Delta: actuaries supporting change
ISSUE 1 | AUTUMN 2016

Developing data

Number crunching could change lives in the developing world – with the introduction of life tables

Predicting pandemics

Forecasts suggest an international health horror is overdue, so how can we reduce the risks?

Helpful measures?

Big data promises the big picture, but tracking technology could skew the stats

Food security

Why our resources are ripe for sudden shrinkage

Institute and Faculty of Actuaries

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Welcome
Colin Wilson

Illustrations: Sam Kerr

Change

Around the world, leaders of business, policymakers and professionals are having to grapple with unprecedented change – in technology, in climate and in the way we all live.

Some of those changes pose threats – but all of them offer an opportunity, for innovation, diversification, thought leadership and new ways to apply insight to provide a sustainable future for generations to come.

The IFoA's latest innovation, *Delta*, or "change", has come about as part of that ongoing change in society, and our desire to engage in issues and with thought leaders across different sectors and professions to stimulate discussion and debate.

In the face of uncertainty and new challenges, the need for risk assessment and modelling together with insight and analysis has never been greater. Actuaries, working in collaboration with others, are well equipped to meet that need, with their unique skill set and cross-sector perspective.

Together we can support decision makers in a wide range of areas of business and policymaking, such as those discussed in this issue of *Delta* – from traditional actuarial work such as pensions planning (p8) to grappling with big data (p16); from re-thinking health policy (p10) to supporting financial services development around the globe (p30).

Because innovation is not just an aspiration, it's an imperative – for all of us – if we're to make the most of the opportunities that change presents.

We hope you'll enjoy this issue and will want to learn more about the IFoA at www.actuaries.org.uk

Colin Wilson,
president of the Institute and Faculty of Actuaries

Institute and Faculty of Actuaries

THOUGHT LEADERSHIP FROM THE IFOA

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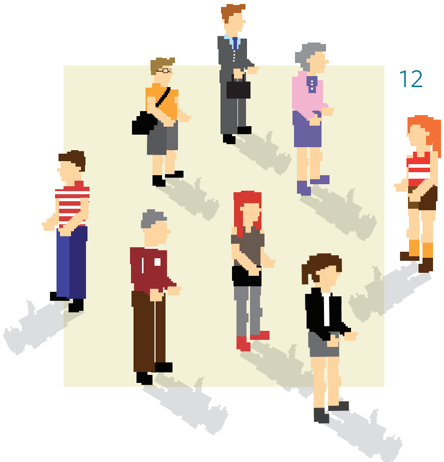

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Delta

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NORMA COHEN is an honorary fellow of the IFoA and former *Financial Times* demography correspondent

NORMA COHEN

Modelling morphing immigration

The fallout from Britain's June referendum on leaving the European Union is still circling the atmosphere, and what the nation's relations with the trading bloc will look like after the dust settles remains far from clear.

One of the most pressing issues – if not the most emotive of the entire 'Brexit' campaign – is Britain's post-referendum immigration policy. To what extent existing EU migrants will be allowed to remain – and on what terms new migrants will be admitted – are thorny questions.

On the face of it, migration patterns seem far removed from the issues that preoccupy actuaries, but drivers of population change, such as rising longevity at older ages, are already being modelled by actuaries. Is there now a need for modelling other forms of population change – and not just migration flows but also other dynamics, such as fertility rates?

Of course, no model can be designed without a firm migration policy. A Norway model – said to be favoured by chancellor Philip Hammond as the price to be paid for maintaining the passport for financial services – also requires Britain to accept free movement of labour and capital. It was precisely to halt this that many voters said "leave".

Moreover, leaving the EU is hardly likely to halt new immigration; data from the OECD shows that Britain's migrant community holds more people from outside the EU than from within it – and that it is the number of such entrants that has been rising most quickly.

Even if we adopt the Swiss model, where individual national free-trade agreements are negotiated, there is still no certainty that immigration levels will change. Switzerland has a far higher percentage of non-nationals than Britain. Therefore, modelling the impact on immigration would need to take account of much more than the size of new barriers. It must also take account of the economy that emerges when the full shape of Brexit is known.

When demographers speak about immigration, they describe 'push' and 'pull' factors. Push factors may include such trends as a weak jobs market or the lack of educational opportunities at home. If the effects of Brexit are to slow Britain's economic growth – as nearly every forecast has said it will – that alone might have a dampening effect on immigrant inflows, before any policy change.

Pull factors are a strong overseas jobs market, higher salaries for similar work, or the ability to gain fluency in a foreign language that would boost earnings capacity. Another is the existence of a sizeable pool of earlier migrants from a single country.

"Drivers of population change are already being modelled by actuaries"

Actuarial science, which gauges the odds that particular events will occur, can surely help to forecast the likely response to various changes in migration policy.

It's not as though any other profession has proven successful in modelling migration flows. The inability of economists to accurately forecast immigration trends frustrated the previous government under David Cameron, who promised to reduce net migration to the tens of thousands.

But certain developments would have to occur first, not least of which is better data. The International Passenger Survey, upon which international migration estimates in the UK are based between censuses, missed some 360,000 migrants in 2001-2011. Modelling the relationship between economic growth and population inflows also requires longer-term data series. Ironically, existing evidence points to a strong positive correlation between the two; limiting new migrants may be economically undesirable.

Population forecasting seems a field that is ripe for new inquiry, with the actuarial profession cheerleading efforts to compile the data to make that happen.

+ To learn more about the potential impact of post-Brexit migration, visit **WWW.ACTUARIES.ORG.UK/PENSIONS-POST-BREXIT**

MICHAEL JOHNSON is a research fellow at the Centre for Policy Studies and proposed the Lifetime ISA in 2014

MICHAEL JOHNSON

What future the pensions industry?

The pensions industry is in turmoil. It should be: soon, we may not need 80% of it. The very future of tax relief – and with it the pensions' tax framework – is up for long-overdue debate.

Tax relief is expensive – amounting to over £40bn in 2014-15, offset by pensioner income tax of only £13bn; inequitable – the top 1% of earners receive 30% of all tax relief; and ineffective. It has failed to catalyse the savings culture the UK desperately needs, namely more low- to middle-income workers saving more. In 2015, the UK's net household savings ratio was the third lowest in the OECD, at minus – yes, minus – 1.3%.

Enter the Lifetime ISA from 2017, welcomed particularly by Generation Y. Combining a 25% upfront bonus, irrespective of tax-paying status, with ready access to funds to purchase a first home, the next cohort of pensions product customers is likely to be thin. A Workplace ISA could follow, residing within the auto-enrolment framework, with the same bonus arrangement paid on employer and employee contributions and the same early access. It would be hugely popular among younger employees in particular. No need for occupational pension provision.

Tax relief on pensions contributions could be scrapped to fund the new ISA bonuses, up to an annual allowance of, say, £10,000. This would provide ample savings capacity for almost everyone: today's £40,000 annual allowance is irrelevant to more than 99% of the adult population.

The industry faces major digital disruption – the government is keen to see a pensions 'dashboard' in place by 2018. It could offer consumers a simple overview of all of their pension pots, breaking the industry's opacity and its innate talent to complicate. As the dashboard evolves, it is likely to enable consolidation of disparate pension pots in one place. This would improve consumers' bargaining power, leading to larger retirement incomes via lower costs and other scale economies. A pensions dashboard would be merely the first step towards a comprehensive dashboard that would display all facets of our personal finances, so that users would be a mouseclick away from offsetting high-cost credit card overdrafts and consumer loans against any positive cash balances, removing the middle man from the retail financial services industry.

Meanwhile, life companies face a perfect storm of sclerotic investment returns, care of anaemic economic growth prospects and quantitative easing (manifest in record low fixed-income yields), with longevity improving ahead of expectations.

Industry oversupply is endemic: self-invested personal pension providers are going bust. Fund managers are also under pressure – evidence is mounting that active management of listed assets delivers very poor value for money. The F&C Consistency Ratio illustrates that, over any meaningful timeframe, active fund selection is a blind lottery.

Meanwhile, the treasury's annual tax relief contributions make it the fund management industry's largest client. Since 2002, it has injected, via people's pensions, over £300bn of cash, on which charges and fees are levied. To misquote Sir Winston Churchill: never was so much taken by so few from so many. The industry is paying the price for failing to deliver what customers want: simplicity, low costs and absolute transparency.

Theresa May and Philip Hammond are both highly experienced politicians. Both understand pensions and, crucially, treasury business, which is where the future of the pensions industry will be determined. Both are also cautious, which could slow progress towards an ISA-centric framework, but the underlying rationale remains. Meanwhile, politicians should consider how to shift the industry towards putting the customer at the centre of what it does.

> **"The industry is paying the price for failing to deliver what customers want"**

Read the IFoA's views on changing the pension tax system at **WWW.ACTUARIES.ORG.UK/PENSION-TAX**
Contact the IFoA to share your views: **DELTA@ACTUARIES.ORG.UK**

Analysis at work

PROJECTION

Growing danger

A counter-strategy to type 2 diabetes is vital as the disease balloons along with waistlines – particularly in the developing world as lifestyles change

6 seconds

one person dies from diabetes. 5.0 million deaths in 2015

$673 billion

12% of global health expenditure is spent on diabetes

Source: International Diabetes Federation

Imagine being able to give the UK's NHS a £10bn boost every year. The current deficit of £2.45bn would be wiped out at a stroke. Underfunded fields such as psychiatric care would be revolutionised. Impossible? That is what a cure for diabetes would provide.

The same is true globally. The disease soaks up 12% of healthcare expenditure worldwide. It affects one in 12 people.

The indirect costs are vast. One in three diabetics will develop eye disease that can cause blindness. Kidney problems, nerve damage and cancers are linked to diabetes. Each year, the NHS conducts 7,000 leg, foot or toe amputations. The regularity with which type 2 diabetes leads to Alzheimer's prompts some researchers to believe they may be the same disease. Indirect costs take the total bill for the NHS to £23.7bn a year.

Worse, the numbers are all moving in the wrong direction – what the World Health Organization calls an "unrelenting march". Cases have quadrupled since 1980. In Qatar and Kuwait, a fifth of adults are diabetic, rising to between 30% and 40% of older citizens. It is the eighth biggest killer in the world, and increasingly prevalent in the developing world.

Stem cells

The field of stem cell research is offering hope. Stem cells are cells that haven't yet decided what body part to become. The most versatile, pluripotent stem cells can multiply into anything from skin and muscle tissue to nerve cells in the brain. In theory, cultivating stem cells offers a way to grow fresh body parts, curing all sorts of maladies.

In July, ViaCyte, a stem cell therapy company, won a $3.9m grant to develop a cure for type 1 diabetes, taking total investment to $60m. ViaCyte is conducting clinical trials of pancreatic progenitor cells, derived from stem cells. The cells are cultivated and matured to secrete insulin and other factors needed to respond to blood glucose levels. The technique has been tested successfully on animals, but there are complications. First, it is hard to create functioning beta cells that make insulin in the pancreas. ViaCyte is tackling the problem by allowing the body to transform immature pancreas cells into beta cells. Second is how to cope with the immune system response, which is to kill transplanted cells. ViaCyte uses a plastic capsule filled with 40m immature pancreas cells. The immune system's lethal T-cells remain on the outside, while insulin and other hormones flow out unhindered.

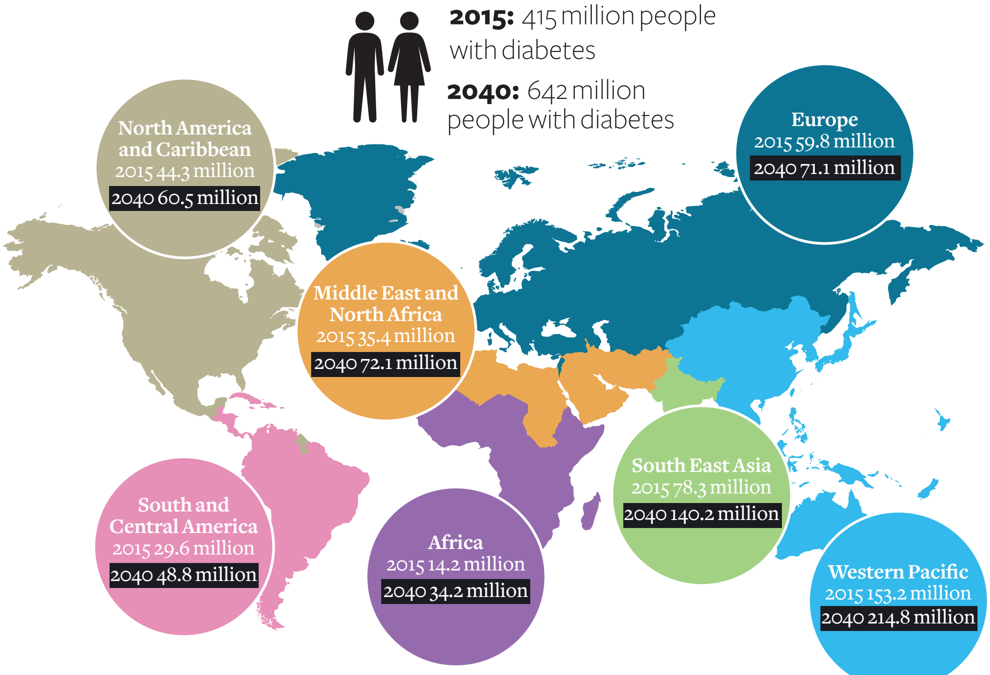
In another landmark project, the Boston Autologous Islet Replacement Program (BAIRT) is working on generating insulin-producing beta cells from pluripotent stem cells, based on a process developed by Harvard Stem Cell Institute co-director Doug Melton. However, the coalition warns: "Generating clinical-grade, pluripotent stem cells suitable for use in patients will take time: the first transplant conducted by BAIRT is expected to be at least three to four years off."

Pump technology

While the progress is impressive, the timeline for a cure for diabetes is distant. A man with a clear perspective on the field is Warwick Medical School's Professor Roger Gadsby, author of over 300 papers on diabetes. "There are no miracle cures. Full stop," says Gadsby.

Instead, he points to an emerging technology offering a new way to treat the condition. "Insulin pumps are being refined. These pump out insulin through a needle to give the body what it needs. They've got smaller, and are the size of a small phone." The breakthrough will be in sensors. "If you could connect that to a blood-glucose-sensing meter that works continuously, rather than pricking your finger for blood, you would

DIABETES: WORLDWIDE FACTS AND FIGURES



Source: International Diabetes Federation

have an artificial pancreas." So far, a quarter of type 1 patients in France and Germany use a pump, with the UK lagging at around 12%. Miniaturisation and falling costs, which stand at £5,000 for the pump and £500 running costs a year, will accelerate adoption.

Lifestyle

Wearily, Gadsby points to another obvious strategy. Type 2 diabetes is closely correlated with obesity and a sedentary lifestyle. Prevention lies in more exercise and a better diet, which can even be curative.

Newcastle University's Professor Roy Taylor ran a trial in 2015, putting 11 people on a two-month, low-calorie diet. The type 2 diabetics cut their daily intake to 600 calories. Taylor said: "To have people free of diabetes after years with the condition is remarkable – and all because of an eight-week diet. This is a radical change in understanding type 2."

Gordon Parmley, 67, took part in the trial. He explained: "At first, the hunger was severe, but I lost an astounding amount of weight in a short space of time. At the end of the trial, my insulin levels were normal and, after six years, I no longer needed diabetes tablets. Today, 18 months on, I still don't take them. It's astonishing that a diet – hard as it was – could change my health so drastically."

More than 90% of diabetes is type 2. If the trial is replicated, it will prove that the condition can be combated. Improvements in diet and lifestyle could deliver huge savings. A 2010 study by actuarial firm Milliman found that, over two decades, a 50% improvement in type 2 management would: lower diabetes-associated deaths by 9% or 49,000; cut the incidence of complications by 18% (239,000 cases); and reduce annual medical costs in the US by 12%, or $196bn at 2031 rates.

If type 2 treatment forced patients to improve their lifestyle, it could be possible to fund research into the trickier type 1 diabetes. Currently, 18 million Brits are pre-diabetic, of which 5% to 10% will contract type 2 diabetes. It's a vast cohort to work with.

Risk assessment

There are ongoing programmes. Diabetes UK and NHS England offer risk tests at events and online, and so far one million people have participated. A tie-up between Tesco and the British Heart Foundation is raising £30m to encourage lifestyle changes.

The diabetes community is taking action. The UK's biggest forum for diabetics is Diabetes.co.uk, and founder Arjun Panesar reports a wave of conversions to low-carbohydrate diets. Waiting for a miracle breakthrough is needless, he says. "Seeing what other people are doing is the best methodology. Over 145,000 people have taken part in the low-carb programme, helping people reduce their weight, come off medication, improve their blood glucose control and ultimately reduce their HbA1c blood glucose into non-diabetic levels."

This is great, but the rising numbers of diabetics suggests that far more needs to be done. If those at risk of type 2 took just 30 minutes of exercise a day, they would cut their risk by 40%. Is an enforced exercise regime the answer?

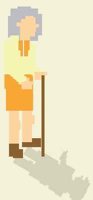
Looking at the lifelong cost of treating diabetics might prompt strong action. Actuaries are adding up the impact of diabetes, and the picture is terrifying. Partnership actuary Dr Richard Willets says: "The key to diabetes is drawing attention to the really long-term implications, so there is tremendous potential for actuaries and politicians to work closer together on this."

Britain's new prime minister might have a view. Theresa May is the nation's first known type 1 diabetic premier. Will she be prepared to sanction type 2 patients if they don't diet? The reward for a radical policy would be huge. She could save the NHS. The numbers all point to the policy. It will be up to her to weigh those numbers and the ethics involved.

What is diabetes?

Type 1 diabetes is an inability to produce insulin, owing to the immune system attacking and destroying pancreatic islet cells, which contain insulin-secreting beta cells. Also known as child-onset diabetes, type 1 cannot be prevented. Users must test blood-glucose levels using finger pricks, and routinely inject insulin.

In type 2 diabetes, the pancreas doesn't produce enough insulin, or the body's cells don't react to insulin. Type 2 typically emerges in adult life. Incidence is closely correlated to diet and lifestyle.



PENSIONS

The generation game

Will one age group benefit in retirement at the expense of another?

Earlier this year, the *FT* published an article that – unusually for the pink pages – went viral. The comments ran into the thousands. Tabloid newspapers covered the frenzy. BuzzFeed ran a spoof. The frazzled *FT* later commented: "Within hours of publishing the article online, it probably generated more Twitter sass and cat memes than any piece in the history of the *FT*."

The article in question was 'Why millennials go on holiday instead of paying into their pension'. Hot topic? This one is scorching.

Amid the public fury, one claim in particular surfaced again and again: that the young are being fleeced by older generations. Baby boomers enjoy gilded pensions, funded by young people who can barely save for their own.

But is it true? In January, the House of Commons' Work and Pensions Select Committee set out to uncover the truth about intergenerational fairness in pensions. The conclusions are not yet published, but the early proceedings have destroyed a few glib assumptions.

The triple lock

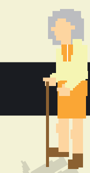
One immediate area of discussion is the impact of the 'triple lock'. This is a policy that guarantees the state pension will rise each year by whichever is highest of inflation, earnings growth or 2.5%. The policy began in 2010 and, by 2014, had increased the value of the annual state pension by £440. It was one of the planks of the Liberal Democrat 2010 election manifesto and was then taken up by the Conservatives in theirs in 2015. To some, it seems to epitomise the benefits baby boomers might be enjoying at the expense of younger workers.

The triple lock gets a hammering from many directions.

The Institute for Fiscal Studies' director, Paul Johnson, calls it a "bizarre" way of setting payment levels. Mathematically, Johnson explained to the Work and Pensions Select Committee, it means the state pension will eventually arrive at 100% of the entire economy – although he did caveat that by pointing out that this will take "hundreds of years". The Institute of Economic Affairs' Ryan Bourne says it "has no economic justification whatsoever – unless your objective is to bake in ever-higher pension spending".

Even former work and pensions minister Iain Duncan Smith, who co-created the triple lock, has called for a review, asking: "Do we just keep saying it's working age [people] who bear the brunt [of cuts]?"

The triple lock insulates retirees from the downturns affecting all other age groups. As it is the best of all three measures, it means that pensions will rise more than prices or wages, possibly significantly more



VALUE IN 2014/15 PRICES

Mature (pre-1945)

Today's mature generation experienced high income growth during their peak earning years. As such, there has been a trend for successive generations of pensioners with higher incomes than the last.

The Institute for Fiscal Studies reports that, at the age of 35, 64% of those born in the 1940s owned their own home. This statistic compares with 71% of those born in the 1950s.

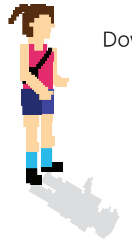
This generation also experienced lower increases in the value of their homes than later generations.

Those aged 60-plus have benefited from higher incomes from savings and pensions.

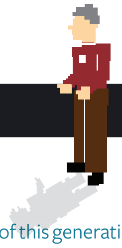
£15,830
PAST YEAR
Average personal income

£2,250
PAST YEAR
Average put into savings

64%
BORN IN 1940s
Homeowners at age 35



Download the IFoA response to the Work and Pensions Select Committee at
WWW.ACTUARIES.ORG.UK/INTERGENERATIONAL-FAIRNESS



VALUE IN 2014/15 PRICES

Baby boomers (1945 to 1960)

At the age 35, 64% of the early baby boomers and 71% of later boomers owned their own home, according to the Institute for Fiscal Studies (IFS). They enjoyed free education and high income growth and, consequently, have lower debt levels than successive generations.

Many boomers benefited from rising house prices. The average return for those born in the 1940s was just below 3%, IFS reports, rising to 3.3% for those born in the late 1950s and early 1960s. Many of this generation have defined benefit pension schemes, which guarantee a fixed pension payment every month. These preceded a rapid switch to defined contribution schemes, which are considerably less generous.

£16,560
PAST YEAR
Average personal income

£2,364
PAST YEAR
Average put into savings

71%
LATER BOOMERS
Homeowners at age 35

if price and wage inflation is very low. The financial crash was barely noticeable for pensioners. Research by Canada Life last year revealed that, since 2008, the average retired household income rose by almost a third, beating inflation by 14.3%. By contrast, working households saw a fall of 4.4% in real terms. In the past two decades, average retired household income has gone up 77% in real terms, compared with 49% for workers. By 2025, retirees will soak up 18% of all UK income, compared with 13% in 1996. Why is this particular retired generation getting a pension accelerator?

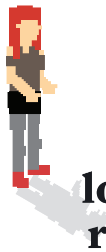
In fact, there are defenders of the triple lock. The then pensions minister Ros Altmann told the Work and Pensions Committee that the triple lock is just one factor to consider. Changes in the pension age, and other measures, will counteract the triple lock. Altmann explained: "One of the reasons for the new state pension is to make the system sustainable going forward. If you look at the projections, you will see that the proportion spent on state pension would be roughly stable until 2040, despite the sharp rise in the number of pensioners. It will then fall thereafter."

Add in other factors, such as pension credit and the winter fuel allowance, and the amount rises from 5.4% of GDP to 7.3% over 50 years – what DWP deputy director Tom Younger calls "a reasonable increase".

House prices

A second line of attack on pensioners is house prices. Rising house prices are a 'hidden' fortune enjoyed by older citizens, it is alleged. Pensioners who own a home – or more than one – have passively accrued income. A resident of Notting Hill may have seen their property value rise from £400,000 to £4m in the past 25 years.

Meanwhile, the young are called 'generation rent' with good reason. Yet, once again, house prices are only one ingredient of a more complex picture. For example, interest rates determine repayment costs. They are at record lows. Plus there are dozens of other key categories of income and asset allocation to consider. There are new incentive schemes, such as the Lifetime ISA, exclusive to under-40s (see p8). An analysis of the pension and welfare rights of each generation must account for every variable.



The triple lock insulates retirees from the downturns affecting all other age groups

Prudence

The final ingredient is prudence. Shake-ups to pension schemes mean individuals have greater personal responsibility to set money aside for retirement. Many fail.

"People in the private sector are often putting nothing like enough into their pension," observes Peter Tompkins, a consultant actuary and former Council member of the Institute and Faculty of Actuaries.

"Even when the current laws requiring enrolment in a pension scheme are fully in force, the government will be requiring that no more than 8% of income – including employer and employee contributions – is put into a pension. It is inevitable that this figure should eventually go up," he adds. "Defined benefit schemes – nowadays largely confined to the public sector – typically cost employees and employers around 20%-25% of salary each year."

The 2015 Scottish Widows Pensions Report shows that one in five Brits are saving nothing for their pension. Only 56% are saving enough. Those failing represent a demographic that cuts across income groups. Earners with the ability, but not the prudence, to invest for old age have no one to blame but themselves.

The Work and Pensions Select Committee will try to determine whether it is possible to calculate generational unfairness. The IFoA stressed that to achieve intergenerational fairness it is important that the current workforce is not unnecessarily burdened with funding state benefits that will not be as generous when they retire.

The Committee has heard from experts from bodies ranging from the Institute of Economic Affairs to the Institute for Fiscal Studies, but there is no simple answer.

Calculating the scale of generational unfairness is seriously difficult, bordering on impossible

In a nutshell: calculating the scale of intergenerational unfairness is seriously difficult, bordering on impossible. University of Sussex professor of economics Richard Disney studied the factors supposedly favouring the old, such as house prices, the stock market and pensioner protection. He concluded: "These 'generational accounts' can only be calculated accurately on a full lifetime perspective, with full measures of intergenerational transfers (private – intra-family – as well as public). [Such] data is simply not yet available for younger generations. Moreover, unsurprisingly, such calculations of 'intergenerational fairness' are heavily sensitive to projections of GDP, price and earnings growth." So are the young being shafted on pensions? The answer Twitter users don't want to hear is: it's terribly hard to know.

VALUE IN 2014/15 PRICES

Generation X (1961 to 1980)

Despite enjoying higher incomes than their predecessors at the same age, today's 35- to 55-year-olds have failed to save as much as the generations before them. Sluggish income growth over the past decade, coupled with rising house prices, is making it hard for them to catch up.

Only 66% of people born between 1970 and 1976 owned a home at the age of 35, compared with 71% of later baby boomers, according to the Institute for Fiscal Studies. The shift away from defined benefit pension plans towards less generous defined contribution plans will affect this generation's retirement income.

66%
BORN 1970-1976
Homeowners at age 35

£57,903
AVERAGE DC PENSION POT VALUE
Savings in defined contribution schemes

VALUE IN 2014/15 PRICES

Generation Y (1981 to 1995)

Median income levels for today's millennial generation are the worst of any age group. Having suffered two recessions, their income is still 7% below its 2007-08 level. Moreover, many are in debt, largely because of student loans.

Rising house prices since the mid-1990s, coupled with falling incomes and reduced availability of high loan-to-value mortgages, has made homeownership a distant dream. Today's younger generations are far more likely to be renting than their predecessors were at the same age.

Most will be enrolled in defined contribution pensions, with employer payments squeezed since the 2008 financial crisis. All these factors combined means millennials are likely to work longer into old age.

RENTING
Today's younger generations are far more likely to be renting than their predecessors were at the same age

£16,872
AVERAGE DC PENSION POT VALUE
Savings in defined contribution schemes

VALUE IN 2014/15 PRICES

Generation Z (1996 to date)

Stagnating income growth, soaring debt and high housing costs are leaving today's 15- to 24-year-olds with a challenging start in life. Between 2006 and 2012, average unsecured debt for this generation more than trebled to £12,215, according to a BNY Mellon report. Some 45% of this is on student loans. There has been more than a fourfold increase in friends and family loans to this generation, says Citizens Advice.

The debt-to-income ratio of the younger generation is quickly rising. In 2010-12, 15- to 24-year-olds had an average debt:income ratio of nearly 70%, reports the Institute for Fiscal Studies. High debt, slow income growth and declining home ownership put Gen Z on track to be the least wealthy yet in retirement.

SOARING HOUSING COSTS
Await Generation Z

HIGH DEBT
And slow income growth are likely to be a fact of life for young adults aged under 20 now

Sources: Black Rock 2016; DWP 2015; Institute for Fiscal Studies 2013

Business and beyond

Helpful measures?

Wearable technology is being developed for an increasingly diverse range of purposes, from healthcare to surgery. For businesses and insurance companies, this type of technology presents opportunities to understand behaviour in more detail – but only the behaviour that is tracked

WORDS: REBECCA BRACE

While wearable technology is very 'now', wearables have in fact been around for decades – remember the first Sony Walkman and Casio calculator watches? What's changed more recently is the scope, range and portability of items available, as well as the sophistication of the technology behind them. The way an item looks can perhaps be just as important as its functionality to the wearer. But when it comes to what they can do, wearables now feature in everything from fitness and healthcare monitoring to equipment repairs.

As many as 14% of Brits have been wearing their technology since last year, with 7% owning a fitness band and 3% a smartwatch, according to research published by market intelligence agency Mintel in December 2015. More than three million wrist-worn wearables were sold in 2015, up from 1.4 million the previous year; CCS Insight forecasts that the wearable tech market will be worth $34bn by 2020.

"Two of the key drivers are personal entertainment and healthcare," says Happiest Minds' head of consumer technologies, Srikant Sowmyanarayanan. "As hardware got smaller and faster, the scope for using it in wearables increased, leading to the likes of Google Glass and a whole new ecosystem of wearable tech."

Wearable business

Wearables are not just for consumers. Webtrends' EMEA marketing manager, Calum Geraghty, outlines some of the different ways that wearable devices can be useful in a working environment. "For emergency personnel, search and rescue teams and mobile warehouse workers, wearables can provide high-tech mobility and tracking features," he says. "Smart glasses could be useful for technicians who need to consult a manual while performing repairs. Wearables may also be able to remotely manage equipment, such as machinery on an assembly line, making the workplace safer for employees." Data can then be captured on the kinds of repairs frequently made.

Wearables may also have a role to play in the way businesses interact with their employees. Often, the focus of such initiatives is on employee wellness: many wearables are designed to measure and improve people's physical wellbeing. "Technology has evolved from simple steps tracking to adding capabilities such as the monitoring of sleep, heart rate and oxygen levels," notes Sowmyanarayanan.

While individuals are taking advantage of these capabilities themselves in a bid to become healthier, businesses are also tapping into this technology. There is a clear benefit to employers if their staff are well: improved productivity, fewer sick days and lower health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FAST FACTS

3+
MILLION
wrist-worn wearables were sold in 2015

14%
OF BRITS
have worn their technology since last year

7%
OF BRITS
own a fitness band

$34
BILLION
Predicted value of the wearable tech market by 2020

insurance premiums. As a result, employers including BP America, IBM and Kimberly-Clark have handed out Fitbits to employees.

"Thousands of companies worldwide offer staff wearable activity-tracking technology," says Protectivity's Julian Hucks, managing director of the specialist insurance provider to individuals and businesses in the active leisure sector. "These methods are often strongly linked to companies negotiating lower rates on collective insurance policies. Underwriters may trust these devices more than self-reporting."

Diagnosing data

For insurance companies themselves, the data gathered by wearables gives an unprecedented opportunity to gain a detailed picture of the health and lifestyle of individuals. Wearables have the potential to inform risk calculations in a couple of ways: they can measure specific health indicators, and they can also track activities that are intended to improve people's health.

"For the first time, [insurers] can potentially see real-life data for each prospective client – not just a single physical examination, but years' worth of information for activity and sleep, with more data points no doubt added as the products improve," says pensions advice company Portafina's managing director, Jamie Smith-Thompson. "Blood pressure could be a particularly useful one."

Smith-Thompson adds: "Insurers of the future may be able to look not only at an individual but also at the data of their immediate family to provide a more developed picture of their risks and life expectancy. It could mean we see insurance individually tailored like never before."

The correlation between wearables and insurance is already becoming a reality. Vitality, part of the Discovery Group, uses data obtained by wearables to gain a clearer picture of customers' health. "Within the technology and fitness industries, wearable technology has been and continues to be increasingly popular," says VitalityLife's head of technical marketing, Richard Purcell, also volunteer editor of *The Actuary* magazine. "While other insurers are starting to take note and incorporate it into their programmes, at present we are the only insurer to use devices to both understand and reward our members' health behaviours."

The company's Active Rewards programme operates on a points basis. For example, if someone does 7,000 steps a day, they will be given three points; if they do 10,000 steps, they will get five points; and if they do 12,500 steps, they will get 10 points. People also receive points for a range of other activities, such as going to the gym, eating healthily and undergoing health checks.

These points can then be translated into rewards. "By getting more points, you move your status up," explains Vitality's head of technical pricing and big data analytics, Pierre du Toit. "You start off as a bronze status member, and as you earn more points you can move up to silver, gold and platinum. That translates into lower premiums on certain types of policy and other benefits."

Shorter-term benefits, meanwhile, could include a free drink from Starbucks and a cinema ticket from one of Vitality's partners. "We're giving people short- and long-term goals, which we know is effective in driving a change of behaviour," says du Toit.

The bigger picture

So far, so good – but choosing which measurements to focus on is not straightforward. For one thing, opinions can vary about what constitutes healthy behaviour. For another, some factors are easier to measure than others. "I tell a joke about a man who's looking for his keys on the pavement under a street light," says Willis Re's head of life and health reinsurance, Greg Solomon. "A passer-by gets down

Photography: Image source, iStock

For a health and care actuary's perspective, visit
WWW.ACTUARIES.ORG.UK/WEARABLE-TECHNOLOGY

Thousands of companies worldwide offer staff wearable activity-tracking technology

to help him look, to no avail. Eventually, he asks: 'Are you sure you lost your keys here?'. The man replies: 'No, I lost them over there – but the light is much better here.' I tell this joke because I worry that companies may be focusing on the things that are easier to measure, when the really valuable information is further down the pavement."

It is easy to measure your heart rate, for example, says Solomon. But a more valuable measurement is heart rate variability (HRV), which measures the time between beats. "A body under stress makes the heart beat very predictably, with almost the same time between each heartbeat, whereas, when relaxed, a heart speeds up and slows down as the person breathes – but each averages the same beats per minute," says Solomon. "This is a very powerful measure for working out how healthy you are and whether your body is overly stressed – even a good predictor of heart attacks in some cases. Measuring your heartbeat as opposed to your HRV is like looking for things under the street light – it's easy to measure, but it's not really that helpful."

Even when insurers look at the 'right' measurements, there is a question mark over what value isolated metrics can have in indicating a person's overall health. "Is there a risk that focusing on data gathered may prompt businesses to focus on the detail of a few behaviours? Yes; they have no choice," says Solomon. "They will focus on what they have available, in the belief that, indirectly, if you are good with A, you are good with B. People who exercise well are more likely to eat well – but that is still a probabilistic statement. Some people eat healthily, but do no exercise. Some people try to 'out-exercise' their diet – they do a lot because they eat so unhealthily. Insurers are hoping – and they're right, of course – that over an entire portfolio of hundreds of thousands of people, on average those who do A well will probably also do B well. But for any one individual, measuring A doesn't confirm that they will also be good with B."

My data, my business

Data privacy is an important topic when it comes to the use of wearables for insurance. On the one hand, there is the risk that an underwriting database could be leaked, leading to people's heath data being made public. There is also a question mark over how companies gathering this type of information are using it. Such concerns are not limited to insurance companies. "There is a risk that the wearables and trackables used by businesses, which collect so much tangible data, could lead to staff privacy and security issues," says Hucks. "There are also questions regarding how this information is stored or used, or even sold to third parties. The threat of this is real, and there are data breach insurance policies out there to protect against this."

Nevertheless, research published by Deloitte in May found that four out of 10 UK health insurance customers would consider tracking and sharing their health and fitness-related data in order to get a more accurate premium.

It is also worth noting that fitness trackers are not infallible. When people genuinely want to improve their fitness levels, it is counterproductive to try to cheat the system. However, it is possible that people may go to the gym without actually exercising, or attempt to trick wearables into recording extra steps in order to access rewards from insurers or win workplace step challenges.

"There are always going to be a few people who try to cheat any system," observes du Toit. "There have been interesting situations where people try to put their Fitbits on their dogs to get more points. However, abuse of the system is very rare, and we monitor it to ensure that a few people do not spoil it for the majority."

Solomon adds: "The reality is that if you're going all the way to the gym just to 'check in' on the system, while you're there you may as well work out for 10 minutes – so it does encourage good behaviour, even if people try and cheat the system. People who are cheating the system are also more likely to give up than maintain cheating for years and years."

Empowering change

It is clear that wearable technology presents a vast range of opportunities. While there are a number of obstacles and considerations that will need to be addressed, the data unlocked by wearables can lead to a more informed understanding of people's behaviour.

Interestingly, these devices could also change the relationship between parties. Insurers, for example, are not just measuring the risk that customers will die but are taking steps to prevent this from happening.

This could become more explicit in the future. Increasingly, wearables are focusing not just on measuring various health-related data but also on taking action to address any issues that arise. Apps measuring heart rate variability could call an ambulance before the wearer even notices a problem, while people with diabetes could use patches that sample their blood to detect problems with their sugar levels. As Solomon concludes: "Devices are already saving lives this way, and through insurance companies that could become the standard for many more people."

Tracking driving behaviour

Where car insurance is concerned, tracking technology is being used as a means of understanding people's driving behaviour in more detail. "In the car market, there are already insurance providers that look at your driving telemetry to determine your driving characteristics," comments BestVPN.com's online security expert and director of operations, Peter Selmeczy. "This allows insurance companies to offer discounts to people who continually demonstrate safe driving behaviours."

Data from wearables may also play a part in determining a driver's car insurance premium. "Fitness data can be used in risk management in addition to other parameters like location, driver behaviour, vehicle health and traffic patterns," notes Sowmyanarayanan.

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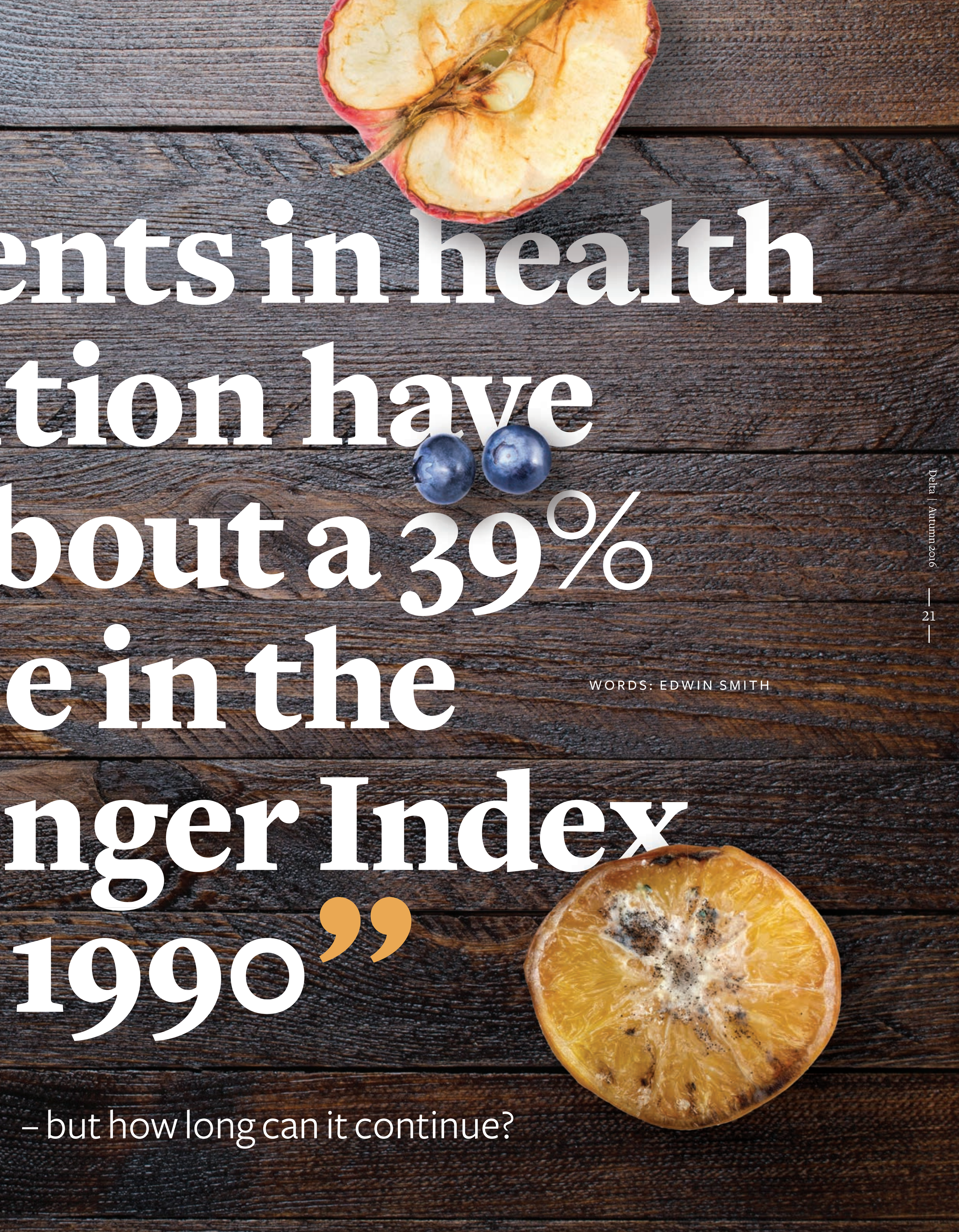

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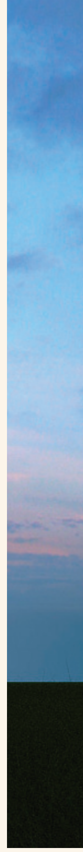
WORDS: EDWIN SMITH

– but how long can it continue?



The architects of Plantagon's World Food Building in Linköping (*right*), are developing the technology required to create urban 'vertical farms'

Against a backdrop of political upheaval, terrorism and wider economic uncertainty, it might not seem a logical thing to say, but it's true: life has never been better. Or, put it another way, being alive in 2016 is, on the whole, a sweeter deal than it has been at any other time in human history.

We're living longer – globally, the average is 71.5 years, according to a recent study in *The Lancet*. That's not bad, especially when you consider that the figure hovered around the 30-year mark right up until the beginning of the 20th century. What's more, according to the American academic Steven Pinker, there's a good chance that "we're living in the most peaceable era of all time" – some 500 people out of every 100,000 are reckoned to have died from violence in prehistoric times. Today, that figure is down to around seven. We're more intelligent, too. The average person taking an IQ test today (and scoring 100) would score 118 by the standards of 1950, or 130 if they were to take the test back in 1910 (putting them in the top 2% of the population). That's thought to be partly down to improvements in health and nutrition, which, according to the International Food Policy Research Institute, has also brought about a 39% decrease in its Global Hunger Index since 1990.

Overshoot and collapse

No one would doubt that these measures of human progress are cause for celebration. However, there are those who question whether the trend can be relied upon to continue for much longer.

In a 1972 book, *The Limits to Growth*, four academics commissioned by the Club of Rome thinktank used computer-generated models to plot the possible effects of continued exponential population growth and resource depletion. Worryingly, in the context of a comparatively slower improvement in efficient resource use and of a planet with finite natural resources, two of the three scenarios explored by the study resulted in a regression of living standards and what the authors described as "overshoot and collapse" of the global system by the mid to late 21st century.

More worryingly still, research published by University of Melbourne academics in 2014 found that the 'business as usual' projection made in *The Limits to Growth* – the one that would lead to "overshoot and collapse" sooner rather than later – is broadly in line with the reality depicted by data that has been collected by the UN, Unesco and other organisations over the subsequent 40 years.

"Many economists don't like the argument [made in *The Limits to Growth*]," says the University of Leeds' biological sciences professor, Tim Benton. "There is this discourse that we can have infinite growth. But, however you define it, we are surpassing the planetary boundary."

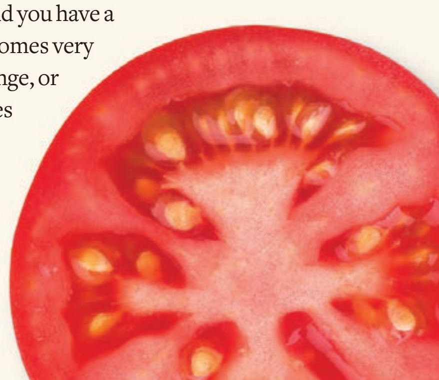
If Benton and those who set store by the arguments laid out in *The Limits to Growth* are right, then one of the most serious symptoms of continued population growth and resource depletion could be the increasing frailty of the world's food supply – not just in the poorer parts of the world, but across the board.

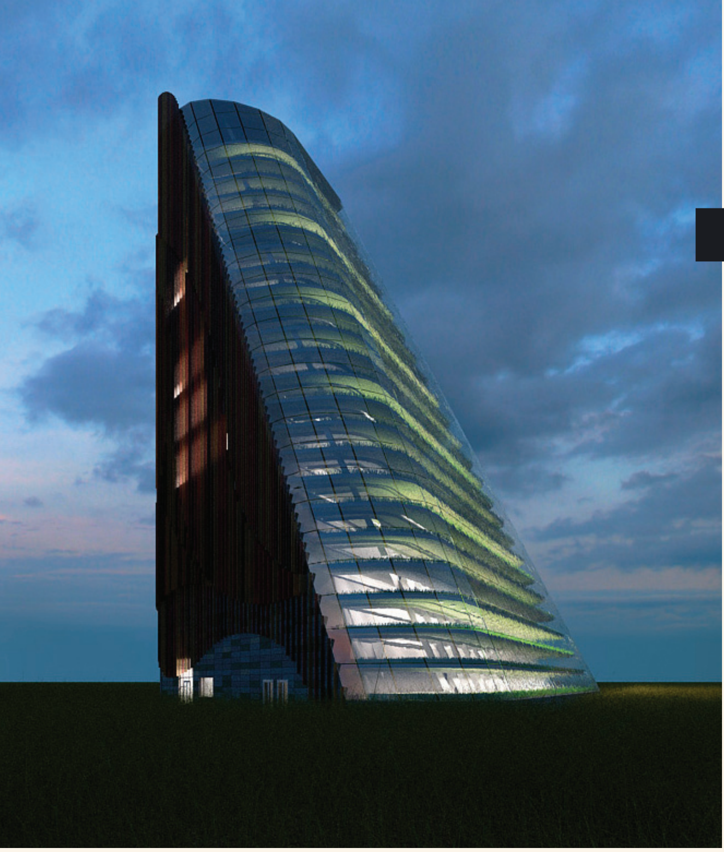
"From the British perspective, everything looks fine," says Professor Tim Lang of City University's Centre for Food Policy. "There's no shortage of food, supermarket shelves are full, and you don't have to step over people dying of starvation on the street when you're on your way to the opera. But huge changes are likely. And, a lot of analyses say, even the overfed, complacent British are in for a shock."

The knock-ons

According to Benton, who holds the role of 'champion' for the UK's publicly funded Global Food Security programme, the threats to global food security – defined as people having physical and economic access to sufficient, safe and nutritious food that meets their dietary needs – can roughly be divided into long-term and short-term risks. "In the long term, the danger is that demand outstrips supply," he says. The likely causes are considered to be population growth, a climate-change-induced decrease in crop yields, or a combination of the two.

"The more intensive that we make farming, the less sustainable that it becomes. As an example, the more nitrogen, phosphorous and other synthetic inputs we add to the land, the more the microbes in the soil become specialised. As a result, the soil biodiversity goes down, the structure of the soil disintegrates and you have a breakdown into something that becomes very dusty. Then, if you have climate change, or just a big drought, the vegetation dies and there is the potential for dustbowls to form." And, Benton adds, the formation of a dustbowl in one of the world's key "breadbaskets", such as the





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FAST FACTS

20% **INCREASE** in predicted crop prices by 2050

70 **MILLION** extra people to feed by 2030

7KG **OF GRAIN** required to produce 1kg of beef

Midwestern United States, Russia or China, has the potential to temporarily wipe out a significant chunk of global food production. “Suddenly you get to a tipping point where prices go sky high.” According to The Global Risks Report 2016, published by the World Economic Forum, the effects of climate change are currently on course to result in a 20% increase in crop prices by 2050.

In the short term, Benton says the greater risk comes from specific extreme weather events, which are thought to be made more frequent by climate change. But the consequences are broadly similar. “Sufficiently bad weather acts as a threat multiplier. If you’re in a situation where prices go up, people come out on the street, there’s political destabilisation, breakdown of infrastructure and that builds threat on threat on threat.

“One of the interesting things that we’re realising now is that the overwhelming reliance every country – perhaps with the exception of North Korea – puts on international trade in commodities means that everybody’s food systems are effectively interlinked on a global scale.

“In the middle of the 19th century, the Irish potato famine affected the Irish. There was a bit of a knock-on in that many Irish people went to America, but it was contained. If you had a similar sort of famine now, the consequences would be worldwide. The systemic risks associated with food systems are increasing.”

This sort of contagion effect was one of the areas covered by a report published by the Foreign Office, on which Benton worked with actuary Kenneth Donaldson. Donaldson collaborated with Nasa scientists and climate change specialists to model the possible consequences of a “double breadbasket failure” – a scenario in which two of the world’s major grain-producing regions suffered major shortfalls in the same year. “There wouldn’t necessarily be bloodshed and uprisings in the way that Syria has seen [partially as a result of food shortages]. But you could posit scenarios where food shortages came down from North Africa, got as far as Nigeria and then fuelled Boko Haram. That could lead to Boko Haram taking over the oil fields. Then things start to get really nasty.”

Bad habits

The bad news is that things may get worse before they get better. According to projections made by the World Bank, there will be an extra 70 million people on the planet to feed every year, which amounts to a 50% increase in demand for food by 2030. On top of this, the swelling ranks of the middle classes in countries such as China are placing extra stress on an already stretched system.

Since 1982, the amount of meat eaten by the average Chinese person has almost quintupled – up from 13kg to 63kg per person per year and now accounting for some 28% of the world’s total consumption. Some projections suggest that the figure could rise by a further 30kg per person by 2030.

One problem is that creating edible calories from meat requires a staggeringly inefficient conversion of water and grain. Beef is the worst offender, requiring 15,400 litres of water and 7kg of grain to produce a single kilogram of meat.

Another is that livestock accounts for 14.5% of planet-warming emissions, such as methane, which is more than the emissions from transport. With climate change being another threat to global food security, it’s easy to see how the problem is threatening to become increasingly cyclical and spiral out of control.

Lateral thinking

Fortunately, there is also good news. Solutions to food security have begun to increase in number and ingenuity.

For example, a 2013 UN report entitled ‘Edible Insects: Future Prospects for Food and Feed Security’ made the case for humans to take advantage of a largely untapped source of protein, by looking to creepy crawlies, which are much less reliant on scarce resources such as land, water or grain.

Also in 2013, scientists at Maastricht University unveiled a $330,000 lab-grown ‘beef’ burger for the first time. Then this year, American company Memphis Meats created its first lab-grown meatball. While still prohibitively expensive, it also represented a significant improvement in the cost-efficiency of the technology – at a mere $18,000 per pound.

Scenes such as Matt Damon's character tending to crops on the Red Planet in Hollywood film *The Martian* may not be confined to science fiction for much longer

Companies such as Sweden's Plantagon are developing the technology required to create urban 'vertical farms'. It received a boost when its project, The Plantagon World Food Building in Linköping, was recognised by the International Architecture Awards this year. Meanwhile, in London, disused subterranean Second World War air raid shelters have been used by a company called Growing Underground to produce crops such as parsley, rocket, celery and coriander, which have been used by chef Michel Roux Jr.

The Chinese government has cited the establishment of new fishing ports as part of the motivation for its recent land reclamation efforts in the South China Sea, where it has created manmade islands. However, whether this is as much of a consideration as the desire to gain a strategic territorial advantage over its neighbours is open to debate.

And if Elon Musk's plans to colonise Mars with SpaceX prove fruitful (he intends to send the first manned flights within a decade), then the scenes of Matt Damon's character tending to crops on the Red Planet in Hollywood film *The Martian* may not be confined to science fiction for much longer.

Perhaps more prosaically, the World Economic Forum has advocated the use of weather-indexed insurance schemes, which pay out on the basis of weather conditions rather than actual crop losses, thereby avoiding the paradox of farmers sometimes being compelled towards inefficiency and waste.

However, there are those who doubt the efficacy of these measures. "When it comes to finding solutions to this problem, my view is 'the more, the merrier'," says Nico Aspinall, chair of the Institute and Faculty of Actuaries' Resource and Environment Board. "But I can't help but think that these things will remain at the fringe of the debate for the foreseeable future. The vertical and underground farms, for example – you can see how they would easily substitute the cost of transport for the cost of lights – even with a green source of electricity. And if you're facing a systemic risk, then insurance companies providing finance to farmers isn't that helpful when what the region would really need is food."

The main focus, according to Aspinall and an increasing number of campaigners, should be on waste.

Throwaway ideas?

Figures from the Food and Agriculture Organization of the United Nations show that roughly one-third of the food produced in the world for human consumption every year, around 1.3 billion tonnes, is lost or wasted – at a cost of $680 billion to industrialised countries and $310 billion to poorer nations.

"Another third [of the food produced] is fed to livestock to create meat, and a third of the world's population overeats by 20% or so," says Benton. "If you put those loss factors together, we are only about 40% efficient. There is lots of potential if we are willing to change demand, reduce the waste, change our diets and become healthier. That, for me, is the way to pull back from the brink."

Roughly one-third of the food produced in the world for human consumption every year is lost or wasted

Campaigners such as Tristram Stuart (whose exploits include hunting down the skips where sandwichmakers dump thousands upon thousands of unused ends of loaves of bread) have worked hard to publicise the scale of avoidable waste in developed countries.

But for Lang, the most important factor in improving food security is government action – at least in theory. In reality, he says: "There's more engagement and willingness to do something about it from Tesco than there is from the government. You couldn't invent that for its stupidity. The key issue here is that we're paying huge amounts of money for the NHS, which is dealing with diet-related diseases (see p10) – yet we're celebrating cheap food as a social value. This is stupid – bad economics, very bad public health and also very bad environmental policy."

In Benton's view, there is hope for better food security, but it is likely to depend on a gradual shift in attitudes that, eventually, leads to a decisive change in legislation – in much the same way as has been seen with smoking. He points to how decades of scientific research into the harmful effects of smoking was followed by evidence of the danger of passive smoking. Finally, he argues, events such as the 1987 King's Cross fire, which killed 25 people and was in all probability sparked by a smoker's discarded match, was enough to bring about legislation and set off a behavioural shift that is still in motion today.

"If you use the same sorts of arguments with food, we've got the evidence that the current system is bad for us and the environment. We know that our food choices are impinging on other people's livelihoods. The analogous event to the King's Cross fire could be a food spike."

Perhaps it would take a major international crisis to prompt Western governments to legislate for improved food security at home and abroad. If so, politicians will just have to hope that it's also possible to manage the other consequences that would inevitably be part of the deal.

Photography: Alamy, Shutterstock

International perspectives

Predicting pandemics

Calculating the risk of pandemics is a question of when, not if – so how can we better understand this threat and limit the impact?

WORDS: CHARLES ORTON-JONES

The sudden eruption of the Zika virus before the Olympics was a reminder of how quickly disasters can happen. Within months, an unheard-of disease became a major regional threat. By September, scientists in *The Lancet* were forecasting that 2 billion people could be at risk. At the same time, Yellow Fever is multiplying in central Africa.

The danger is real. It is possible we are overdue a pestilential mass death. History is littered with such gory episodes. In 1348, the Black Death wiped out a third of the population of Europe. In the 18th century, smallpox killed 400,000 Europeans, including five monarchs. The death toll

Decontamination played an important role in the containment of Ebola

Photography: Getty

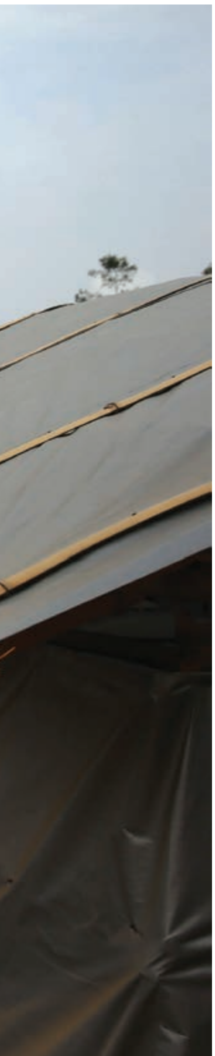
reached between 300 million and 500 million in the 20th centuries. Smallpox is now extinct, but we have Ebola, tuberculosis, dengue fever, malaria, and umpteen other killer diseases to worry about.

So is apocalypse nigh? One industry that takes more than a macabre interest is life insurance. Insurers absolutely need to know – an outbreak would spell financial ruin. But is it possible to put numbers on something so random and rare?

Risk Management Solutions' Dr Gordon Woo is one of the few people able to quantify the danger. As an actuary specialising in the field, Woo advises life insurers on the odds of a pandemic. "It's a pretty niche field," he admits.

Imminent emergency?

"We've had a pandemic every 30 years or so. This is the historical average that biologists subscribe to." Why this time period? "The frequency of pandemics is associated with a shift in the genetic make-up of viruses," says Woo, adding that the best scientific advice on this scenario is that the shift is a random occurrence. "It is not possible to forecast that the timespan will get larger or smaller."



This ought to get us sweating a bit. An average of 30 years between strikes – that's two, maybe three, pandemics per lifetime. But there's more to a pandemic than frequency. There's size too. Some potential nightmares fizzle out – look at Ebola. It had all the characteristics of a doomsday disease. Lethal: between 25% and 90% of people die. Contagious at just the right level: not so lethal that the hosts can't travel far enough to infect other people, but contagious enough to put health workers and others in close contact at risk.

When Ebola spread rapidly in December 2013, the governments of Liberia, Guinea and Sierra Leone took fast action. Infected persons were quarantined. Travel was curtailed. And the spread of Ebola was, ultimately, contained. During the three-year period to March 2016, when it was declared no longer a state of emergency, 11,325 deaths were reported from 28,657 cases – extremely distressing, but at the low end of forecasts.

As Ebola proves, the chance of being felled by a pandemic has as much to do with travel and infection rates and quarantining as outbreak frequency.

The life insurance industry and others involved in planning require precision, so Woo manipulates a complex model to calculate the severity of an outbreak. It begins with the rate of recovery and death. 'SIR' modelling looks at the shift between 'Susceptible', 'Infected' and 'Recovered' population groups as the contagion flares and then subsides. Viruses present unique patterns – the avian flu virus H5N1, for example, has a fatality rate as high as 60%, but is hard to transmit between humans. It is possible that a mutation might create an airborne version, but research indicates this is unlikely. All of these factors are woven into the model.

War on risk

The origin of an outbreak is also important. If the source is a remote island with a strong

CURRENT ALERT

Yellow Fever in Angola

The World Health Organization (WHO) is placing special focus on the spread of Yellow Fever in central Angola. The first case was detected in December 2015 and quickly spread to multiple regions in the country.

The Angola Ministry of Health applied to WHO for 1.7m vaccine doses, which were approved the same day and arrived five days later. Further requests for 6m and then 4.3m vaccines were made shortly after, again agreed by WHO.

By April, the Democratic Republic of the Congo (DRC) reported an outbreak, requesting 2.3m vaccines. Uganda, Ethiopia, São Tomé and Príncipe and Peru have also reported cases.

Data suggests 6,000 people are infected by Yellow Fever in Angola and the DRC. WHO's Emergency Committee chair Oyewale Tomori says: "We are not out of the woods yet."

FAST FACTS

30 YEARS
Average frequency of a pandemic

2 BILLION
Number of people at risk of the Zika virus

£424 MILLION
Cost of Tamiflu for bird flu virus scare in UK

50 MILLION
Deaths from Spanish Flu in the 1918 outbreak

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political infrastructure, the virus can be contained. But if the source is highly populated and chaotic, with a high degree of international travel, the consequences are dire.

Woo also looks to the nexus between pandemics and war, noting the work of Canadian historian Mark Humphries, who studied the cause of the 1918 Spanish flu pandemic. "Was the mobilisation of troops responsible? No, as it came long after. Humphries tracked the cases of flu and found that, in 1917, the Chinese government set up the Chinese Labour Corps and sent 100,000 workers to the Western front to help with the war effort. It wanted leverage to get Shandong province back from the Japanese. Those labourers were sent by ship to Vancouver, then to Nova Scotia, then to Europe. That journey almost certainly brought Spanish Flu with it. Having large numbers of people moving around from one place to another accompanies pandemics. It is an underlying cause."

The seriousness of this message is obvious. In times of peace, we can contain a pandemic. In times of war, it is far harder. The experience of Iraq and Syria is bearing witness to this. In 2015, Cholera deaths began to spike. Unicef's Iraq representative, Peter Hawkins, warned: "[The outbreak] already has a regional dynamic, and the risk of that can only be increased by people from all over the region coming into Iraq." The Shi'ite festival of Arbaeen brings millions of worshippers to the Iraqi shrines of Najaf and Kerbala. The festival last year attracted 26 million, the largest peaceful gathering anywhere in history. The conditions for a mass outbreak are ripe. The World Heath Organization has reacted to the threat with mass vaccination.

An untimely mutation of a potent virus could also wreak havoc. Woo has his eye on the respiratory disease MERS. "If a contagious version of it had materialised in Syria, it would have been a disaster, as one million refugees left for Europe."

Path of least resistance

A likely source of a pandemic is a mutation of a current microbe previously thought to be treatable. Overuse of antibiotics and antivirals is leading to microbial resistance. Old diseases suddenly become lethal, with no treatment.

The World Health Organization (WHO) reports: "Gonorrhoea may soon become untreatable, as no vaccines or new drugs are in development." Resistant strains of malaria have been found in Cambodia, Myanmar, Thailand and Vietnam. Globally, 3.6% of new tuberculosis cases and 20.2% of previously treated cases are estimated to be multi-drug-resistant.

It concludes: "The problem is so serious that it threatens the achievements of modern medicine. A post-antibiotic era – in which common infections and minor injuries can kill – is a very realistic possibility for the 21st century."

In Sierra Leone, the military were involved in enforcing checks for Ebola

Potent policy

With such horrors, we might suppose governments are taking a keen interest in pandemics. And to a degree this is correct. In the UK, Imperial College London's Neil Ferguson is a lead adviser to the government on infectious diseases. He had a major role analysing data during the foot-and-mouth epidemic and advising on control policies. His mathematical models examine the possible spread of new pathogens, and reveal the best containment strategies for pandemic influenza and bioterrorism agents.

Ferguson's work has grants totalling £5m, but that's where the budget starts to run out. Governments tend to take the view that reaction is better than prevention. The economics of stockpiling vaccines for rare diseases, or even funding cures, aren't vote winners in the short run. Ten years ago, the UK government splurged on 40m batches of the Tamiflu antiviral drug in preparation for the bird flu pandemic. Basic materials such as gloves, masks and syringes were in short supply. But the panic turned out to be baseless. Tamiflu cost the government £424m, with £72m of it discarded, owing to poor record keeping.

The episode shows why governments are reluctant to react early. "Politicians take a short-term view," says Woo. "In a five-year election cycle, they are reluctant to spend on risk mitigation. That is the price of democracy."

Worried? Current research by actuaries rates the chance of a similar scenario to Spanish flu in 1918, when 50 million people died, as less than 1 in 400. Even then, the key is containment – for which we need peace, not war. If we can't work for a cure to pandemics, then resolving conflicts is the next best thing.

Wider fields

Developing data

The Institute and Faculty of Actuaries believes number crunching could transform life in the developing world. IFoA member ***Nick Silver***, director at Callund – a company of economists, actuaries and public-sector experts – explains how the development of life tables in Nigeria could be an important step

Wider fields

International development

Life insurance and pensions can offer vital support to those in countries with no welfare system, and life tables make these safety nets possible, Nick Silver explains

Q At the core of your bid to introduce life tables in developing countries is data. Why?

NS: Information is vital. A life table – lists of ages and the probability that someone of that age will die – is essential because, in order to assess the value of a pension, the provider needs to know how long they're going to have to pay you. That's crucial for the pensions industry, because without it you can't price the contract. Many developing countries like Nigeria have data, but it's 20 years out of date. The UK is something of a world leader in its expertise in life tables, and it seems to me that we could export that – the training, the methodologies – and roll it out across other developing countries. In some countries it would be a long-term process, over years, to collect enough data of quality.

Q Why is there a need for financial services in developing countries now?

NS: We take risk management tools for granted, but you'd notice if they weren't there. If you suffered a drought in your city, it wouldn't make much difference – because you don't store your resources in the form of, say, cows, which makes a drought much riskier. And while not heterogeneous, some developing countries are much more developed than we think. Parts of Africa, for example, have a growing middle class, so there's a demand to access insurance services. Nigeria, for example, has a population of 165m, but only five qualified actuaries.

Q What other sociodemographic shifts are driving these new markets?

NS: There's increased life expectancy and, with it, an awareness of the need to save in some form. People are moving to cities and having fewer children – ask someone how many children people in Bangladesh typically have and they're surprised to hear the average is just over two, not six or seven – so there isn't the ability to rely on children for care in old age. And technology – especially the mobile phone – is proving a game-changer. The farmer now has access to the modern world – to services, to information [see box, p33].

Q Will this expansion of financial services into new markets really contribute to the greater good?

NS: I think people are moving away from a sceptical view of financial services providers that claim to be about creating value or doing good. There is a genuine opportunity here to use professional skills to bring benefit to a lot of people. But I do think that, to maintain professionalism, you have to get paid. That's a stamp of the value of that professionalism. That said, yes, the developing world is a sustainable market. In fact, I think it has better prospects than a lot of markets in developed countries with their ageing populations.

Q Why hasn't this expansion come about sooner?

NS: The people in developing countries typically have had other things to worry about; they've had bad governments, or everything

Mobile finance

Telecommunications have been groundbreaking in building financial services in developing countries: "Faster, more efficient and less costly because there's no need for offices or men in suits and ties," it's no wonder mobile finance is growing, says MicroEnsure marketing director Peter Gross. A farmer in a remote rural village can now submit a claim via WhatsApp, and be paid via Mobile Money. Such methods have been embraced by homegrown and international financial services companies: "Small sums assured, short-term, large market – it's really an insurance industry dream," Gross explains.

While bricks-and-mortar retailers may have been able to build financial services in developing countries at a slower pace, services offered via mobile phone have been able to use the platform as an education tool, offering local language services to hard-to- reach people – with tech-savvy children on hand to help. "You can't rely on conventional means of selling insurance in developing countries, because of the need to compress costs," says UN International Labour Organization actuary Lisa Morgan. "The mobile has also demonstrated the ability to educate on insurance and health. Of course, with everyone using mobiles, there's a lot of spamming, too."

The mobile phone has shaped not only the scale of digital lending – it allows loans of as little as $1 – but also the parameters to assess suitability for lending: credits checks in developing countries can now be based on a person's airtime and call expenditure. Using mobiles to access financial services is expected to grow as technology becomes cheaper, and, with that, innovative services can be expected. "Developed countries are now looking to developing countries, because necessity is the mother of innovation," says Gross.

+ For more on the rise of mobile insurance, visit **WWW.ACTUARIES.ORG.UK/MOBILE-INSURANCE**

Read more about the potential of micro-insurance at
WWW.THEACTUARY.COM/FEATURES/2016/04/MICROINSURANCE-SHOWING-POTENTIAL

Credit checks could be based on call expenditure

has been run by the state, or the country has just been too poor to need any insurance arrangements. Often, whatever system is in place is the result of the nation having been a colony, but this has been left to go to wrack and ruin. Pensions have not been a priority – if life expectancy is 40, you don't need one. A pension was always considered a tertiary good, something you don't buy unless someone forces you. But all those factors are shifting, and mobile phones have provided access that wasn't there a decade ago. We're at a kind of tipping point.

What challenges are there to a successful rollout of life tables in Nigeria?

NS: The biggest challenge is getting data and building capacity. In the UK, for example, you're dealing with professionals who go to conferences and compare notes. In developing countries, there isn't that depth of knowledge. Those with the knowledge tend to leave the industry for higher-paid work. People are left working in a vacuum, with no background for comparison. But it's worth pushing forward on this despite the challenges, because the work can make a massive difference to people's lives and to the future of a country's development.

What other difficulties have you faced on similar projects?

NS: Often what we do or recommend doesn't get implemented, or not in the way we hoped. And given that a lot of the work is about pensions, we're dealing with long-term prospects, so we'd need to return in 10 years' time. But getting anything in place is a plus. We come across the same issues that make that hard. Local people don't trust the government, or feel it's just taking money. It's complicated and often people just don't understand it. Because they're not that interested either, it doesn't become a political issue. Governments don't like taking money or telling people they'll have to work longer – the temptation is to just leave reform to successors. We have to accept that it's a long, slow process. But then no country has really got pensions right.

How has building financial services in developing countries shaped your view of the sector?

NS: When you're dealing with a frontier market, you really need to be able to answer the question of why anyone needs a pension at all. It gives you an outsider perspective. In developed countries there's also a scepticism of financial markets. Go to somewhere without financial markets and you realise it's better to have them. There may be a lot of arguing about CEO pay, for example, but a listed company still has to conform to certain standards – the CEO can't put company money in their bank account. The system isn't perfect but to have the equivalent in developing countries would be a huge step forward.

Developing financial services fast

"Insurance is not a silver bullet for developing countries," stresses UN International Labour Organization actuary Lisa Morgan. "They need all systems such as education and sanitation developed at the same time. But insurance certainly has a role to play."

MicroEnsure marketing director Peter Gross points out that customers in developing countries are convinced of the nature of risk: "They breath it and sleep it," he says. "The risks they face make them very insurable."

Not that such services – of a kind – are not already available. One in four Ghanaians now have an insurance policy; six years ago, that was just one in 20. Morgan cites Africa's financial infrastructure-free savings clubs: small and informal, perhaps not-so-secure, but personal and therefore trusted. These are increasingly being advanced by funding from major NGOs, and 10.5 million people are estimated to now be members. "Winning trust is crucial to establishing any formal financial service in a developing country," she says.

Trust and transparency are so powerful that life policies are sometimes even paid out at a funeral, so that onlookers can see insurance in action.

Alongside life insurance, crowd-funded loan ventures such as Kiva, micro-finance and micro-insurance are also well established in many developing countries for those who can afford it. Circumstances can vary wildly between developing countries, so services are also being provided by financial co-operatives, including credit unions, low-capital rural or local banks, state-owned banks, and postal and non-postal savings banks.

The scope is growing. "Driven by the huge potential of the emerging consumer, plus the opportunity to appear socially progressive, many major international industry players that a decade ago would have been nonplussed by the idea now feel it's less about micro-insurance than just insurance. That's about to boom," says Morgan.

10.5 million people are estimated to be members of savings clubs in Africa

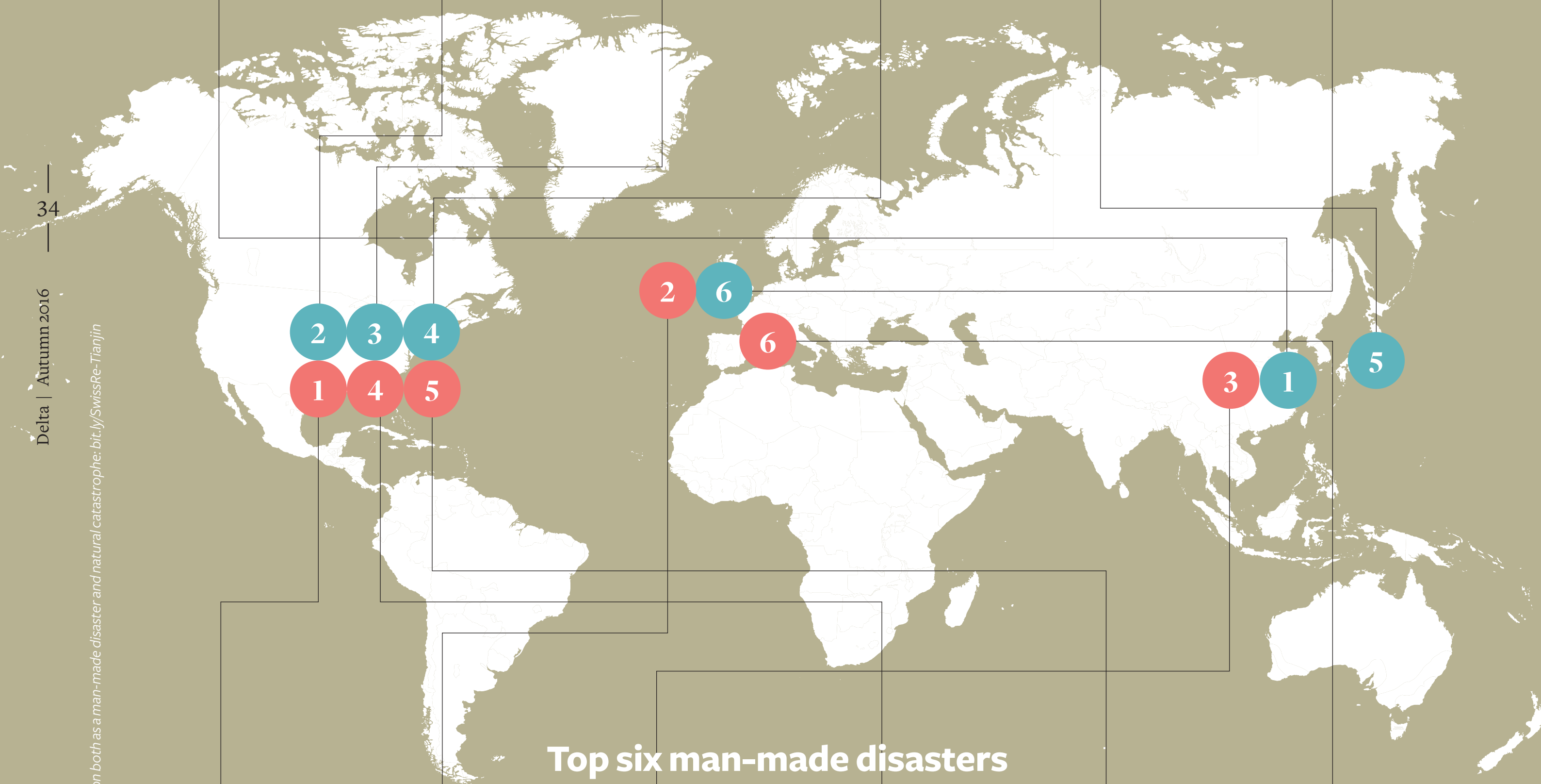
Photography: Getty

Many reinsurers anticipate rising levels of global catastrophic risk, owing to the effects of climate change and increasing interconnections between risks (see feature, p20). The World Economic Forum warns that the effects of such interconnected catastrophes are unpredictable, making risk modelling ever more challenging.

Catastrophe costs

Top six catastrophes

1	2	3	4	5	6
CHINA Explosion at Tianjin port	**UNITED STATES** Winter storm	**UNITED STATES** Thunderstorm, flooding in Texas	**UNITED STATES** Thunderstorms	**JAPAN, PHILIPPINES, NORTH KOREA** Typhoon Goni	**UK, IRELAND** Flood (storms Eva and Frank)
$2.5 - $3.5BN	$2.1BN	$1.5BN	$1.2BN	$1.1BN	$1.0BN
August 2015	February 2015	May 2016	April 2016	August 2015	December 2015



Top six man-made disasters

1	2	3	4	5	6
UNITED STATES Terror attack on World Trade Center	**UK** Explosion on platform Piper Alpha	**CHINA** Explosion at Tianjin port	**UNITED STATES** Vapour cloud explosion	**UNITED STATES** Damage at nuclear power station	**FRANCE** Explosion destroys fertiliser plant
$25.2BN	$3.0BN	$2.5 - $3.5BN	$2.4BN	$1.4BN	$1.3BN
2001	1988	2015	1989	1979	2001

Reinsurer Swiss Re lists the complex Tianjin port explosion both as a man-made disaster and natural catastrophe: bit.ly/SwissRe-Tianjin

Insured losses Source: Swiss Re

Institute and Faculty of Actuaries

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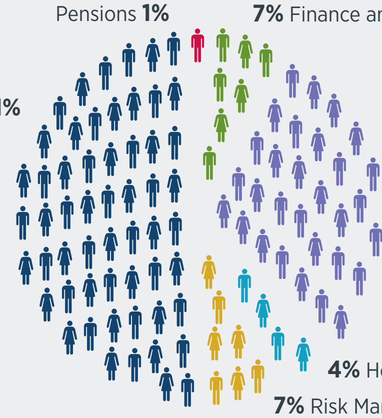
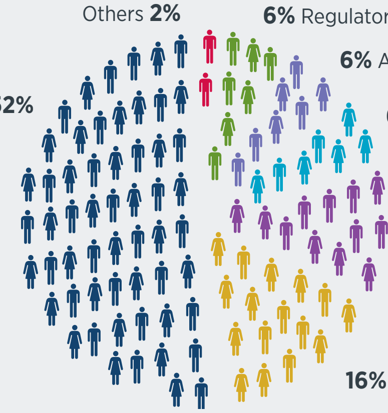


2016 Conference attendees by employer:



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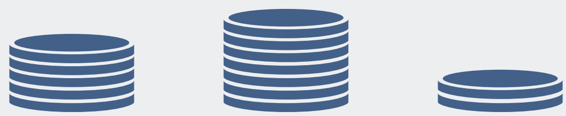

2016 Conference delegate testimonials:

Excellent all-round event: CPD, networking, relevant issues ... it has it all!

The conference is a great way to broaden your professional horizons both in the knowledge gained and people met

Can't fault the event, exceeded expectations on every aspect. Speakers line-up was especially impressive

Great opportunity to hear from industry and thought leaders, as well as to network with actuaries from all over the world

The best conference I have been to in KL for 20 years!

Great event for learning and development, I would highly recommend the conference to others

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