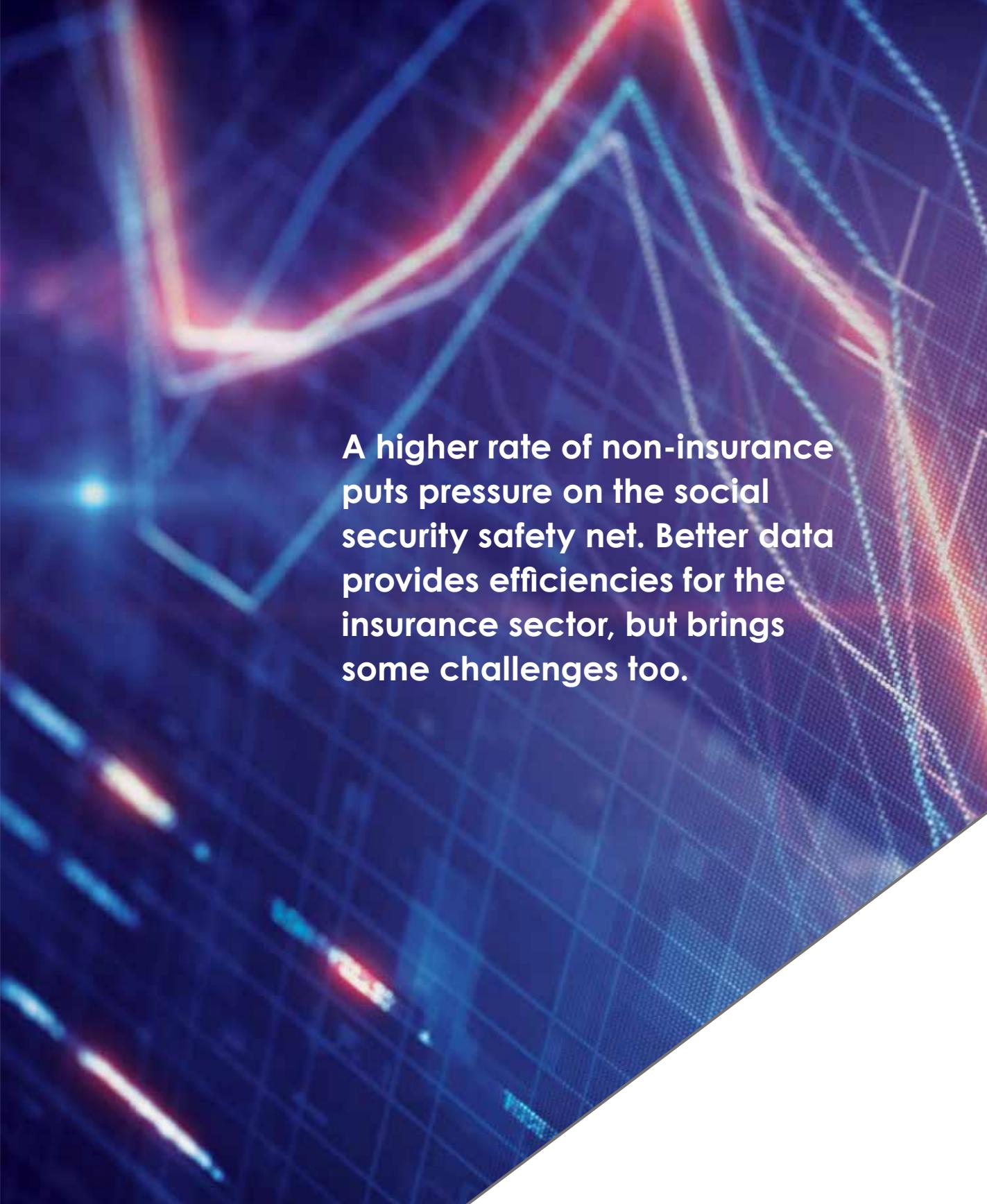


3.2.4 Connected Homes and the Internet of Things ("IoT")

In recent times, the Internet of Things revolution has led to a multitude of household devices becoming "connected" – connected to each other, connected to the internet, connected to the homeowner and beyond. Smart/Connected homes represent a network of connected home appliances, electronic devices, control systems and computers.

Connected homes can benefit insurance policyholders by: identifying and monitoring risk factors (e.g. temperature, smoke or surges in water usage), automatically modifying the environment to prevent risks from occurring (e.g. a water sprinkler being triggered or a smoke alarm that signals to your mobile phone to take corrective action to prevent fire), or taking adequate action for early triaging of the risk (e.g. an early warning alarm sent to the relevant emergency services to ensure early intervention and thus minimising damage). Smart homes may also allow insurers to anticipate incurred claims earlier and perhaps assist with the rehabilitation of the insured property.

⁹ Vitality (2016) *Vitality on fortune's first 'Changing the World' list*. Available at: <http://www.thevitalitygroup.com/vitality-on-fortunes-first-changing-the-world-list/> (Accessed: 29 July 2016).



A higher rate of non-insurance puts pressure on the social security safety net. Better data provides efficiencies for the insurance sector, but brings some challenges too.



How might society be adversely impacted?

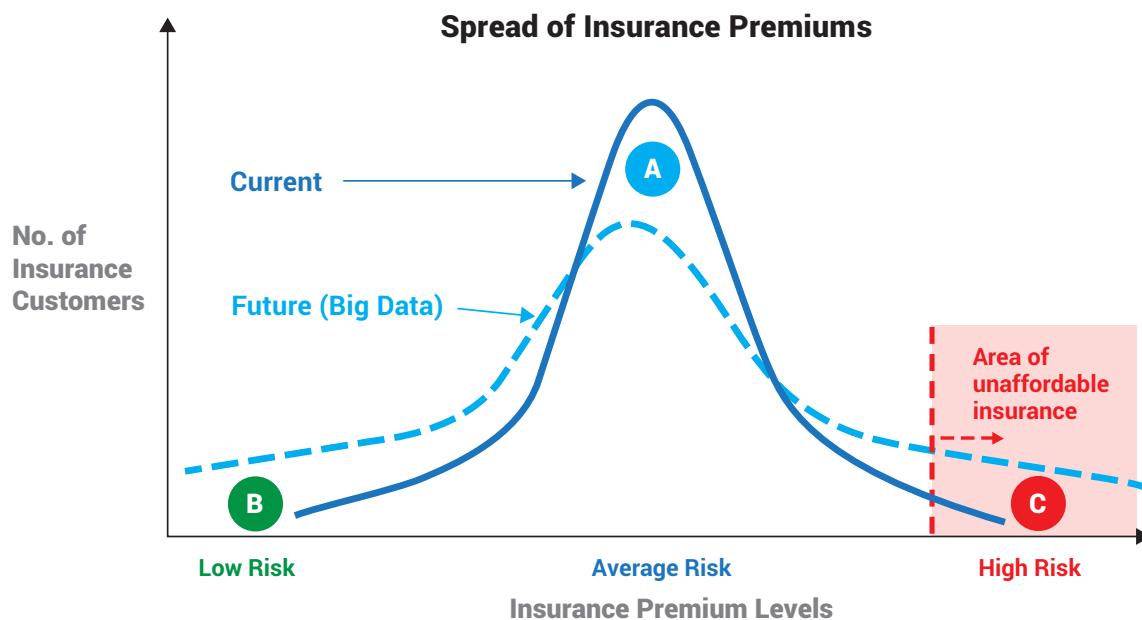
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4.1 Overview

Australians benefit from insurance protecting them from the financial consequences of unlikely and unpredictable adverse events. Higher rates of non-insurance potentially impact the health, wealth and wellbeing of individuals and puts pressure on the social security safety net. Better data provides many improvements to the efficiency of the insurance sector, but brings some challenges too.

4.2 Insurance will become unaffordable or unavailable for some

As explained in section 2.4, examination of big data will allow insurers to better distinguish between risks. The higher risks will only be able to be insured for higher prices or on worse terms. At the extreme, some policyholders will have their risks assessed as so high that the price will be prohibitive or insurers will decline to provide cover. The following diagram illustrates the effect that increasing data will have on insurance premiums.



As explained, the distribution of insurance premiums will “flatten out”. Overall, there will be fewer insureds treated as “average” risk (area A) and paying average premiums. They will increasingly be classed as either lower or higher than average. Greater numbers of insureds will thus be recognised as being lower risk and given lower insurance premiums (area B). Conversely there will be more consumers falling into the higher risk category, ultimately reaching the “unaffordable” levels of insurance premiums (area C).

For example, increased flooding on Australia’s east coast in 2011-2013 resulted in the collection of new flood information and an increase of some flood cover premiums by insurers. As at March 2013 it was estimated that 9% of building and contents policies did not have active flood cover and the Insurance Council of Australia confirmed that around 7% of policyholders have exposure to flood risks. Therefore, it is reasonable to conclude that the people most at risk of flood and who need cover most are also those that are most likely to be uninsured for it.¹⁰ The issue of affordability is compounded by the fact that often the areas with the highest premiums are those with the lowest income levels. Allianz¹¹ has stated that in its experience, the annual premium for a home building and contents policy (e.g. total sum insured of \$400,000) for a property in a flood-prone area can be as much as \$20,000. Similar concerns have arisen for cyclone risk.

In response, some people may mitigate or avoid the risk. Others who find the insurance premiums for their risk to be unaffordable may have to take the risk themselves. If the risk event does happen, they will suffer financially. The more people change from insured to uninsured status because of price increases arising from more targeted use of data, the greater the burden will be on the public purse or on others outside the insurance system.

¹⁰ <https://www.actuaries.asn.au/Library/Submissions/GI/2014/19June2014ProdComNaturalCatastropheDisasterFunding.pdf>

¹¹ Allianz Submission Inquiry into the Development of Northern Australia

Unaffordability or unavailability of insurance may marginalise high risk individuals, preventing them from participating in all of life’s activities. Examples of how this already occurs today are a breast cancer patient who cannot fly because travel insurance is not accessible, or a mortgage application is declined because life insurance cover is denied. Circumstances such as these will become more prevalent as more individuals are identified as particularly high risk, in the absence of market or technological solutions.



Privacy concerns may arise over the use of private information within big data in future; particularly over who actually owns the information.

4.3 Privacy concerns

The principle of insurance is that insureds are obliged to disclose all that they know about their risk and the insurer may ask any relevant questions of the insured. The insurer may seek additional information, (e.g. a medical examination for life insurance) or an inspection of the insured asset, (e.g. a mine site). Thus the insurer obtains a large amount of private information and will obtain even more in a world of open data (perhaps from other sources, where the applicant may not even be aware that the insurer has accessed this information). At what stage does the insurer's acquisition of certain pieces of personal information become a privacy breach?

Privacy concerns may arise over the use of private information within big data in future; who owns the information (the insurer, the consumer, the product manufacturer such as Fitbit or telematics manufacturer, or the collection source such as the supermarket or gym), what your personal data might be used for and who it may be passed onto. As mentioned above, this does not only refer to data that is directly provided by the applicant/insured; it could include your social network footprint or tracked internet browsing history.

Data security is another area of concern, especially given the growing threat from cyber-attacks. The security and confidentiality of consumers' information has to be protected.

4.4 When a "fair" premium becomes undesirable

A premium that reflects all that is known about a risk, together with an appropriate amount for costs and profit, can be said to be a "fair" premium. But is this desirable? Fairness can also be seen from the viewpoint of the customers who are paying higher or lower premiums as a result of big data. Improved data will produce winners and losers amongst insurance customers. As a society we might ask:

"given insurers' increasing ability to accurately price risks, do we want to charge individuals the price that reflects their risk level or do we sometimes want to ensure that everyone has access to affordable insurance? At what point do we want to interfere with a free market?"

One way to consider this question of what is desirable is to consider two groupings, depending on the level of control the insured has over their risk factors:

- Risks within the individual's control ('controllable risks').
- Risks that are not within the individual's control ('uncontrollable risks').

Whilst acknowledging that it is not so black and white, many insured losses are, at least to a degree, within the control of the individual (improved diet and fitness can reduce health risks). Others are not within their control (such as a genetic make-up or having bought a property before the flooding risk was known). There are also many instances in the grey area in between (e.g. shift workers driving during the riskier night-time period).

4.4.1 Controllable risks

Some risks are controllable and premiums can be reduced or cover provided if appropriate mitigation action is taken. A reckless driver can take more care and reduce speeding; a sedentary office worker can exercise more often. If the customer responds appropriately to the right risk signals they can reduce risk and premiums.

For controllable risks, there is a benefit for all of society from understanding big data trends and pricing at the individual level. Customers benefit from what they are learning from the insurers. Community benefits from less risky behaviour of these individuals could include fewer road accidents and lower health and welfare costs.

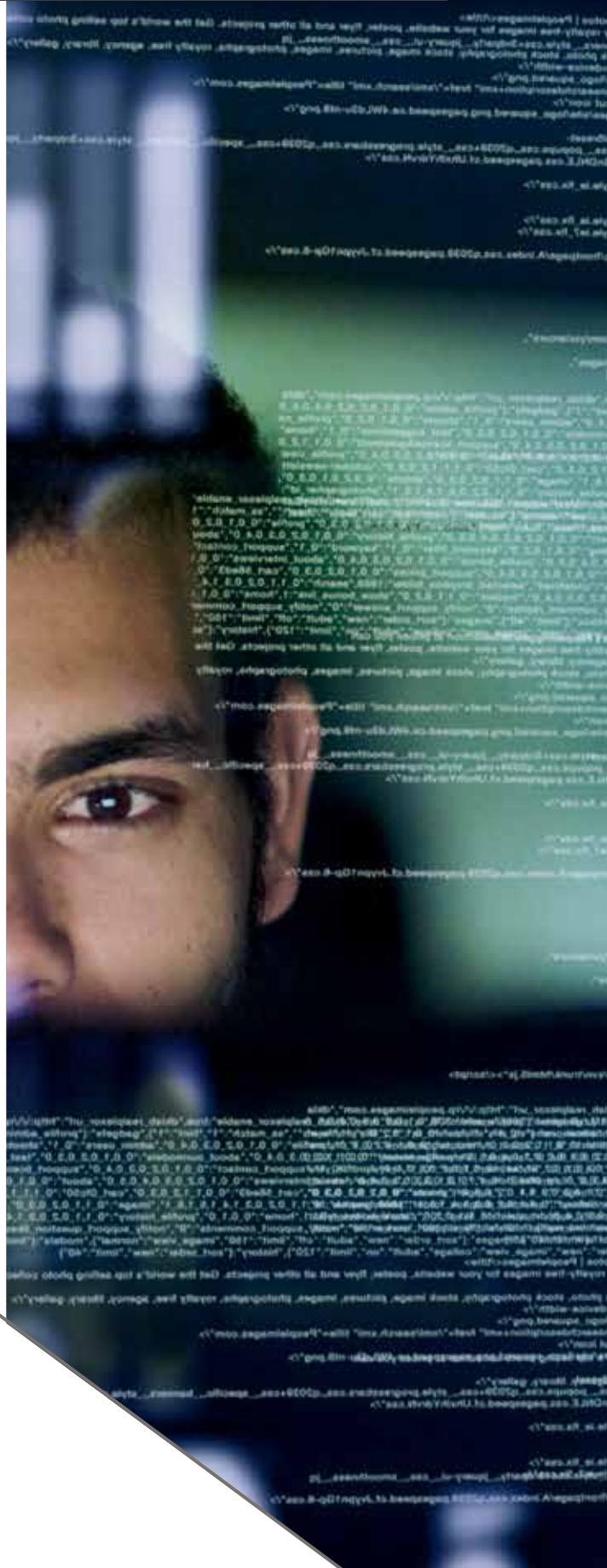
4.4.2 Uncontrollable risks

Some people will face higher premiums due to factors outside of their control. The highest risks may include the location of homes on a flood plain or in a catastrophe prone area, genetic make-up and pre-disposition to certain health risk factors.

For these groups of risks, the use of big data will raise unaffordability issues that cannot be mitigated by the individual modifying the risk. There are likely to be society-wide and public policy implications to ensure that their basic needs for risk protection are met. The key question is whether these individuals should be protected by insurance solutions or through the existing welfare and self-financing systems.

An example of an uncontrollable risk is one's genetics. With genetic testing there is a concern that individuals will not be aware of (or understand) the potential future consequences on life insurance pricing and availability when undertaking a genetic test. With the reducing cost of a genetic test and increasing awareness of their function, there is likely to be an increase in the number of tests taken. Underwritten life insurance products and those required for business and bank loans may be impacted by a genetic test result, especially in Australia where a person is obliged to disclose such results to their insurer when requested. Then there is anecdotal evidence of people putting off genetic testing because of concerns around their insurability and being mandated to share this information with the insurer.

Defining the line for what is outside the control of the individual is not straightforward. For example, some unhealthy people might argue that it is at least as difficult to change their habits and lifestyle as it is for someone else to move their home away from a flood plain.



Gender is not controllable but Australian insurers (in contrast to European insurers) currently use different pricing for males and females acknowledging their different risk profiles. What society deems acceptable in terms of discrimination evolves over time and legislation can lag societal change. This could leave insurers using data to charge different premiums for different risks in a manner that is legal but not in keeping with current societal expectations.

4.4.3 Data accuracy

The reliability and accuracy of the data will be important. Issues may arise from:

- Malfunctioning measurement devices.
- Inaccurate data transmission.
- Misuse of a measuring device, deliberately or inadvertently (e.g. the insured who lends their Fitbit to a fitness fanatic in order to appear active and healthy; the insured who purchases “unhealthy” groceries but on behalf of a friend; or the insured whose car is driven by a family member or friend, thus skewing their driving data).

4.5 Inappropriate or insufficient risk signalling from insurers to consumers

Big data will give insurers a large amount of information about a risk. How this knowledge is used brings opportunities and responsibilities. Where there are controllable risk factors, the insurer often has a financial interest in helping to motivate the insured to reduce the risk. The means of motivating changes in behaviour to reduce risk will vary from consumer to consumer but as a starting point, information about the risk and how to manage it is essential. The insurer may even become aware of an increased risk before the consumer does, for example through health monitoring data (such as a smartwatch) or an imminent hail event.

There may be issues with an insurer sharing its findings from its data:

- Some consumers may not want the information.
- The findings may not be properly understood by the consumer (possibly leading to inappropriate responses).
- There may be a liability for an insurer if the consumer acts inappropriately on the information or if the information is inaccurate.

For example, a future life insurance product provided to someone at higher risk of heart attack might include constant monitoring by the insurer of blood pressure through a connected device. Elevated blood pressure could trigger warnings and actions. However, ensuring

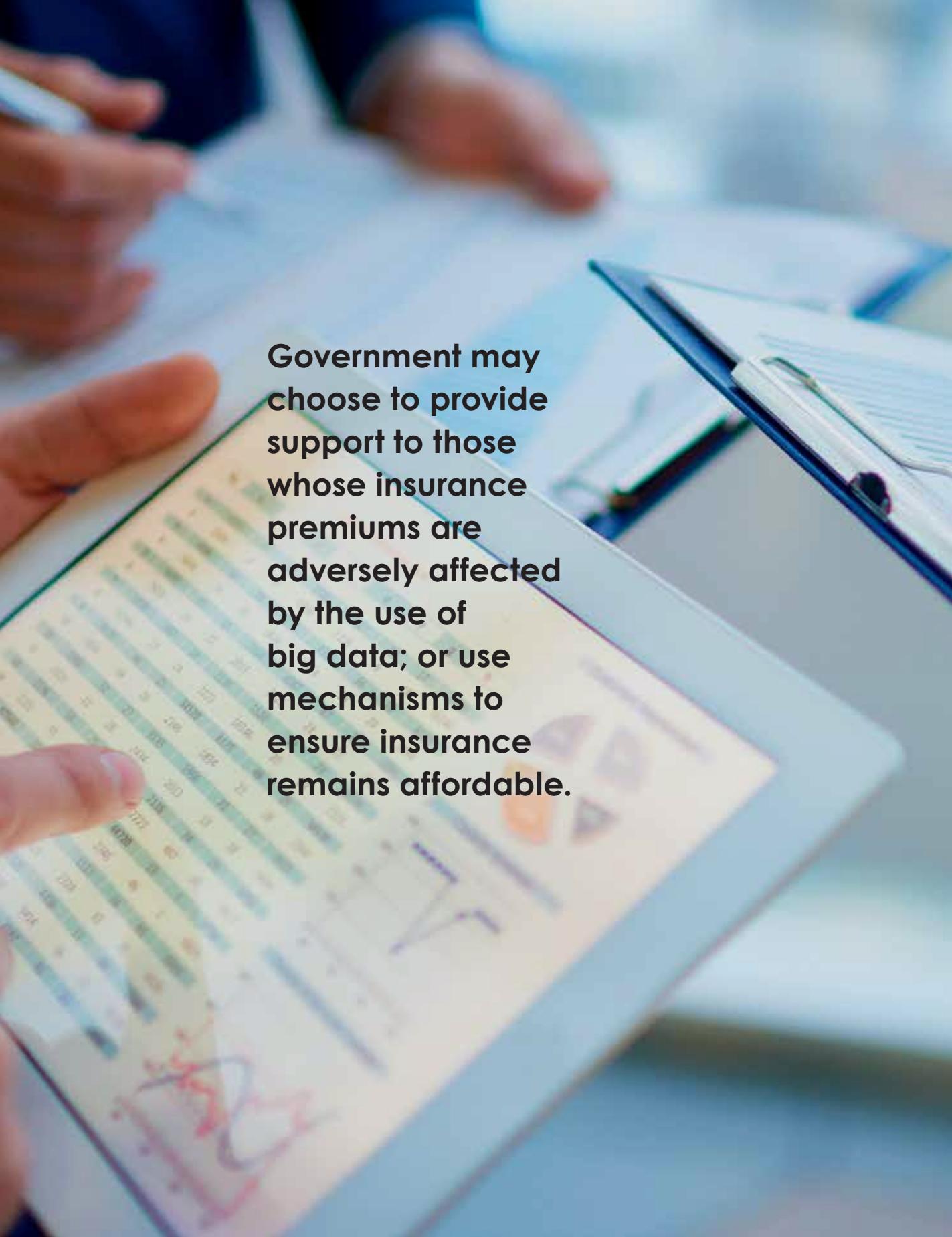
that these monitoring processes are suitable at any point in time is not straightforward. Alerting too early could be a waste of resources and may create additional stress for the consumer. However, alerting too late, should a heart attack actually occur, may mean the insurer is held responsible for not having taken action earlier.

An additional obstacle to risk signalling is the period between risk-reducing behaviour and resulting lower claims. This may be decades (e.g. better nutrition in early adulthood leading to lower claims for health and life insurance many years later). Thus an insurer's claim costs may not be any lower for those who reduce risky behaviour for many years. This may make it uneconomic to give premium reductions in the early period that would encourage the risk reduction.

4.6 Competition

Data is not only being gathered by insurers, but by retailers, banks, airlines, technology companies etc. Increasingly this data is being shared between organisations. There are also increasing amounts of open data. The Productivity Commission's inquiry into *Data Availability and Use* acknowledges the importance of this issue. The collection and amalgamation of this data will be a source of competitive advantage in pricing insurance. However, there is a cost in the collection and use of the data. The insurer will be looking for the benefits of collecting the data to outweigh the costs. Excessive regulation could stop the gains from being realised and the benefits to society of big data would be lost.

An insurer that gathers big data on a specific risk category may develop a greater understanding of that risk than its competitors. This may make it difficult for the insured to obtain competitive quotes from other insurers which do not have as much information about the customer. It may also make it possible for the insurer to charge a premium in excess of the fair price for the risk but still lower than the price charged by a competitor. In these two ways, the market may become less competitive with consequential costs for the economy as a whole. The situation could be worse if the market becomes very concentrated with a small number of larger insurers holding the largest data sets. Competition regulators will need to monitor changes in market forces to ensure that the insurance market remains competitive enough to protect consumers from being exploited.



Government may choose to provide support to those whose insurance premiums are adversely affected by the use of big data; or use mechanisms to ensure insurance remains affordable.

5

Considerations for Policymakers

5.1 Unaffordable or unavailable insurance

Those who find insurance unaffordable through the use of big data can be expected to suffer significant financial loss if the event that they cannot afford to insure actually happens. The Government may want to provide them with support, particularly if the risk could not have been reasonably avoided or mitigated. That support could be provided 'after the event' through grants or other financial support to those in need e.g. post-disaster compensation or 'before the event' by risk mitigation. Alternatively Government could make insurance affordable by:

- Placing limits on premiums. Currently, the Australian Government restricts pricing and underwriting for insurance viewed as a "social good". Health insurance and Compulsory Third Party ("CTP") motor insurance are examples. This could be managed by requiring that a certain portion of an insurer's portfolio covers these high marginalised risks. Doing so would increase premiums for the lower risks.
- Implementing risk sharing mechanisms so that the costs of high-risk customers are shared amongst all insurers in that market. Such an approach could assist when placing limits on premiums, mandating that insurers provide some level of cover for high risk groups or facilitating community insurance. Again, this would increase premiums for the lower risks.
- The Government could become the "insurer of last resort" for those risks that no insurer will cover or take part of the risk. For example, The Australian Government covers commercial property and associated business interruption losses from terrorism as administered under the Terrorism Insurance Act 2003. In New Zealand the New Zealand Earthquake Commission shares earthquake losses with insurers.

People living in a flood prone area provide a good example. Home insurance may become unaffordable if changing weather patterns increase the likelihood of flooding.

'Post-event' support usually involves a mixture of Government support through the existing social security system and philanthropic support from the corporate and community sectors. However, 'post-event' assistance creates a lot of uncertainty for homeowners and public support donations can be variable.

'Before the event', the Government can take proactive steps such as building mitigation infrastructure, raising building standards and prohibiting new building in high-risk locations. It could also



put a cap on insurance premiums and require insurance to be made available, potentially supported by a temporary reinsurance pool¹².

A market driven solution could be developed by insurers using the increased data to gain a better understanding and management of risks, thus providing more affordable solutions to these marginalised risks. One example is AllLife in South Africa, which provides affordable life and disability insurance to policyholders who suffer from manageable diseases, such as HIV and diabetes, and who agree to adhere to a strict medical protocol.

5.2 Privacy concerns

The Privacy Act (1988) and the Australian Privacy Principles provide the privacy protection framework in Australia. As the use of data expands and community expectations change then the framework may need to be refreshed to continue to protect Australians in the way that they expect to maintain trust in the system. Therefore, we expect that Government would carry out periodic reviews to assess the need for change.

The Government may want to consider whether any restrictions should be placed on what information an insurer may seek. It could require insurers to be more transparent about the use of data and whether it will be sold or passed on. It might also confirm the right of the insured to understand whether their social network footprint or internet browsing history is being used.

Enhancing and maintaining individuals' confidence and trust in the way data is held and used is important, and is currently being explored by the Productivity Commission's inquiry into data availability and use. The security and confidentiality of these increasing volumes of information has to be maintained.

Solutions to privacy concerns are summed up by the Financial System Inquiry's recommendation number 19.¹³ "Review the costs and benefits of increasing access to and improving the use of data, taking into account community concerns about appropriate privacy protections."

5.3 Dealing with the undesirable impacts of insurance pricing

Scrutiny of big data may lead to insurance differences that Australians judge to be undesirable for society.

Society may see pricing for controllable risks in insurance as fair as it provides an incentive to change risky behaviour. Thus smokers can reduce their life insurance premiums by quitting and poor drivers can reduce their car insurance premiums by building up their no claims bonus. This could go further as premium incentives are available to reduce other lifestyle risks such as obesity.

Increased data will reveal new factors that measure risk over which the insured has no control, e.g. genetic predispositions. The Government may want to act in future to prevent insurance pricing that reflects uncontrollable risk factors that society thinks are unfair.

We note that insurers in Australia are currently not permitted to require a genetic test of an applicant for insurance, but are entitled to the results of previously undertaken genetic tests. This is unlike some other countries, including US, Sweden, Germany and France, which all prohibit genetic discrimination. The Australian approach is in keeping with the principle of disclosure, and reduces anti-selection.

12 Actuaries Institute's response to the Productivity Commission's issues paper on Natural Disaster Funding Arrangements <https://www.actuaries.asn.au/Library/Submissions/I/2014/19June2014ProdComNaturalCatastropheDisasterFunding.pdf>

13 Financial System Inquiry <http://fsi.gov.au/publications/final-report/>

Enhancing and maintaining individuals' confidence and trust in the way data is held and used is important.



Where appropriate, and in the light of prevailing community standards, Government could consider restricting the use of certain data on uncontrollable risks for pricing, whilst maintaining the principle of disclosure and avoiding the potential for consumers' adverse selection against insurers. An overseas example helps to bring these potential challenges to life.

Like Australia, Canada currently requires insurance applicants to provide the results of previously undertaken genetic tests to requesting insurers. The Canadian Institute of Actuaries constructed a model to assess the impact on companies and the public if underwriters were prohibited from accessing the results of genetic tests known to applicants. In separate studies for life (term) insurance and critical illness, they concluded that as a result of the genetics test prohibition the average claim rates within the term insurance portfolio were likely to increase by about 35% for males, and 60% for females in the age range 20–60; and that there would be a concomitant increase in term insurance premium rates. Critical illness claims would go up 26% if insurers were not allowed to use genetic test results for a selected six causes of claim.¹⁴

This leads to the question of where society believes it is appropriate to draw this line of controllability, and what risks (or elements of risk) might fall under this banner? As an example, the EU has decided to disallow rating on gender in insurance. In Australia, despite gender and age being non-controllable, it is generally accepted as reasonable to price on them (subject to the pricing being based upon actuarial or statistical data on which it is reasonable to rely). As a society the question becomes important when insurance is unaffordable or unavailable.

Some statistics may act as a partial proxy for race, e.g. certain genetic dispositions. Whilst it may be argued that increasingly many factors could in some way correlate with race (for example where you live and what type of food you purchase at the supermarket), there needs to be careful consideration by insurers specifically exploring the data and extracting these links. Using such data for pricing insurance may be statistically valid but run contrary to anti-discrimination laws.

14. W. (Bob) Howard, R., Canadian Institute of Actuaries, (2014) *Genetic Testing Model: If Underwriters Had No Access to Known Results*. Available at: <http://www.cia-ica.ca/docs/default-source/2014/214082e.pdf> (Accessed: 29 July 2016).



5.4 Responsibility for sharing of risk information

Previously, insureds had greater knowledge of the risk being insured than the insurer. The insurer therefore would seek additional information. More detailed data on, say, a person's driving risk, may reverse the situation, making the insurer more knowledgeable about risk than the insured. We think that it would be in consumers' interests to be informed of their risks in some situations which would give them a chance to reduce their risk.

Often it will be in the insurer's interest too. However, an insurer may decline to insure someone on the basis of increased data obtained from a device, say, in the car. In that situation, there is no benefit to the insurer in revealing the observed riskiness on which the insurer's decision was based, but this raises the question of whether they should inform the applicant.

Providing information about a risk is a part of the process of applying for insurance. The applicant has a duty of disclosure. Conversely, an insurer may have information that would help with the management of a risk. This suggests the need for a two-way sharing of information gained as a general principle – that the duty of disclosure be extended to insurers in respect of their customers.

Enabling insurance to be more proactively used as a risk management and prevention device, rather than just as a mechanism for retrospectively covering the costs of an incurred risk event, is in all stakeholders' best interests.

The Government should consider the insurer's responsibility to share knowledge of risk with the consumer so that society benefits. At the same time, the Government needs to clarify the insurer's liability in those circumstances.

5.5 Competition

We want competition to deliver the benefits of big data to Australia, with a balance between the benefits to insurers from their use of data and its availability to promote competition.

The Government may consider giving people the right to obtain all the information that an insurer holds on them in a form that can be passed to another insurer assists this competition. A prescribed data format would help to make this practical and cost effective.

We support two recommendations that the Government has chosen to pursue as a result of the Financial System Inquiry (currently the subject of a public inquiry by the Productivity Commission), first to review the benefits and costs of increasing the availability of, and improving the use of data, and second, to consider ways to improve individuals' ability to access their own data to inform consumer choices. In this regard, we note that car insurance renewals in UK carry a bar code that conveys relevant information about the pricing factors for that renewal. Any insurer can read the barcode.

Since collecting, storing and analysing data is an expense for the insurer, consumers may have to pay a fee to access that data. If fee charging is not permissible, insurers may be discouraged from utilising big data and its potential benefits for insurers and society may not be fully realised.

Appendix

Recent developments in risk monitoring and reduction



Lifestyle and policyholder behaviour can be a greater driver of risk than genetics or uncontrollable risks.

A. Introduction

There are many instances of insurers already adopting technologies and means of accessing increasing volumes of data on individuals, for a variety of purposes. This section further expands on the recent developments touched on in section 1. It highlights just a few such cases, to give an indication as to where and how big data is currently being used in industry.

B. Vitality Program – Health and Life Insurance

Discovery Limited, headquartered in South Africa, engages in long and short-term insurance, health insurance, asset management, savings, investment and employee benefits through its various brands in multiple countries. Discovery has successfully partnered with large employers and insurers around the world in countries including the United States, United Kingdom, South Africa, China and more recently Singapore and Australia (AIA).

Through its Vitality rewards program, attached to its various insurance units, it pioneered the idea that human behaviour can be influenced to reduce the risk to which both the individual and their insurer is exposed. This follows the notion that lifestyle and policyholder behaviour can be a greater driver of risk than genetics or uncontrollable risks.

Discovery does so by offering various rewards to the insured, earned or maintained through the collection of personal data on the individual, demonstrating that the individual is actively reducing their risk profile (be it their health, lifestyle, longevity, or driving habits). These rewards can be:

- Short term – such as free drinks from a health club, discounts on flights, movies and healthy food.
- Medium term – such as discounts on gym memberships.
- Long term – such as premium discounts on their insurance contract (both upfront discounts and ongoing maintenance of these discounts), payback benefits, or increasing cover for no additional premium.

In its health and life insurance divisions, Discovery believes that there are better indicators of risk than age. Discovery uses big data and health information to determine each policyholder's "Vitality Age", which is an indicator of overall health that may be higher or lower than their actual age, and which can improve over time as the policyholder works toward living a healthier life. This tells the insurer more about the risk than the policyholder's chronological age. Through Vitality's partnership with John Hancock in the US, they concluded that, on average, most Americans are five years older than their actual age, based on various health and wellness factors.



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Once policyholders understand their health status, the insurer can help them to improve their health through rewards and incentives. Examples of how healthier lifestyles are encouraged:

- Vitality points are awarded for undergoing frequent medicals, for being active (e.g. regular gym attendance, achieving a certain number of steps a day, sufficient sleep etc.), for purchasing healthy groceries, etc.
- Vitality members can receive an Apple watch if they reach a certain status, and the repayments are waived in each month that the data collected from this watch demonstrates that the individual has reached a certain level of physical activity.

In its motor insurance division, it collects data on drivers through a telematics device, and has a driver behavioural program that rewards good drivers. Points are earned on activities including good driver performance (e.g. no cell phone use, braking and speeding habits), online driver assessments, the car's service history to date, how many claim free years the driver has had, tyre checks, and driving courses taken. Rewards include fuel rewards, Uber discounts, free coffees and smoothies.

Discovery has found many uses for the data it collects:

- Reduce the risk profile of its portfolio. It does this in two ways:
 - Attracting lower risk customers, who are attracted by the incentives for healthier lives / safer drivers.
 - Reducing the risk of all customers already on its book, whether high or low risk initially. The Vitality database and learning algorithm tracks behaviours and updates customer profiles across their life, health and auto insurance businesses.
- Reward customer behaviour and provide greater customer service: A personalised risk profile enables Discovery to meet competitors' premiums on price, while offering greater rewards to clients through third party partners (e.g. cash back on groceries, discounts flights, vouchers) and reduced premiums in some circumstances. The value created can also be ploughed back into customer service and innovative products.
- Higher margins than its competitors from more accurate underwriting and pricing. Discovery has been able to capture the additional margin of their accurate, less risky client profiles. Premiums and benefits are shaped by individual riskiness and behaviour over time, while being priced similarly to generic competitor profiles.
- Greater cross-selling and bundling of products due to all the data it has on customers and the relationship and customer engagement developed through its rewards programs.

Discovery claims it has had great success so far from its Vitality programs in both commercial terms and in influencing policyholder behaviour. According to Discovery:

- Independent studies show that Vitality members are more likely to take up and stick with physical activity. Engaged members also go to the hospital 7.5% less frequently and for noticeably shorter periods too.
- Vitality clients are among the healthiest workplaces in America.
- Vitality participants remain customers for longer (lower lapse rates – anywhere from 36% to 88% of non-participants' lapse rates), and claim less frequently (lower mortality rates – anywhere from 47% to 81% of non-participants' mortality).
- There is evidence of improved behaviour, which reaffirms the power of the shared value model. In the short term space, due to members being rewarded for safer driving, loss ratios and lapse rates have improved by duration, having a positive impact on the overall safety of South Africa's roads.
- The association of lower claims costs has been particularly evident for medical admissions related to diseases mutable by lifestyle, such as cardiovascular disease, diabetes and cancers.
- Evidence for the efficacy of the program – in terms of improved clinical outcomes, reduced healthcare costs, lower hospital admissions, increased productivity at work and improved mortality rates – has been profiled in leading academic journals such as the American Journal of Health Promotion.

C. MLC – Life Insurance

Wearables have only just begun scratching the surface in the Australian insurance market. MLC's Basis Peak smartwatch is being offered by the life insurer in conjunction with its 'On Track' program, to help policyholders save on their life insurance if they get enough exercise and sleep. The device allows the user to score points in various areas, for example based on the number of steps the user takes, the number of minutes they are active throughout the day, the hours they sleep and their resting heart rate. If users achieve their target number of points over a certain period of time, they can get a 10% discount on their premium for life.

MLC has said that customers won't need to wear the watch 24 hours a day, and won't be penalised for future policies if they fail to meet the health goals set by the insurer.

D. Genetics testing – Life Insurance

Genomics uses DNA to better understand the function and structure of genomes (the complete set of DNA within a single cell of an organism). Genetic testing can be used by health providers and insurers to better understand the risks to which individuals are pre-disposed.

There is much research focused on making genetic testing cheaper, less invasive and more available. For example, 23andMe, a personal genomics and biotechnology company, has a US\$99 DNA testing service (saliva-based test, sent by mail). Given US FDA rules, it now focuses on ancestry tracking, but it started as a way of getting medical data from DNA markers. This is cheap enough to be available to anyone, and is an indication of the uses of this type of data within insurance.

Below is a short video on how Discovery Limited are using genomic/DNA screening in healthcare. According to Discovery, advances in the use of genomics in everyday healthcare are improving the precision of diagnosis and treatment of many conditions. With your consent, healthcare professionals can use the results of genetic testing to tailor treatment to the genetic profile of the patient, with better healthcare outcomes:
<https://www.youtube.com/watch?v=8rmmLOkCvjo#action=share>

E. Athene USA (formerly Aviva USA) – Life Insurance

As far back as 2010, the U.S. life insurance arm of Aviva PLC experimented with selectively replacing costly and inconvenient medical exams with predictive modelling of risk, based on enhanced data (partly consumer-marketing data)¹⁵.

A study of 60,000 Aviva applicants found that non-traditional data was as effective as blood and urine tests in identifying potential health risks. A key part of this Aviva test, run by Deloitte Consulting LLP in the US, was estimating a person's risk for illnesses such as high blood pressure and depression. Deloitte's models assumed that many diseases relate to lifestyle factors such as exercise habits and fast-food diets.

F. Telematics – Progressive Insurance – General Insurance

Telematics insurance is car insurance where a telematics device or application is fitted to your car. The telematics device then measures various aspects of how, when and where you drive. Telematics devices open the potential for insurers to offer usage-based insurance ('UBI') products, and to determine an insurance premium that more accurately reflects an individual's risk.

As a result, previous proxies for risk are now replaced by a more accurate assessment that doesn't rely on a generalisation. For example, a particular 21-year old may actually be a safer driver than their 55-year old counterpart, *ceteris paribus*, and shouldn't be penalised simply due to their age being used as a proxy for risk. The enhanced connectivity gained through

15. Scism, L. and Maremont, M. (2010) *Insurers test data profiles to identify risky clients*. Available at: <http://www.wsj.com/articles/SB10001424052748704648604575620750998072986> (Accessed: 29 July 2016).

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these on-board devices also makes it easier to assist drivers in an emergency and track and recover stolen vehicles.

Progressive Insurance's (US) Telematics Program involves a Pay as You Drive product called *Snapshot*, which is installed in an insured driver's car. It collects data such as time of day, vehicle speed and braking tendencies. Other insurers, such as Insure the Box in the UK, also access GPS technology or vehicle location, whether you take breaks on long journeys, total mileage and number of journeys. Progressive claims it will not share data with third parties and cleanses personally identifiable information once allowable by law.

Aside from possible rate savings for better drivers, users benefit from:

- Transparency – Progressive allows users to view driving reports and projected savings.
- Feedback – the insured is given suggestions on how to alter their driving habits and save even more. This results in safer roadways and also creates a positive environmental impact as drivers will be motivated to drive less aggressively and with fewer rapid starts and rapid breaking. This saves fuel for the insured and translates in fewer carbon emissions for society.

However, in its 2014 annual report, Progressive announced the beginning of a concept that this paper has discussed, viz., "for the first time, increasing rates for a small number of drivers whose driving behaviour justifies such rates". A Progressive representative estimated that about one-fifth of all Snapshot drivers may see a rate increase.

Beyond telematics, motor insurance is an interesting space to watch, because as much as telematics and pay-as-you-drive initiatives are changing the way that risk is assessed for motor insurance, self-driving cars (or cars with features like automatic steering, automatic braking etc.) are becoming available, and going one step further, insurance may indeed shift from insuring the driver at all (based on their behaviour) to product liability insurance for the car manufacturer. Or at a stretch, is it fathomable that the roads authorities may be required to absorb part of the risk where, for example, lane-markings on the road wear off to the point that the inbuilt system in the car cannot read them and pushes the car into a different lane or off the road?

G. Connected Homes – General Insurance

The Internet of Things ("IoT") revolution has led to a multitude of household devices becoming "connected" – connected to each other, connected to the net, connected to the user and beyond. Smart/Connected Homes represent a network of connected home appliances, electronic devices, control systems and computers. Emphasis is put on surveillance and other security systems, audio video equipment, gadgets control, computers and communications (including the connection to internet). The primary purpose of a connected home is house automation and control, but there are further uses within insurance.

How can Connected Homes be used within insurance?

- Monitor key metrics (such as temperature) and automatically modify the environment accordingly based on learning, thus preventing risk factors from arising.
- Identify risk factors (e.g. smoke) and take adequate actions for prevention / triaging the risk. This may be a smoke alarm that signals to the mobile phone of the occupier of the property (who may be out) to take corrective action immediately and prevent the fire from occurring; it may be an early warning alarm sent to the relevant emergency services (e.g. fire brigade) to ensure early intervention and as such to minimise the impact / damage caused.
- Communicate with the environment to adapt to surrounding environments – in the smoke example above, this may be an interaction with a water source or fire extinguisher to attempt to automatically extinguish the fire.



Insurance may indeed shift from insuring the driver at all (based on their behaviour) to product liability insurance for the car manufacturer. Potentially, road authorities may also become liable for failures to maintain necessary infrastructure.

Appendix

- Communicate with insurers – in the smoke example, it may be a note is sent to the insurer such that they can anticipate incurred claims earlier and perhaps assist with the rehabilitation of the risk. The insurer may also monitor the data and risk factors, and adjust premiums according to, for example, frequency of smoke alarms being set off. It enables dynamic risk monitoring and improved claims handling.

An example of Connected Homes devices being linked in with insurance and assistance services is Allianz's partnership with Panasonic in Germany. The aim is to protect people's homes and prevent further damage from break-ins, window breakage, water leaks etc. The Smart Home system detects these incidents (such as motion detection, window breakage, water leakage), and sends an alert to the customer's smartphone, activates an indoor siren, and notifies an Allianz service centre. The service centre can then inform the designated contact person and manage the necessary responses to limit the damage to the customer's home (e.g. by sending security personnel in the event of a break in, or a craftsman to replace the broken window or repair the leaking pipe).

Another example of Connected Homes being used within insurance is Nest, a business owned by Google that makes a range of Connected Home products, such as programmable, self-learning, sensor-driven, Wi-Fi-enabled thermostats, smoke detectors, carbon monoxide detectors and other security systems.

Nest has established partnerships with American Family Insurance and Liberty Mutual Insurance to offset the costs of a Nest Protect smoke detector, and establish a monthly discount for homes that link their Nest smoke detectors to the insurance firms. The insurer subsidises the cost of the smoke detector for the insured, with the product then sharing data with the insurance firm so it knows if the insured's house has working smoke detectors. Ultimately, these are all data driven responses and decisions, which enable the reduction of both risk and impact, for both the individual and insurer. ▲





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