Longevity Trends 2020

Mid-Year Update

How longevity is disrupting the world across health, science, business, technology and financial services, and why COVID-19 has thrown longevity into sharp focus

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LONGEVITY LEADERS

COVID has shown us the true meaning of disruption, and longevity has been thrown into sharp focus

At the start of the year we predicted that longevity would be one of the most important trends emerging in 2020. We certainly didn't predict that the emergence of a global pandemic would throw so many of our debates about longevity and healthy ageing into sharp public focus, nor quite how impactful the work of the longevity community would become in the immediate future.

In the words of Andrew Scott, *"COVID is showing us the true meaning of disruption."* With that in mind we are re-releasing the Longevity 2020 Trends Report with a new edition covering the changes to the longevity field in-light-of the pandemic. Every sector stands to be disrupted by longevity, whether by changing customer demographics and opportunities, an ageing workforce, new ways to prevent and treat disease, intersection with a rise in wellness and sustainability trends or change across the pensions market.

This report captures Longevity Leader's extensive research into this space, including the most important Longevity Trends of 2020 that businesses, policy makers, scientists and the general population need to be aware of, particularly in light of COVID-19.

3rd annual

LONGEVITY LEADERS WORLD CONGRESS

AGEING SCIENCE | AGEING WELL | LONGEVITY RISK

www.longevityleaders.com

"Having speakers and content to keep delegates interested and engaged for four days is an absolute credit to the conference."

Eric Kerry

Nottinghamshire County Council Pension Fund

"Great organisation and execution. On-demand access was extremely convenient."

Luise De Almeida

Beiersdorf

"This Congress presented a comprehensive overview on the Longevity Economy, highlighting the urgent need for change and evolution across both industry and government"

Anne Marie Wright

Veteris47Inc

"An impressive gathering of the top investors and scientists within ageing and longevity."

Espen Riskedal

Age Labs

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HEALTHSPAN SHOW

HARNESSING WELLNESS TO AGE BETTER, INCREASE LONGEVITY AND PREVENT DISEASE IN LATER LIFE

Business Design Centre, London, UK

"From an investment perspective, at least for now, it's more tractable to invest in companies that are working on so-called healthspan improvement... anything that improves health naturally leads to a longer life."

Xinhong Lee

Vickers Ventures

"The paradigm we are advocating is very different, in terms of how we are going to approach tackling age-related diseases. It's not waiting for symptoms as we're getting older and then treating the symptoms. Rather, it is really thinking about pre-symptomatic and preventive medicine in a very, very different way. The vision is to understand risk factors to develop certain diseases as you age, and start bending the curve so that that you that you don't develop them at a later stage."

Jens Eckstein

Apollo

"Consumers are increasingly seeking products and experiences that promote well-being and healthy habits, with modern-day "wellness" referring to holistic healthy living characterized by physical, mental, social, and spiritual well-being"

CB Insights, Wellness Trends 2019

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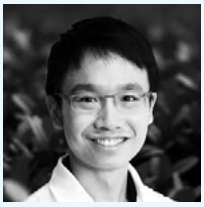

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1.1 Roundtable: Challenges and opportunities of investing in longevity biotech

Laurence Barker, CBO, SV Health Investors
Gregory Bailey, CEO, Juvenescence
Jens Eckstein, Managing Partner, Apollo Ventures
Xinhong Lim, Director, Vickers Ventures
Moderator: Reenie McCarthy, CEO, Stealth Biotherapeutics

REENIE: The World Health Organization has designated 2020 the decade of healthy ageing. One of our panellists, Jens Eckstein, remarked that ageing is the highest risk factor for disease, and this has been demonstrated by the stark and brutal reality of the ravages that COVID-19 is wreaking on our elderly populations. It's timely therefore, for us to have this discussion about the challenges and opportunities of investing in longevity biotech.

So, the first question I'd like to focus on is: what are the major challenges that you see of investing in longevity biotech, as opposed to more traditional yields?

XINHONG: We generally look at the balance between risk and reward in all our investment decisions. So, if we drill down, I'd say the most outstanding risks are scientific as well as regulatory. If we look at the scientific risk, I think the field is has made an incredible amount of progress in terms of understanding mechanisms and markers of ageing, but we still have plenty of work to get a much more granular understanding of how to define ageing, and what we need to do to modulate it. This question of whether or not there is a distinction between lifespan and healthspan is something that I think the field this is still grappling with. So from an investment perspective, at least for now, it's more tractable to invest in companies that are working on so-called healthspan improvement, which, broadly speaking, could arguably cover almost all areas of therapeutics and drugs and vaccines because they know anything that improves health naturally leads to a longer life.

It is interesting to ponder whether or not life extension itself is something that can independently result from manipulation of the biology.

Of course, the other risk that is a big one in the field is whether or not we can get the right standards and the right regulatory mechanisms in place that will enable some of these trials to be carried out in a tractable manner, especially for longevity focused trials, which by definition are much longer. A key challenge, both from the scientific and regulatory perspective, is to get to an agreement on what would be appropriate biomarkers that we can use to measure ageing and use that to reduce some of the risk.

JENS: One of the challenges is to redefine what we mean when we talk about ageing and healthy lifespan. The paradigm we are advocating is very different, in terms of how we are going to approach tackling age-related diseases. It's not waiting for symptoms as we're getting older and then treating the symptoms. Rather, it is really thinking about pre-symptomatic and preventive medicine in a very, very different way. The vision is to understand risk factors to developing certain diseases as you age, and start bending the curve so that that you that you don't develop them at a later stage.

An enormous amount of money goes into cancer, but if you would actually be able to heal cancer, the overall life expectancy of mankind would only go up maybe two or three years altogether. And that is because we have poly morbidity. We usually don't have one single disease in ageing, we have several underlying problems. That's the challenge - to change the fundamental thinking of how we think about disease and how we can treat disease.

This has scientific challenges, but there are also challenges in the business model and economics behind it. You are challenging the way the pharmaceutical industry has done their business in the past as well as all the other approaches to diseases. We're trying to really change the way we think in general about growing older.

REENIE: Greg, you're also investing in diseases of ageing, but you've got some novel approaches to potentially moving the needle here – including looking at a nutraceutical approach in some cases. Is that right?

GREG: Yes, we have both conventional Rx and non-Rx divisions. Ageing is a unique market. You have 7-8 billion people who are getting old.

"An enormous amount of money goes into cancer, but if you would actually be able to heal cancer, the overall life expectancy of mankind would only go up maybe two or three years altogether"

All of a sudden, you can do very inexpensive IP-protected products that don't have to have Medicare or NHS to pay for it. This changes everything going forward. We need the Rx Division at Juvenescence because you need the credibility of it, and of course there are tractable pathologies. A lot of the scientists have both a non-Rx and an Rx product, so this gives us a great opportunity to interact with them on both levels.

REENIE: Laurence, your focus is on dementia related diseases of ageing. Do you think that we can learn anything from the developments in the Alzheimer's or the Parkinson's field that will inform a broader approach to diseases of ageing or longevity?

LAURENCE: If you step back for a bit and go back to some of the fundamental processes of ageing, there's lots of pathways, targets, pathologies that we start to see come up in the dementia research and huge learnings we can take from some of these approaches. There is a lot of overlap in terms of the kind of iterative learnings and of the technological developments that are going to be required to be successful. Whether you're talking about fundamentally understanding the pathology, the biology of these of these diseases, the mechanisms, and then how you test them both pre-clinically and in particular when you think about clinical development.

REENIE: Looking at cross fertilisation from traditional drug development, are there any biomarker developments, regulatory pathways, or any other shortcuts that we take to elucidate these pathways that we can learn?

JENS: Our vision is huge, and we have to take it step by step. Having the full arsenal and learnings of how we have done drug development discovery in the past is obviously helpful. For example, we have become very good at defining targets and getting different modalities to have a biological effect. At Apollo, with all our investments we are trying to dig up what we call a 'stepping stone disease' - that can be a genetic mutation that has an accelerated phenotype that sits on exactly the molecular mechanism that we would like to address for a broader application age related disease. Very often, those orphan diseases are where you pretty much understand who your patients are because they're clearly defined by mutations or by certain accelerated phenotypes.

We will use those orphan diseases - not only to help those patients who are in very desperate situation, but because we can use those trials to actually find, discover and validate biomarkers to go in to age-related diseases much more broadly and also diagnose some of the things that are pre-symptomatic.

That's the overall concept of Apollo. That's why we are focused on building our own companies, because this is a very new approach of doing things.

REENIE: We've talked a little bit about therapeutic development, but what are your thoughts on gene therapy for ageing?

LAURENCE: I think it certainly has a role to play in some dementias. However, you really do need to ask the question upfront of whether it is the right approach, the right modality, the right way to interrogate and potentially solve a genetically driven dementia. Gene therapy is not the answer to all, obviously, but it certainly is with regard to some. I think that field is rapidly growing in the dementias, whether that's in the ALS FTD areas, or elsewhere.

XINHONG: Gene therapy is interesting also because of the parallels with regulatory and commercial risk. I don't think the field has been able to solve the question of how to pay for it necessarily and I can see parallels with the ageing and longevity field here. If you had a cure for ageing, how might one pay for it? First of all, one has to demonstrate the efficacy. But then we still have to figure out how to pay for it. I would really love to see how this might be addressed.

REENIE: That brings up the question of investing in this space, given the time and patience that it requires. Is there a different investor that you target when you go out to fundraise for your funds?

GREG: We're not a fund - we are actually a

pharmaceutical development company with a non-Rx division (but the major focus is the Rx), and we have seen a dramatic difference in the investor approach. The science and developments are happening at such a fast pace we couldn't rely on just the traditional biotech investors which took 3-6 months to raise money from- we just didn't have the luxury to wait that long. We've mostly secured funds from ultra-high net worth individuals. It's an easy story for them to understand. The other thing is that if you assume that Bank of America is even remotely correct that this is going to be a 500 billion dollar market by 2025 and you really believe that science fiction is now science, and you believe in the management team then this is a fascinating investment. I think we'll seek thematic investors, ESG investors, as well as the ultra-high net worth individuals, and then maybe a couple of biotech funds.

REENIE: Xinhong, you were an earlier institutional investor in Samumed. Was that a departure from your typical approach? What was your thinking around that?

XINHONG: Our strategy has really traversed multiple industries and is to go after platform technologies that address multiple use cases. Going after the root cause of multiple disease indications is the problem. If there is a group that discovers novel biology that presents a novel way to intractably target a disease indication, especially something like in the case of Samumed, that could be so fundamental, that becomes a very attractive proposition because then that platform potential allows us to diversify risk across multiple disease indications. We would prefer to invest in a company that has a technology that will enable them to really tick off multiple shots on goal. Then, the question comes to whether or not the company has the right team. Can they execute on this? Can they raise the capital that they need to fund those multiple shots on goal? And I have to say that the good news from the institutional side is that there's a lot more interest and appetite now in funding platform technologies.

REENIE: Jens, you also take a platform-based approach. Is that similarly resonating with your investors at Apollo?

JENS: The major advantage of a platform is that you have several shots on goal. I think the challenge in platform technologies is always that you have to figure out how to keep the platform alive, once you have nominated the lead program. You have to be pretty creative there, or you have to raise a ton of money - either one works! It's up to us to not waste the value of the platforms, because I think that the clinical pathways will be a challenge. It will not be easy to show biological effects in the clinic and really define the biomarkers. On the other hand, if you go directly to consumer nutraceuticals, with time, you will also want to have trials and show that you have an effect

XINHONG: What helped in making the case to our investment committee was really that we weren't saying that we were going after ageing specifically, but that we were going after age related diseases. There was a tractable path to development, and attractable route to commercialization.

REENIE: Laurence, you've got more strategic investors behind you as well as charities and sovereign funds. Do you think that is because of the specific diseases you're targeting? What are your thoughts here?

LAURENCE: We knew we just weren't going to get much traction if we were to target traditional biotech funds, because the industry record in Alzheimer's is characterised by a history of failure. Two groups have been highlighted so far that have some fundamental strategic interests. We've been getting real traction with the ESG impact arms of groups whose own customers are screaming out to them that they want their money to be put to work to have real impact.

The other resonates heavily with what Greg said, the high net worth individuals or groups who want to see impact in this space. They had personal or family stories, of course, in this space. Unfortunately, I think we all do. They were willing to back the team and the types of approaches that we were adopting with the fund. I think we're starting to see interest from groups that we previously had not. I think the only thing that's going to further build that is, of course, success (which, from my perspective, means clinical success). We're not there yet, but we're starting to make material inroads.

REENIE: So to that point, is that the group's consensus that it will be clinical level success that will be the tipping point?

GREG: If you can show investors a path that they can digest, if the science makes sense, then I think you can get there before having somebody definitively get a drug for anti-ageing. Alternate pathways you can pursue like fibrosis or inflammation play an enormous role in ageing and investors understand them and the regulatory pathways so will finance them. Having said that, the discrepancy between the amount of money that's been available for anti-ageing research and the amount of money that goes into the next social media app is phenomenal. You're going to need to drag those people over the sets to make them realise that this is important, and that this revolution in our ability to modify ageing happening now.

REENIE: Shifting to investor expectations, then, particularly if you're going to non-traditional investors. Do tech angels and HNW's really have the stamina to weather the ups and downs and long wait times of biotech life cycles?

GREG: They do, because wealthy people want to live longer. They enjoy being wealthy and they're enjoying life, and so big tech investors like Thiel and Bezos are intrigued by these possibilities and opportunities.

JENS: Once you have a lot of money, like Thiel and Bezos and other tech billionaires, you can afford to have a long-term perspective. I think that's why a lot of high net worth individuals coming from the tech world are interested in ageing because they have all this money and they've got to see a long life to actually take advantage of it.

REENIE: Do they appreciate your strategy of going from rare diseases as stepping-stones to more age-related diseases? Does that resonate?

JENS: I think you need to explain to them how drug discovery works. That's a difficult thing, actually. There are very few shortcuts. The first thing you have to show is that whatever you do is safe, and that's generally a Phase I clinical trial and all of the mind bogglingly complicated and bureaucratic nightmare that that entails. Getting investors that are non-traditional biotech investors to properly see and understand this is a challenge.

GREG: To add to this though, the nice thing about biotech is there's a light switch that flips and your stock doubles after a successful phase II or I trial, which we have to educate investors about. If you go public, and if you are successful, your investors will make money, sometimes incredible amounts.

REENIE: When building your portfolio, do you need to think about where you are in your lifecycle across your portfolio so you can balance it out?

LAURENCE: You have to take a portfolio view, and you have to look at the time and capital you've got and if you are allocated sensibly across that for risk and reward based on the stages of your of your different investments. For us, we made the conscious decision that we were going to start out this fund by probably having to take some early investments and build companies from scratch, so we decided to construct a 15 year fund from the get-go rather than anchor it at 10. Time will tell if that was the right decision, but I think this approach manages expectations appropriately, and is an acknowledgement to our investors that these things can take time and can be tricky.

REENIE: So, Greg, does that influence what your exit strategy will be? You're not a fund, so do you think about doing licensing deals or other things to pull in earlier catalysts?

GREG: Our job is to deliver a return to our limited partners, to our shareholders. When I'm talking to an investor, I'm not saying this is an amazing drug, what I'm saying is I am going to make you an extraordinary amount of money if I'm successful and this becomes real, because that's what their mandate is.

I don't think Big Pharma are really going to get how big the product is if it does what it aims to, so I think we're going to end up licensing. To structure something where I could individually pass off the various companies and license them without having to sell the whole company is important to our strategy. We set it up where the licensing is done within a tax-efficient jurisdiction, and you can buy shares back pro-rata. So, investors can generate long term capital gains and don't get double taxed.

To make this successful we have to have good products, and then we have to make sure that our investors do very, very well. By doing that, it will drive this sector forward in leaps and bounds.

REENIE: Xinhong, Vickers is a global fund. How are you structured and how does that influence your strategy?

XINHONG: We decided to be global from day one because we believe that innovation happens everywhere. And we need to be able to pick from the best innovation in order to give the best returns to our limited partners.

We have an interesting structure that's a bit different from the traditional VC fund. We have a 10 plus 2 lifespan with what we call 'a phase shift' in the strategy. Most VCs would raise the fund, make investments from the fund but would save money for follow-ons from the same fund. You typically can't invest across funds because there's a potential for conflict, and LPs don't like to see that. However, we're structured in a way that right from the outset allows us to reserve about half of the fund to invest in the follow-on rounds of the most promising companies of the previous funds. Then we fully invest in so-called discovery companies that are new to our portfolio. This enables us to have multiple funds participating in the company's growth and to have a long-term relationship with the company, which is particularly important when investing in longevity companies where there's a very long lifecycle.

"The discrepancy between the amount of money that's been available for anti-ageing research and the amount of money that goes into the next social media app is phenomenal."

REENIE: Laurence, does your investor base look for first dibs on new technologies you are coming across or in your portfolio? Do you do anything different or are the just straight standard investments?

LAURENCE: We treat all our LPs the same, of course. We do give them advice about our companies on a nonconfidential basis so that they benefit from seeing what's going on our portfolio, but our portfolio companies benefit enormously from their experience. Their capital is crucial for the fund to be successful, but also their advice, guidance and input is just as important. We have a formal mechanism in place to be able to leverage this, with our advisory board that meets several times a year. One of the fundamental principles of the fund together was to be able to deliver that insight – we'd be foolish not to leverage that depth of experience around the table.

REENIE: One final question to close. How do you see the impact of COVID-19 affecting investor interest?

GREG: We've seen an unfortunate side-effect of immuno-senescence and a disproportionate number of people over the age of 70 dying. I think Covid-19 gives us an opportunity to refocus. Governments and investors are now acutely aware of what the change in immunity level is, and so are going to make money available for those trying to find therapeutics. We now have an incredibly heightened awareness of the fragility of life, and also increasing success stories in our ability to increase lifespan.

JENS: I would add that Covid-19 has made everybody aware that we have been looking at disease far too narrowly. I think it's really fascinating is despite the horror of what's going on, that people are learning how complicated that science is around that virus. That the virus has specialised in a systemic approach and systemic weaknesses of the human body. That's pretty much exactly what ageing is. Ageing is a systemic breakdown of regulation of fitness. I think that will open people's eyes. Despite the horror of this crisis, I think it will help how people look at ageing and age-related disease.

LAURENCE: It has slowed down some fundraising and operational aspects of discovery and clinical work and so forth. To look at it more positively, though, it's has reminded us how creative,and flexible we can be and still get things done. It's not impacted nearly as heavily or made things as difficult as I thought it might. It's encourageing people to do and be much more creative in the way they operate and the way they work - and I bet a lot of this will be lasting.

XINHONG: I would echo everything that has been mentioned and add that we have advised our companies to really batten down the hatches. We foresee challenging times continuing for a significant period ahead, and we tell everyone to raise as much money as they can and to take whatever they can at this point, even given the challenging environment.

The good news is that there are some sectors that are clearly benefiting from this. I would say that healthcare and life sciences investments have never looked better. If there's any market not been severely affected this is it. Investors are now looking for opportunities that are not going to be changing with the vagaries of consumer attention and consumer-focused industries that are now suffering significantly. Investor interest has now shifted to looking at longer-term bets and things that are going to be important regardless of how or whether or not we can go out and socialise. Ageing and age-related diseases certainly fall into that category.

I would also add that it's heartening to see scientists, policymakers try their best to marshal their resources in a global way. It shows us how medicine and science can be done in a global fashion. Hopefully we'll bring the same sort of attention and effort to bear on problems of ageing and age-related diseases as well.

1.2 Interview: How far we have come, and where we are going?

Eric Verdin, Chief Executive Officer, Buck Institute for Research on Ageing

Interviewed by: Angela Tyrrell, Senior Vice President, Longevity Leaders

ANGELA: Tell me a little bit about The Buck Institute and your mission in ageing science?

ERIC: The Buck Institute was started in 1999 on the heel of some key discoveries showing that ageing could be studied biologically using the modern tools of genetics. Our mission today is to take what we have learned about ageing during the last 20 years and to start translating these discoveries for improving human healthspan and lifespan.

ANGELA: What were those key discoveries?

ERIC: The initial discoveries by several groups between 1985 and 1995 suggested that there are genes that can mitigate the ageing process. If these genes are mutated to either gain or lose function, one can dramatically impact healthspan and lifespan. These observations were made in a number of models like C.Elegans (or worms), Dresophlla fruit flies and eventually mice. The goal of the Institute for the past twenty years has been to build on these initial discoveries and try to provide a fuller understanding of what ageing is.

We've learned a number of key lessons. Firstly, we've learned that there are genetic pathways that interact together and appear to control ageing. Secondly, these pathways seem to be conserved across different species. So, we find the same pathways in yeast, in worms and in humans. Thirdly, we can speak to these pathways via small molecule drugs to have the same effect as mutating the gene, and subsequently impacting the ageing process. Finally, these genes that control ageing don't just control lifespan, they also control healthspan. The animal models we studied did not only live longer, but they appeared to be healthier for longer.

When you start to look at humans a whole new level of complexity arises, but I think we really need to start examining the relevance of this research in humans. This is something that we are determined and poised to do.

ANGELA: That leads us to the development of a therapeutic field based on this science. When do therapeutics start to come into the picture, and how do you see that field progressing?

ERIC: We are very much in the middle of this and it's not without its ups and downs. The Buck Institute was associated with launching one of the first ageing therapeutics companies along with the Mayo Clinic, a company called Unity. They have been targeting senescence, trying to eliminate senescent cells. Now it is a public company with a market capitalization of close to a half a billion dollars. It's considered one of the early successes of the ageing field. There were others before, but they almost uniformly ended in failure.

ANGELA: Are there any technologies or pathways that you see emerging beyond cell senescence that you think could prove to be particularly interesting or significant?

ERIC: I tend to look separately at how to target an identified pathway, and at the types of intervention. A lot of people are focussed on developing drugs that control ageing, and this is fine. But I don't think it is where the most important work lies today, because these drugs are going to take years to develop and many are going to fail.

We need to focus on what we have today. Some of the key areas that we really have to address to increase our longevity are things like nutrition, exercise, sleep and stress. Unfortunately, a lot of the knowledge in these fields is fragmented. For example, how exactly does exercise impact longevity? We know it does, but we don't know what forms of exercise are effective – endurance vs high intensity interval training? 10,000 steps vs 4,000 steps? We need a molecular-level data to increase our knowledge.

ANGELA: That leads perfectly to my next question: where do you see major gaps in our

knowledge and in which areas would you like to see more research emerging?

How do you see this field evolving in the next five years?

"Our understanding of ageing is still as a process caused by multiple factors. I remain convinced that there has to be a unifying theory"

ERIC: At a basic biology level we have identified what are commonly called The Hallmarks of Ageing. This is a series of problems that we see emerging during ageing and include things like mitochondrial dysfunction, stem cell dysfunction and so on. We have eight or nine of those. The problem is that we don't really understand how they are related. As a result, our understanding of ageing is still as a process caused by multiple factors. I remain convinced that there has to be a unifying theory, and this is something we're interested in at the Buck.

One of the oldest questions in ageing science is why do different species have different life expectancies? Why do we live to eighty years while a mouse only three? There's an inherent diversity across species. If we understood why certain other species live so long, we might be able to replicate this in humans.

We can also go back to the question of exercise – we know that exercise increases lifespan, but we don't really understand how it works. The same goes for nutrition. There's a clear link between over-eating and a shortened lifespan, or decreased nutrition (such as calorie restriction) and increased lifespan. But we don't fully understand the best recommendations to make to people. There's a lot of work right now on fasting which seems to have a beneficial effect, but we don't know how, and we don't know what forms of fasting. We don't really know what we should be eating – carbohydrates or proteins or fats – or in what proportion. We can raise the same sort of questions for sleep or stress.

There is a lot of conflicting information in the public domain right now. Some studies generate a high degree of publicity that they potentially should not receive. Other very strong studies may not receive any attention from press. Part of the mission of the Buck is to publicise validated and curated information to help people make the best lifestyle decisions to maximise their healthspan.

ANGELA: That is a very admirable mission, and I look forward to seeing more of your work.

ERIC: In the next five years there's a critical need to be able to measure the validity of interventions without waiting for our whole lifespan.

Right now, if we make an intervention that we think will increase lifespan we need to study it for twenty or thirty or forty years for an answer.

We cannot run clinical trials this way. One solution is to develop biomarkers of ageing. That is, we need to be able to assess whether a given person is ageing well or ageing poorly at a biological level.

A comparative field would be statins, a class of medicines to lower cholesterol levels. We know that by measuring cholesterol we can predict a person's risk of a heart attack. So the pharmaceutical industry developed medicines that lowers cholesterol as a preventative measure. We measure the effectiveness of statins by measuring cholesterol. We need a similar paradigm for ageing.

There is a lot of interest in the field to identify markers that predict a person's rate of ageing, because we know all of us are ageing at a different quality, a different rate. Some of us are going to live to 90 or 100. And some of us are going to live to 70. The question is, can you look at a 40-year-old and predict their trajectory? Imagine the potential if we can deploy anti-ageing intervention to those at risk of early death or declining health. So, for me, the priority for the next five years is the development of biomarkers of ageing.

We are also in the early stage of testing some anti-ageing interventions, which I think will progress over the next five years. There are clinical trials ongoing for senolytics, for metformin and for rapamycin. I hope that in the next five to ten years we will see the first ageing drugs available.

ANGELA: Do you see a change in how industry - and I'm thinking particularly of Big Pharma - are

"For me, the priority for the next five years is the development of biomarkers of ageing"

approaching or starting to approach this field?

ERIC: They have been sideline players to date. Ageing interventions are intensely disruptive to Big Pharma's business model, which is traditionally organised into therapeutic areas around things like heart disease or infectious disease. It's the way that medicine as a whole tends to be organised. If you have a heart problem, you see a cardiologist. If you have a lung problem, you see a pulmonologist.

Ageing biology presents a different way of organising medicine and of treating disease. Ageing affects every single organ, so if your intervention targets an ageing pathway, you will affect the development of diseases in different organs. That doesn't fit in the traditional field of medicine. So, one of the biggest challenges we face – not just with industry, but with physicians and funding agencies as well – is convincing people that we should be studying disease in the context of pathways that are universal across different organs. We need to change the way that we practice medicine to aim for a preventative approach. I think a lot of people will be reluctant to accept the new model, but this is ultimately what we should be working towards.

ANGELA: Agreed! And to finish off Eric, what would you do with five extra years of healthy life for yourself?

ERIC: I love life! I would keep doing exactly what I what I'm doing now, working to try and change the world. In the old days when labour was physically intensive, the whole idea of retiring, of drawing a pension, was the norm. I envision a future where people remain physically and mentally healthy for longer. So, for me, I have no intention of retiring because this is what I love to do.

"We need to change the way that we practice medicine to aim for a preventative approach"

Section 2:
Age Tech and Business

2.1 Roundtable: Investing in infrastructure for ageing communities to enable independent living

Raina Summerson, Chief Executive Officer, Agincare
Baroness Sally Greengross OBE, Chief Executive, International Longevity Centre
Paula Broadbent, Retirement Solutions Director, Engie
Moderator: Michael Voges, Executive Director, Associated Retirement Community Operators (ARCO)

- Long-term impact of COVID-19 on care infrastructure
- International comparisons
- Investment priorities

2.2 Roundtable: New models for tackling loneliness

Helen Lamprell, General Counsel & External Affairs Director, Vodafone
Catherine McClen, Founder, BuddyHub
Moderator: Anna McEwen, Executive Director of Support and Development, Shared Lives Plus

- Loneliness as a business proposition
- Benefits and limitations of technology
- Formal and informal solutions

2.3 Whitepaper: Who pays for ageing?

Matt Singleton, Vice President, Life & Health Products, Ageing Lead & Gerontologist, Swiss Re

- Exploring the ageing wallet
- Consumer research on funding later-life
- Suggestions for change

2.1 White paper:
Roundtable: Investing in infrastructure for ageing communities to enable independent living

Raina Summerson, Chief Executive Officer, Agincare
Baroness Sally Greengross OBE, Chief Executive, International Longevity Centre
Paula Broadbent, Retirement Solutions Director, Engie
Moderator: Michael Voges, Executive Director, Associated Retirement Community Operators (ARCO)

MICHAEL: I'd like to start by addressing the corona virus pandemic. Do you think there will be any long-lasting change to how society addresses the ageing challenge coming out of the last few months?

SALLY: This is going to have a much deeper and more serious effect on all our lives than anything I've ever known in my quite long life. Our infrastructure is going to need to change. I don't think we'll ever go back to exactly where we were before this crisis in terms of infrastructure or any of our other rather recent systems of care, work or living. For example, I don't think people will go back to working full time in offices and there will be a lot of office buildings which are going to become redundant. This could be a big change of direction in which we're all involved.

PAULA: At Engie, we, like everybody, consider this is just such an unprecedented time that we have to innovate to find new ways to navigate the crisis. There has been a huge change in how we operate. I agree completely with Sally about how things will change going forward. This is going to have a huge impact, but we're quite confident that it isn't all going to be negative. For example, some people may know Engie is very committed to the zero-carbon agenda, and there has been a renewed optimism that we can make real strides in this area off the back of the pandemic.

MICHAEL: So, looking forward, maybe not just six months, but maybe a year, two, three, five years. How will this change the care home sector and especially investment in the care sector? Do you think this will be seen as a sector which is suddenly difficult from a reputational, operational or financial point of view? What is the long-term impact?

RAINA: There are probably two avenues now – public and private. The private pay market expanding very rapidly. Up until COVID we were already seeing some issues around land prices and build costs with the competitive nature of the market. We were seeing people having much lower and slower occupancy fill-up rates, which obviously affected the appetite to invest in that market. We watch that space, but actually, our primary customer bases is less the private pay market and more our local government CCG partners. And I think for that space, occupancy is going to be absolutely key as well and so that will obviously deter investment. We could see some benefits for land prices and build costs in the future, depending on how short lived or lengthy the recession will be.

I think for us, it really is about the public parts – and when we've got easement of the CARE Act, which also affects our clients. I'm worried about some of those easements and how they might affect public funding and activity in the coming months. That would affect us if things just slow down. That said, we deal with people who are at the point of need. They don't come into our care homes unless they really need care and unless other avenues have been exhausted in terms of home care, living care, extra care. I think it's going to be a time of consolidation, and we're going to have to keep an eye on our overheads. It's going to make us more careful of our expansion in our five-year business plan.

I do think this crisis will affect some of the private market. We've already seen some of that heading into tools and services and complex care anyway, and I think that this will probably make that situation continue.

SALLY: That speaks to something I've been pondering. I think we might get a new status for social care coming out of this crisis. If social care workers get a higher status, that will be excellent. It will be very costly. But I'm sure it's going to happen because of the publicity around what's been going on. That's good in many ways, but what about the expense?

MICHAEL: Let's talk about specialist housing now, and especially housing with care developments, which I know internationally are being looked at as an alternative to the acute hospital. Sally, you've been a great advocate of the wider housing with care agenda in the UK and internationally. What's the future for the housing with care sector or retirement community sector after this?

SALLY: Well, I would start by saying that over many, many years, the happiest group of older people that I've seen are living in housing with care developments. It seems to be the answer to a lot of people's needs. That is, you get company and so are not isolated, but you're safe. I believe so passionately in this sort of housing as being the answer, particularly in the UK, to the very, very deeply felt movement or deeply felt tradition in this country, of living and ageing in your own home.

There's a huge opportunity here for housing with care if it can be brought into the mainstream. What we need is the care home sector and the housing with care sector and housing to come together with the NHS instead of all being separate and work on a coordinated plan. Our systems are so fragmented, and don't talk to one another nearly enough. If there's a lesson to be learned from this terrible time we're having with COVID-19, it will be that the ridiculous division between NHS and social care is quite unacceptable. Bringing them together is the only way to rid ourselves of this terrible lack of resources going into social care because the people running the health service really don't talk to the people running local services or social care.

You've got to move the management to comprise all of these people together at the local level. The funding then goes somewhere locally and comes from the NHS and from local authorities working together. We've got to get to a different management system and eliminate the rift between health and social care. I think if there's a single priority, it's to get that right. We wouldn't be in such a terrible situation if we had a coordinated approach, instead of one where NHS is separate to social care and never the twain shall meet. We've got to get over it and use this current reality as an opportunity to do so.

MICHAEL: International comparisons are interesting here, too. The level of sustained intra-community transmissions of COVID-19 in care homes haven't been repeated in housing with care specialist housing schemes in other countries, as well as the UK. I think this is for two main reasons. One is that you can more effectively self-isolate inside your apartment or your own house. The other one is that there's lower instances of potentially asymptomatic care workers delivering visits throughout the day. We've seen specialist housing have not as bad an experience as other sectors.

Paula, you've just entered that sector. Do you think that the contrast between how care homes are faring versus specialist housing or other housing will influence your investment decisions going forwards?

PAULA: No, not at all. I think this has strengthened our direction of travel. Our cost-efficient zero carbon focus comes from every operation that we do right across the hospital, social care, local authority services, transport infrastructure - it all feeds into that. The focus is about ageing in place. The picture that Sally has just painted could have just been taken from our strategy. Would start to think about being a care provider at this moment in time? No, I wouldn't be making a business case for that. But I did make a business case to say we needed to start investing in and creating not just the infrastructure, but actually some of the assets required to create the efficiency we want.

Reflecting on Sally's points, clearly, social care is absolutely essential and is just as essential as the NHS. You just need to look at our demographic stats to then consider where are we going to be going forward. For example, we've got a shortfall of probably 400000 care home units by 2030 in the UK and 80 percent of the growth in households brought by 2041 is projected to be by somebody from the over 65 age group. These are really stark figures. I do agree with Sally, that it is about looking for a holistic approach so that we have harmonious services. The zero-carbon component is critical here as well.

MICHAEL: Raina, have you looked at alternative housing-with-care options recently?

RAINA: Two of our sites already have housing-with-care onsite. We also operate about fifteen extra care or assisted living support contracts across the country, and work with various landlords in the kind of housing care arena. We would be keen to explore potentially being a landlord and an operator and looking at an operating model in a different way.

Housing-with-care is an area we love. We see stability. We see some really great outcomes for people who live in those services. The two

that we have are interesting because they've been disposals by operators who aren't really interested in that cross-fertilization of services. But like Sally and Paula, I've always seen the value of having that full range of services. We deal with local authority contracts largely and my worry always is that they will try and get care homes on the cheap. Some of that model of housing-with-care and independent living is polluted and can get mutated. You really need to be committed to that philosophy in a proper way rather than just thinking it's a cheap option in place of a care home. That is my concern about that market. It needs to be with the right intent and the right philosophy behind it.

MICHAEL: What change would you like to see come out of the pandemic, for care and care infrastructure?

PAULA: For me it is that flexibility and collaboration is more vital now than ever before. People and organisations will need to be bold in their commitments and seek out and find opportunities to partner and collaborate to create solutions without it being a burden on just one organization.

RAINA: I think something positive coming out of COVID-19 is that social care will have a different profile, there will be renewed emphasis and push for better integration of services. That has to be underpinned by a system that funds that. It has to be that social care isn't overtaken by NHS and absorbed into a complex bureaucratic system that takes away some of the necessary innovation. I think the sense of community has been a huge positive coming out of this crisis, from public health to transport to climate change, all of those things hopefully will come together to create an environment where people question what it means to age well in this society and what do we need to do to make that happen. And some of the community spirit that's come out will hopefully drive that awareness in the younger generation as opposed to it being just by people who work in the sector or are directly affected.

SALLY: What we are really talking about is a new approach to the coordination by different sectors. And if we can bring together the different sectors at a level which is below central government, but locally so that the NHS is now not a thing apart. We could also think about the inter-generational aspect of housing. We have a very exciting possibility here because young people need housing, and older people need young people... And we have to do all we can to benefit from what is a terrible crisis.

"Reduced-isolation, supported wellbeing and a choice of how to access these communities looks a lot like preventative health care that will reduce the overall burden on the state. I'd like to see retirement communities serve a large proportion of the elderly population"

2.2 Roundtable:
New Models for tackling loneliness

Helen Lamprell, General Counsel & External Affairs Director, Vodafone
Catherine McClen, Founder, BuddyHub

Moderator: Anna McEwen, Executive Director of Support and Development, Shared Lives Plus

ANNA: Today, we are talking about new models for tackling loneliness. There is something of a stereotype that loneliness only affects older people but it's a preconception that we need to step away from. In your experience what does loneliness look like?

HELEN: It's when people lose the sense of community that brings them together. In the UK we're not very good at welcoming people into our communities anymore. We've lost a lot of those hubs where people would gather like the church. It is incredible to look at how many people are affected by loneliness. Our data suggests that 1.5 million people over 65 are chronically lonely in this country.

Obviously, the elderly is an important demographic. Another is new mums on maternity leave. We also found that eighteen to twenty-four-year olds, as a group, are affected by loneliness. It's a complicated problem that is widespread and nuanced. For example, in the "later-life" category, the experience is extremely different for people who are first retired, missing being surrounded by people in an office, from those who are much older and perhaps losing their social group. Looking at the eighteen to twenty-four group, you might see people who have left school or university, that thing that gives them instant network.

CATHERINE: When I started BuddyHub the stereotypical lonely person was an older person. In some ways it makes sense. There's something called the lifecycle of friendship, where we tend to make a lot of our friends earlier on in our lives, often through school or tertiary education, through work and through having a family. Our networks tend to increase into middle age and then stabilise. But then as we move towards later life people face transitions of a different nature – leaving work, family or friends moving away, changes in health or situation (such as becoming a carer) and eventually, sadly, friends will start to die.

There are two big risk factors that I see among older people. One is health. Poor health is a real barrier to getting out and doing things that you enjoy or seeing your friends. Conversely, if life circumstances lead to you becoming lonely that will also impact your health. It's a vicious circle. The other major risk factor is living alone. In the UK about 83.8 million people over sixty-five live on their own, which is a big increase over the last twenty years. How do we persuade people not to live on their own?

So old age certainly puts people at risk of loneliness. But more recently, the data has started to show that loneliness is really striking much younger people, the internet generation. Perhaps they just haven't interacted in person as much as older generations have done. At BuddyHub about half of those we connect older people with are under thirty. For many of these people the real reason to get involved with us is not because they're moved by loneliness as a social issue, but because they are feeling that loneliness themselves. They want to increase their social network. There's also this idea that people really crave intergenerational mixing. So really, loneliness can strike anybody.

HELEN: I find the intergenerational aspect very interesting. You see that in countries like Italy where they have maintained intergenerational living to a stronger degree than in the UK. It's something that we really must try to reclaim. There's a great example from the Netherlands of university students living in the same accommodation as older people. It works brilliantly for both. There are a lot of great opportunities out there, but we need to start shouting about them.

ANNA: These schemes certainly have the ability to be beneficial to all generations, not just older people. I'm also interest in the benefit to another stakeholder – business. Why is tackling loneliness an attractive business proposition?

CATHERINE: BuddyHub is a social enterprise, so we combine fair financial returns with impact.

"Our data suggests that 1.5 million people over 65 are chronically lonely in this country."

We bring high quality services to people who are often excluded from have quality offers available to them, so from that perspective there is a great business opportunity. It's important to empower people to change their own lies, which is what our service is really about. We run as a membership club with a subscription, which changes the orthodoxy that older people want free services. We just don't see that, what we see is that people want really good services. They will pay for things that they value, as in any other sphere of the economy. Something that is important to us as a social enterprise, and to me personally, is inclusivity. How do we make sure that all of these technologies and services are in reach to everybody, particularly those on a lower income.

HELEN: We didn't come at it from a business angle specifically, but so much is at our core. As a business, we connect people. It all goes back to people's desire to communicate with each other, which is the bedrock of everything we do. What we have seen though, is that by using technology you can do more. We ran a pilot with Mencap to see whether we could run an assisted living programme for people who would otherwise require lots of physical help and care and didn't have the independence they wanted. We basically created an interface for a variety of different technology solutions that existed already, packaged together into a portal that is very easy to use. The portal gave people the ability to do things for themselves, to live more independent lives, to feel safe when they went out. Something like that could work well in care homes. There is a huge opportunity just in repurposing existing technology. But for us, that wasn't the rationale for doing something in this space in the first place, it was just a happy by-product.

ANNA: It's interesting isn't it, we have this assumption that older people can't use technology when actually they can. If anything, COVID has accelerated that.

CATHERINE: Technology can be brilliant to nourish friendships. If we don't do that they will eventually die, and even prior to COVID technology provided a means to do so. The digital literacy angle is interesting. It's a very individual thing, and many older people are highly digitally literate. Others may not have grown up with technology and actually, they're not interested. It's not for them.

Then there are other people who are not digitally literate but would like to learn.

At BuddyHub we created the concept of a Tech Buddy, where somebody will help the older person that they are matched with to embrace digital technology. But something that we need to bear in mind, is that there is a cost for using hardware and software. That can be a real barrier and is often something that is forgotten about in these conversations.

There is another problem with technology that gets right to the heart of what we're all doing. There's no point in having What'sApp or Zoom, or whatever piece of technology you chose to use, if there is nobody to call. At the end of the day, people still need a personal network, and technology doesn't address the fact that sometimes people don't have friends or family to contact in the first place.

HELEN: I think that's at the heart of the conundrum. As you say Catherine, you can use technology to connect people so long as there is somebody to connect to. For me, it's about shining a light on all of the brilliant resources that are out there and getting them into the hands of the people who need them, as well as getting past the stigma of actually saying "I would like somebody to talk to". Loneliness is still very stigmatised in this country.

We need to enable people to have these conversations about being lonely. Something I've found interesting in the context of coronavirus is the idea of people putting notes through neighbours' letterboxes offering help. That enabled the breaking down of barriers that in our very reserved British way we might previously have struggled with.

I had a classic example standing outside my house clapping for the NHS. We noticed some people in the drive opposite who we didn't know and introduced ourselves and found out that they'd moved in the week before. Previously I might have eventually got around to speaking to them, but realistically we all have busy lives and there isn't much that brings us together physically outside of the crisis. We don't form communities easily. But now, because we were all standing outside together it offered a chance to connect that I might not have taken a few months ago. We need to maintain that when life returns to some sort of normality.

ANNA: There is a sense of community emerging from the coronavirus crisis that would be great to capture. There are so many people who want to volunteer, whether it is formally or in their

community. We need to hold onto that and take it forward. We also need to raise awareness about loneliness and shout about the different solutions available to people. How do we do that?

HELEN: Originally, we were going to build a portal with all the solutions available. But we stopped because the Department for Digital, Culture, Media and Sports have already done it. So there is a fantastic resource out there already that has gathered together loads of different information. One of the challenges is – and maybe I'm wrong here – I don't think people Google "I'm lonely." The chances of self-identifying as lonely are quite low. It's often in retrospect that people realise something was wrong.

CATHERINE: That is absolutely right Helen, we really battled against the stigma of loneliness. We changed our messaging to position the discussion around friendship. There's an instant correlation for volunteers as they can relate to the story of friendship in their own lives. It also helps us to reach older people. We talk about the benefits of friendship and it's something that people understand. But I've also been touched and surprised by how many older people will openly say "I'm lonely."

HELEN: At Vodafone I want to make sure that we're using all of our channels to shout about issues and point people towards the resources that exist. We've seen a desire during lockdown for people to help each other, and perhaps in the past we've underestimated people's kindness. If we can galvanise that and tell people how they can help, I think they will. It's all about communicating the amazing work done by the likes of BuddyHub and Shared Lives, bringing it to the fore and asking people for help. We need to raise awareness that it is not an unsolvable problem.

CATHERINE: I often say that one day I'd love to shut BuddyHub down because it's no longer needed. But I also have to say that I don't see it happening in my lifetime. We help to break the ice between strangers, because in reality people don't just knock on somebody's door for a conversation. I certainly think that there's a willingness to do it, people are incredibly kind and there is a lot of goodwill around. But enabling them to do something is the challenge. One of the biggest challenges that has been amplified during lockdown is that people in isolation are very difficult to reach. We've seen with the NHS volunteering drive that finding people who want to help is the easy bit. Finding the people who need the support is the challenge.

ANNA: I remember a few years ago when a neighbour asked me for help. His wife had a fall and so I went in and called an ambulance as any neighbour would do. I went to check on them a few days later and the care assistant made me feel as though I wasn't allowed to be involved because I wasn't part of a formal organisation. But I was just doing the neighbourly thing. So how do we enable that community and neighbourly connection alongside the more formal support that has the process and safeguards around it?

HELEN: There's always going to be space for the organised response and we definitely need that. But I think we also need to give people ideas about how they can participate at an informal level. There are a lot of lovely stories on Twitter right now about people cooking for their neighbours and things like that. There are business ideas like Good Gym – you go for a run and you bring somebody a bag of groceries on the way – a lot of those organisations are making a good response the norm. You can drive other people's behaviours by inspiring creative thinking and normalising the idea that we all contribute. If we can do that, I think we start to solve the problem at a grassroots level alongside the planned interventions that are necessary.

CATHERINE: It's interesting to frame this discussion in the context of lockdown. I think lockdown has given many people the experience of loneliness and isolation that they may have not had previously. The silver lining is that there may be more support now for people who were already in that situation. Another is that people may experience the rewards to volunteering, and at least for some of them, it might carry on beyond the pandemic. We've all been struck by the immense kindness out there. In my own experience, I always feel I've got more out of volunteering than I put in. I call myself the selfish volunteer. It's a bit of a USP for the voluntary services, that once people start, they get a taste for it and keep going. Maybe it will be informally, maybe it will be through organised services, I think you're right Helen, in that there will be a mix.

ANNA: There's really a demand for awareness-raising on two levels. One, on the solutions available to lonely people at an organised level like BuddyHub, Good Gym and Cares Family. The other, helping people who want to volunteer but don't have the opportunity or channels to do so.

CATHERINE: Something that we haven't yet addressed is the importance of prevention. How do we stop creating more lonely people as we move through time? Humanity developed in villages, and as we become increasingly urbanised there has been a breakdown in community. I think this is where we need to come back to technology and look hard at the role that technology plays in our society. There is a lot of

good. When the telephone first came along it was a brilliant solution for keeping people connected. But there is also cause for concern. You might say that younger people - that eighteen to twenty-four bracket that Helen mentioned earlier - have become too reliant on virtual communities and are craving physical contact. I feel very concerned about younger generations. The data that is coming through suggests that people are not developing the social skills that we need to interact face to face.

HELEN: I totally agree. It has become a defence mechanism – "I don't know anybody, quick, get my phone out." Putting the phone down is just as important as having access to it for social connections. We have a Digital Parenting Guide which encourages people to put down their phones and talk to the person next to them. It's absolutely vital because while I love technology, I love what it can do, it can be a barrier to face-to-face communication. We need to make sure that a balance exists.

One of the interesting things we've noticed at Vodafone since the outbreak of the pandemic is the amount of extra voice coverage. We've seen a forty percent increase in people making voice calls on their mobile. So, speaking of silver linings, I think people are beginning to rediscover the lost art of talking to one another. Let's hope we can capitalise on that as a country as we begin to move to a post-COVID world.

"There's no point in having What'sApp or Zoom, or whatever piece of technology you choose to use, if there is nobody to call."

2.3 Whitepaper: Who pays for ageing?

Matt Singleton, Vice President, Life & Health Products, Ageing Lead & Gerontologist, Swiss Re

Traditional populations are changing. We all know that the population of people aged over 65 is growing at a rapid rate, about 1.3 percent per year in developed countries. Sometimes, we overlook the fact that the traditional consumer base for insurers - those who are buying their first mortgage and taking out life insurance products, or who might be starting to take their pension savings seriously for the first time for example – is in decline. That population is falling at a rate of 0.3 percent every year. For insurers, that means that just to stand still, companies need to increase their penetration into that population of age 30-49 consumers.

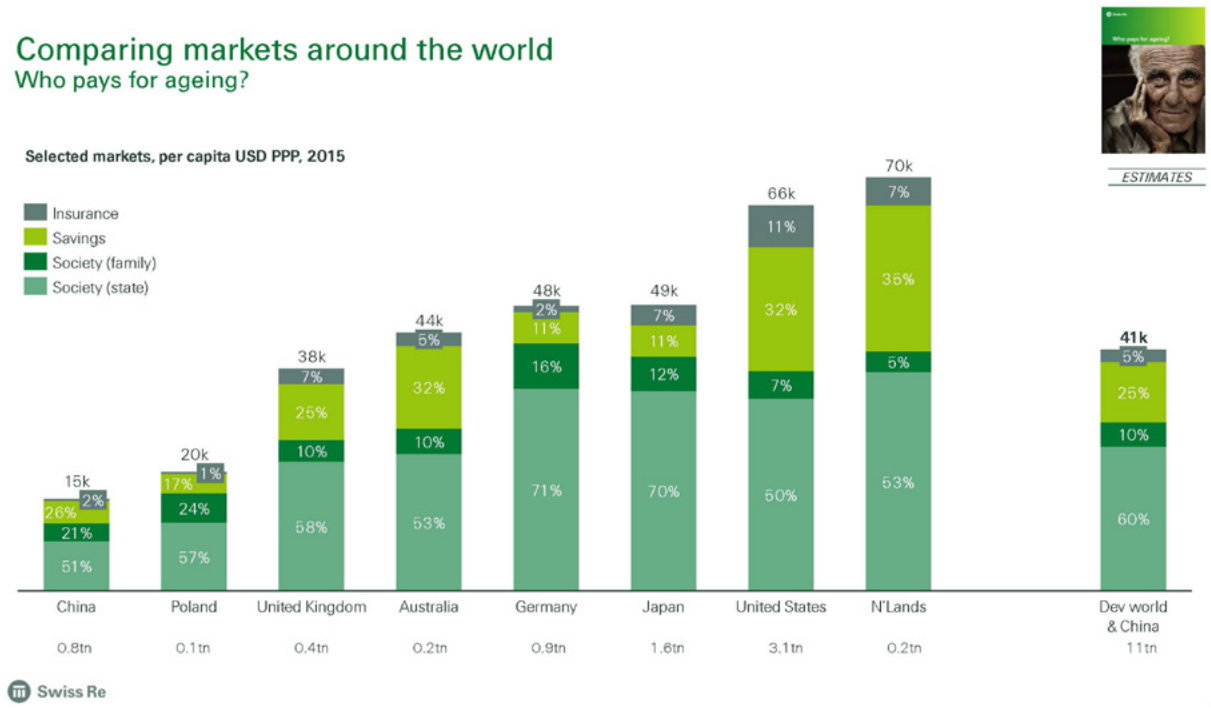
Let us discuss the ageing wallet. The ageing wallet looks at how nations currently fund their over-65 population and the opportunity for industries to do more. There are three main funders of the ageing wallet. Firstly, there is society, made up of both the family who provide informal care, and the state who provide things like a state pension, health care and social care. Secondly, there are individual savings, including private pension savings and housing assets. Finally, there is insurance. The insurance industry provides a contribution to the ageing wallet through things like pension annuities, private health care and some whole life insurance policies.

The total ageing wallet equates to approximately 11 trillion US dollars each year, or 41,000 US dollars per annum per person over 65. The insurance industry currently funds just 5 percent of that. The family provides about 10 percent, and private savings about 25 percent. So, in the developed world, 60 cents in every dollar is currently provided by the state.

When we look at individual countries, we can see some vast differences. **Figure 1** shows the data on countries in the most developed countries including China. China and Poland are both relatively small spending markets with a strong contribution from the family and a relatively high contribution from individual savings. The United Kingdom and Australia are mid-level spenders with a public-private partnership philosophy, where individual savings support the state spend. Germany and Japan have similar expenditure to the UK and Australia, but the state dominates the proportion of spend. Finally, the Netherlands and the US have a similar level of state spending to Germany and Japan, but also have an enormous private market.

Our research suggests that contributions from society – both the family and the state – will likely decline in these countries. Various medical,

Figure 1



social and economic trends are driving lower contributions from the state and putting more focus on individual provisions. The family is not going to go away as a key provider to people in later life, but we'll talk about that in a moment. What is clear is that as the Ageing Wallet changes, the needs of consumers are evolving, and as insurers we need to understand them better. But there is also a huge opportunity in front of us.

At Swiss Re we spoke to nine thousand consumers across nine markets. This wasn't just focused on insurance – it was quite clear that insurance isn't front of mind of most populations with the potential exception of the United States. Instead, we talked about what people's aspirations are in later life and how they intend to fund those aspirations. We talked about what fears people have for later life, and what plans they have in place financially to tackle them. We also put numerous conceptual insurance products to them and tested to see which ones worked.

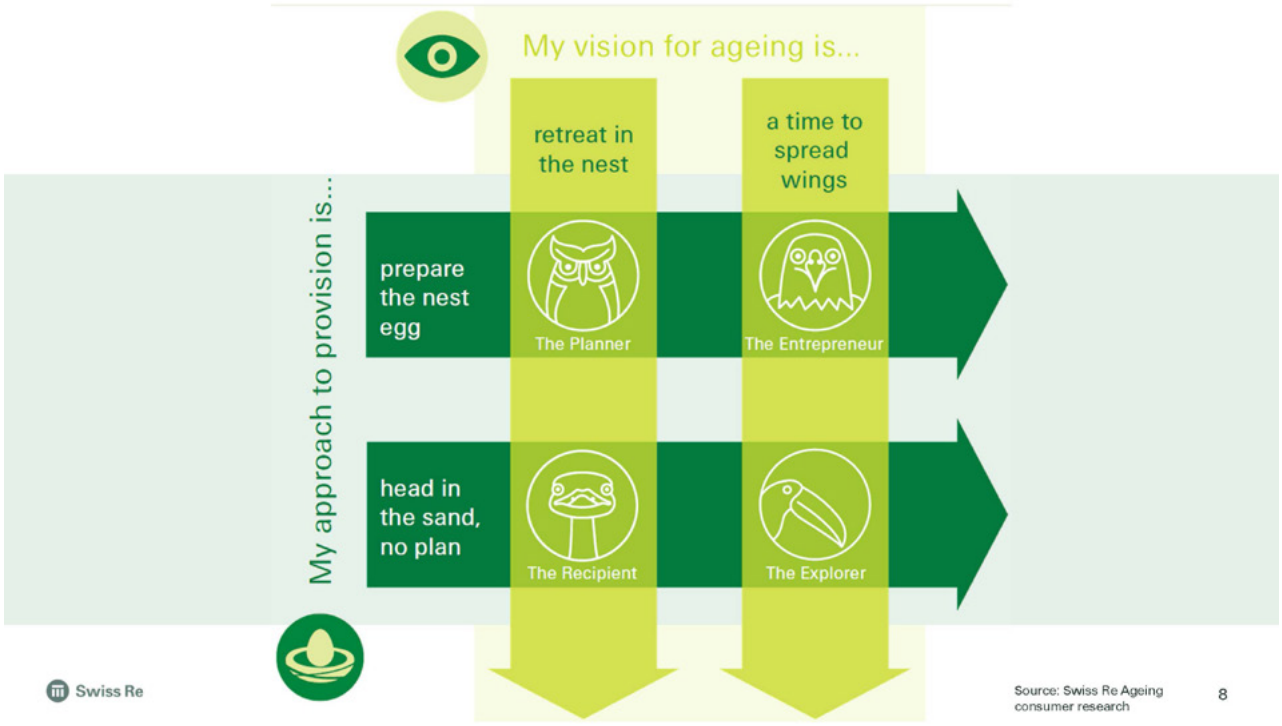
The outcome was some very robust consumer segmentation, shown in **Figure 2.** These segments exist in all the markets we examined, albeit with some differences such as age group. First up, there's the Planner, the wise owl and somebody very much like me. I'm quite enthusiastic about my finances and take my pension saving very seriously. I check how they are doing each year and have a clear plan for how I want to get to later life. When I think about my vision for retirement, I'm focussed on carrying on doing the things I enjoy doing today – continuing my gerontological studies, spend more time in the garden and watch a whole lot more cricket.

On the other hand, we can see people who are much more adventurous. My wife, for example, is the archetypal Explorer, the colourful toucan. Her vision for retirement is to visit new countries, learn new languages, maybe study something new. But her attitude towards provision planning is less engaged than mine, more reactive. The soaring eagle is the Entrepreneur. Their approach to planning is more like mine, but their vision for later life is more like my wife. Finally, there is the Recipient, represented by an ostrich. They are likely to bury their head in the sand and prefer not to think about, or prepare for, later life.

These four segment types sit on a continuum, so we may see somebody who is perhaps seventy five percent Entrepreneur and twenty five percent Explorer. Those with greater wealth tend to be in the top quadrants, the Planners and Entrepreneurs. But that is not always the case, and we certainly shouldn't make the assumption that all Recipients and Explorers are from lower socioeconomic groups. We see many successful Recipients and Explorers.

When we look at the vision for later life, younger people in many markets have a tendency towards the Explorer or Entrepreneur segments – again,

Figure 2



a rule of thumb rather than an actual trend. They have a more flamboyant approach. We think that this is a cohort effect, where the generation who is currently older and may have been bought up in the days of rationing or other hardship are more pragmatic. By comparison, younger generations may have been bought up in a more consumerist time.

We also see differences between markets. In the UK for example, about fifty eight percent of people fall into one of Planner or Entrepreneur. In Japan, these segments make up just thirty two percent. Japan's Ageing Wallet is dominated by the state, whereas the UK has more of a mix of public and private funds which may account for the difference in preparedness.

Let's come back to the family. When we spoke to our consumers, we intentionally spoke with three generations of the same family in the same room at the same time. We wanted to see whether the family represented a decision-making unit, which was in line with our original thinking. But instead, we discovered something quite different. We got confusion and disarray. The differences of opinion on what is best for one another is really a taboo subject, and one that had not been talked about before. Here is an example of an exchange between mother and daughter in Poland, although it could have come from just about any market that we studied:

Mother: "My daughter drives me to the doctor regularly, but should my condition worsen, I will go to an elderly home."

Daughter: "No way! Imagine what the neighbours will say about me then!"

We didn't find much evidence for the idea that adult children don't want to provide informal care for their aged parents. What we did find was that the children were willing to provide care, and the parents refused it, saying that they wanted their children to enjoy their own lives. The word burden came up a lot. It is a term that a lot of elderly consumers tend to associate with themselves should they become too frail to care for themselves.

We also found that in most cases there is an aversion to care homes. People hope to stay fit and well in the first instance, but if they do need care, they want to avoid a nursing home and instead age in their own home. This was common across all markets with the slight exception possibly of Japan, where there seems to be more acceptance of moving into institutional care. The study also suggested a new form of reciprocity could be emerging. Grown children expressed a desire to be in a position financially that if either parent needed support, they would be able to pay for that support.

The final piece of our findings that I would like to cover is around people's needs. We had an ongoing hypothesis at Swiss Re that people have some form of mental accounting when it comes to financing later life. They would have a bucket for their income. They would have some money set aside for care, or health care if they don't have access to a good state health system. They might have something set aside to provide for their children. Essentially, it would be a hierarchical approach to retirement income starting with quality of life, then health care, then care, then inheritance. But we didn't find much evidence for this. Instead, we found that people see wealth and health as interchangeable. Instead of a hierarchical approach to funding later life, all of people's needs were bundled in together.

So, what can we as an insurance industry do to enable people to age how they want to? And by doing so, how can the insurance industry increase its share of the ageing wallet as society's share declines?

Historically, the insurance industry has looked at everything through the prism of risks, especially catastrophic risks. By that, I mean that consumers have historically been sold the idea of protecting yourself from the risk of having to pay for institutional care, for example. Now if you do have to go into a nursing home it's true that there are huge expenses associated. But these products haven't traditionally sold as well as the industry would like, because as we've heard, the consumer doesn't identify with that problem at all. People are more likely to tell us "Don't let me go into a nursing home. Keep me independent and healthy for as long as possible."

So, forward-thinking insurers need to look at the problems that consumers need solving, particularly as countries adapt to an ageing population. The insurance industry could do a lot more to help people manage their finances in later life and help pay for ageing. There is also a need for service provision and potential for partnerships to provide enhanced services for consumers. The ageing population is not a single homogenous group. The way we pay for ageing is evolving, with differences between and within generations. By understanding those differences better, the insurance industry can create more relevant solutions to serve them better.

Section 3:
Longevity Risk

3.1 Roundtable: The impact of scientific, medical and socioeconomic trends on life expectancy

S. Jay Olshansky, Chief Scientific Officer, Lapatus Solutions
Aubrey de Grey, Co-Founder & Chief Scientific Officer, SENS Research Foundation
Stuart McDonald, Head of Demographic Assumptions & Methodology, Scottish Widows

Moderator: Paul Kitson, Partner & Pension & Savings Disruption Lead, PwC

- Predicting changes to life expectancy
- Life expectancy metrics and how to use them
- Examining equality of access to scientific and medical advances

3.2 Roundtable: The rise of the superfund

Adam Saron, Chief Executive Officer, CLARA Pensions
Antony Barker, Managing Director, Asset & Liability Management & Solutions, The Pension Superfund
Jay Shah, Chief Origination Officer, Pension Insurance Corporation

Moderator: Angela Tyrrell, Senior Vice President, Longevity Leaders

- What is longevity risk and how has it been managed traditionally?
- Unpicking the superfund model
- Regulatory framework for consolidators vs insurers

3.1 Roundtable: The impact of scientific, medical and socioeconomic trends on life expectancy

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PAUL: To start us off, give us a brief overview of your thoughts on human life expectancy and in particular, what's likely to change?

AUBREY: My personal view is that both in the U.K. and in the wider developed world we are likely to continue to see an increasing levelling off of life expectancy in the short term. We may even see a slight decline in life expectancy by the traditional measure and early period life expectancy in some countries. The USA leading the charge in that race to the bottom.

But in ten to twenty years-time things may be beginning to look very different. We may be starting to see the signs of the next revolution in medicine, a revolution that will see a change in the trajectory of life expectancy. It could be even more dramatic than what we saw one hundred and fifty years ago, when the ability to contain and avoid early death from infections became increasingly widespread.

This will occur as a result of what I call rejuvenation medicine. In other words, medicine that actually turns back biological age rather than just slowing down biological age advancement. Of course, we don't know for sure that this technology will come along twenty years from now. But the present challenge is worth waiting for.

JAY: As we all know, life expectancy rose by about fifty years in the last century or so. It's decelerated in recent years in spite of people claiming that it will continue to increase as it has in the past. This recent deceleration in the rise in life expectancy and even decline should not be news to most people. It's been predicted by many for almost thirty years now.

Exactly why it's happening also should not be a surprise. That, too, has been discussed extensively in the scientific literature. The logic behind these life expectancy models is based on the use of blinders, looking only to the past and extrapolating into the future. This is a really bad idea as we know that the future cannot be like the past, and we can no longer achieve the gains in life expectancy that were associated with reductions in infant child and maternal mortality. Ageing is what gets in the way, and we can't modify ageing - yet.

I agree with Aubrey that we don't know when it's going to be, but I'm very optimistic that we are going to find a way to break through this longevity ceiling.

Now, whether or not we can achieve gains in life expectancy in the future that are on par with what we saw in the past, unlike Aubrey, I'm sceptical that that is going to happen. Keep in mind that you when you save children from dying, you add seven, eight, nine decades of life. The increases in life expectancy are dramatic. You would have to add the same seven, eight, nine decades of life to a 70-, 80- or 90-year-old today to achieve the same result. I haven't seen any evidence presented to suggest that that is even remotely possible.

I believe that as long as we live now is about as long as we're going to live, based on current technology, on what we're capable of doing today. I've referred to this as peak longevity. That shouldn't be interpreted to mean that there is a biological limit specifically for the purpose of keeping us from living longer. It's a limit imposed by body design.

STUART: I agree with much of what Aubrey and Jay have said, and sit between their two viewpoints on where life expectancy is headed over the next couple of decades. Despite the deceleration in life expectancy gains that's been called out, life expectancy in the U.K. today is the

"We may be starting to see the signs of the next revolution in medicine, a revolution that will see a change in the trajectory of life expectancy"

highest it's ever been. It's rising and has been for more than a century.

I think comments so far have focused on total life expectancy from birth. I'm an actuary looking at insurance and pensions risks. That means I'm most interested in life expectancy for members of pension schemes. I need to make allowance for expected changes to death rates during the remaining lifetime of those pensioners.

Life expectancy for a 65-year-old retiree today is about twenty-two years for males and about twenty-four years for females. That's higher than many people realise – it's a real concern that people systemically underestimate how long they are likely to live when making financial plans.

I'm expecting life expectancy to change relatively slowly over the next five to ten years, but then potentially more rapidly after that. I'd anticipate about a one-year increase in the life expectancy of retirees over the next decade and then maybe another one to two years increase on top of that in the 2030s. Personally, I'm much more confident in the first prediction than the second one. The level of uncertainty increases pretty rapidly as we look further ahead.

PAUL: Aubrey, could you explain some of the big developments, or perhaps barriers that need to be overcome, in order to unlock the potential of transformative regenerative medicine?

AUBREY: Rejuvenation is damage repair. It is restoration of the molecular and cellular structure and composition of our tissues and organs to something like how they were at an earlier age in early adulthood. It's a divide and conquer approach.

Some stem cell therapies are going really well right now. There are clinical trials in indications like Parkinson's disease attempting to demonstrate repair of damage from ageing. There are also clinical trials in removal of senescent cells, or zombie cells that are hanging out, not necessarily dividing, but not dying when they should and creating difficulties for their environment.

The most difficult areas are mitochondrial mutation accumulation and also the loss of elasticity of various tissues, especially the artery walls. I'm delighted to say that in the past couple of years we have had enormous breakthroughs in these areas. At this point, we can be a lot more optimistic about how soon we may actually reach a decisive level of comprehensiveness in our ability to repair damage and thereby cause people to remain youthful. Of course, that will have a consequence on mortality rates, irrespective of how long ago they were born.

PAUL: Jay, the question I want to put to you is around life expectancy metrics. How we use them and what should our focus be, or not be?

JAY: First of all, the metric of life expectancy itself is not a good one, it's an insensitive one. The higher it gets, the more difficult it becomes to move it further. I'm not a big fan of using life expectancy for just about anything, truth be told, and certainly not forecasting. It's just not going to move that fast.

Really, our focus should not be trying to make us live longer. We should be focused on extending the period of healthy life. A longer life extension without health extension could very well be harmful. Now, chances are we're going to live longer as a result of ageing science's impact on health span. How much? I don't know, but I don't actually care all that much about how much longer we might live. I'm far more interested in how much more we can extend the period of healthy life and compress the period of frailty and disability at the end of life.

I agree with Aubrey that there are really exciting lines of research now going on in the study of senescent "zombie" cells as well as the clinical trials on metformin that are beginning.

But it's not going to be easy to determine the effect on lifespan, because it takes too long to study. Anybody claiming that these interventions will make people live ten, twenty, fifty years longer is making it up out of thin air. There's no way to possibly know what the effect will be on a population. The point I'm making is that you have to be careful about the absence of legitimate scientific methods for assessing longevity, and the effects of any intervention that we're looking at.

"Anybody claiming that these interventions will make people live ten, twenty, fifty years longer is making it up out of thin air"

By contrast, healthspan can be measured quickly and easily. Scientific tools allow us to understand the effects of interventions on healthspan far more efficiently and more effectively, and within a short time period. So that's the reason why I'm suggesting that we focus on healthspan rather than lifespan.

AUBREY: Let me just add to this. I am characterized often in the media as taking a view that rather strongly departs from what Jay just said. People call me the Prophet of Immortality and so on. This is very frustrating. Pretty much all of what Jay says is absolutely identical to my own view. I've been getting more and more aggressive over the years onstage and on camera making this point: lifespan is a side effect of health.

With regard to testing, though, I think we can do better than what Jay had just said. We have seen in model organisms that some interventions don't just reduce mortality rates in the near term, but also throughout the remaining lifespan. Then it's a reasonably justified extrapolation to determine what this probably means for lifespan extension even from a short-term study.

Some of the interventions we're talking about may or may not be as effective in extreme old age as they might be if they begin earlier in life. But I think this just points to the difficulty in generating research designed to test a hypothesis within ageing. It's not untestable, it's just the difficult one to do.

PAUL: Stuart, you're the actuary who thinks about life expectancy risk in the context of pensions. This discussion really demonstrates the sort of challenges an actuary might have in Managing risk. What are your thoughts on this debate?

STUART: I take some comfort from the fact that I am not having to forecast for younger people. As you can tell, there are a wide range of views even among well-informed experts. There is a significantly narrower range of possible futures when considering only older lives. Actuaries shouldn't get too much confidence from their ability to forecast life expectancy for retirees and extend that down to younger age groups without allowing for the additional uncertainty.

The first thing that actuaries need to do is to get their starting point right. We've talked a lot about how things will change in the future. Actually, the difference between the life expectancy of richer and poorer groups today is bigger than the uncertainty around how the population death rates will change in the next couple of decades. It's really crucial to allow for these socioeconomic differences, both in assessing current mortality rates and also the rate of future change. We've seen a slowdown in the pace of mortality improvements over the past decade within the general population, but it didn't affect everybody equally. So, we need to allow for the possibility that more affluent groups may well continue to outperform the average level of mortality improvement.

Actuaries increasingly need to cast a very wide net when forming their views on life expectancy. Relevant developments are coming from many different fields, including some of those discussed already today. We need to rely on the expertise of others, but also appreciate the limits of those expert opinions. For example, a cardiovascular expert asked thirty years ago about improvements in preventing and treating heart attacks and strokes might have missed the impact that technology like mobile phones would have, through reducing response times.

Finally, we need to be realistic about our ability to make these forecasts. We need to ensure that the institutions we are advising will be solvent in cases where life expectancy increases more rapidly or indeed more slowly than our best estimate view. A key part of our role is communicating uncertainty rather than producing a single deterministic projection.

PAUL: The question of inequality is one that is paramount in longevity. Do you have a view on the potential for the benefits of this research; will it become the preserve of the rich and affluent? Will it be available for everyone or will it exacerbate the socio-economic divide?

AUBREY: The question of whether and when this medicine comes along is, of course, a very open question. It's pioneering research. However, the question of what happens when it comes along is not an open question at all. It's completely clear to me. These therapies will reach everyone and anyone who is old enough – irrespective of ability to pay.

"This is the next big breakthrough in public health, on par with what we saw in the middle of the 20th century with the introduction of antibiotics, the advent of vaccines and the emergence of basic public health services"

This is because it would be economically suicidal for governments not to make sure that they frontload the investment that's required to build the infrastructure and train the medical personnel and so on. The overwhelming majority of medical expenditure across the entire industrialized world is directed at the health problems of later life. Governments and society stand to gain an insane amount of money by a focus on prevention and preventative healthcare. Jay was a prominent participant in an important initiative more than a decade ago called the Longevity Dividend Initiative, in which this was pointed out. Things haven't changed since then.

JAY: That said, there isn't anything of value in the world of medicine and public health that is equitably distributed. Nothing. Clean water. Fresh food. Access to health care, income, education. All of these factors influence longevity. The forces that they exert on survival prospects are dramatic. They are not small. They are not equitably distributed.

Let me first emphasize something I consider of great importance. This is the next big breakthrough in public health, on par with what we saw in the middle of the 20th century with the introduction of antibiotics, the advent of vaccines and the emergence of basic public health services. We are talking about a huge sea change. I share Aubrey's optimism that this is going to happen. Not only is it going to happen, we need to be aggressively pursuing it for all of the obvious reasons.

However, I don't anticipate it will make its way equitably to the population to begin with. Some of these compounds or potential genetic interventions are likely to be costly and anything that is costly is not going to be equitably distributed. Now something like metformin, for example, could be different. It is an inexpensive drug that could make its way to the population very much like aspirin.

PAUL: Stuart, what is your sense of longevity and the gaps between different socio-economic groups? Will we see the them converge? Do you have any view on what's caused the difference over the last few years?

STUART: Whether the life expectancy of different groups will continue to diverge, or will converge probably depends on the timeframe you measure. I do expect some further divergence in the near term, with perhaps some convergence to follow thereafter. As a rule of thumb, when life expectancy is increasing slowly as it has in recent years, it tends to mean that the gap between rich and poor is getting larger. That's a simple function of the fact that you get the most "bang for your buck" in increasing life expectancy when you focus on those at the more deprived end of the spectrum. It's mathematically similar to Jay's earlier point that you increase average life expectancy much more when you save a child than an older person.

A few things that I think could make a real difference in years ahead, and which could have a different impact on different socio-economic groups, would be public education, particularly around things like diet and exercise; nudges, like the recent sugar tax; moving towards a total smoking ban; and any changes to access to medical and social care. These are absolutely crucial to life expectancy.

There's a big dependency on the extent to which governments are prepared to direct increased funding towards those areas to meet the demands of an ageing and growing population. How governments invest in these public health issues will be very relevant to the level of life expectancy increase that we see, and how equitably that's shared across the population. If you could bring everybody up to the level of the least deprived ten percent that would make a much larger difference over the next twenty years than any of the sexy new science.

JAY: My colleagues and I published an article several years ago entitled Two Americas at the Dawn of the 21st Century, where we were arguing the same thing – that there is a vast difference among population subgroups and it's going to grow larger. There was also a paper that came out in the Journal of the American Medical Association that documented in great detail the disparities that exist in life expectancy in the United States and the cause of the decline that's actually been occurring since about 2010. Part of the takeaway message from this latest research is that the issue, at least in the United States, is a systemic problem of disparities. It's not one that is getting better, but one that is getting worse. As a systemic issue, it means that the problem is going to echo across future generations.

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AUBREY: Let me clarify my position on this particular point of inequality, as I fear I may have given the wrong impression. It is not that I think that there's going to be absolute egalitarian access to this. Of course, there is a great deal of disparity in terms of access and ability to pay to some public goods, like education, for example. But if we look at basic education for young kids it is actually pretty much free at the point of delivery, irrespective of ability to pay, even in the USA. I think that we will see universal access to the basics and that that will have a pretty rapid impact on life expectancy, whether period life expectancy or anything else.

PAUL: Let's change tack a bit. One of the things I've seen commentators talk about in the field is the ability for one to find out one's biological age. We've already seen one case in Germany where a man went to court to be recognised by biological age rather than chronological age. What are your views on the science of biological age, or the role that biological age may play in helping people understand ageing?

AUBREY: It's an extremely big area right now, and it's big scientifically, medically and socially. Scientifically, measuring biological age is getting better.

However, on the medical side, we are still a long way away because we need to identify a measure of biological age which not only predicts the onset of a disease, but also correlates when you introduce a new intervention. That, of course, was not involved in the development of the biological age measure because the intervention is new. It's going to take a long time to identify measures of biological age that are robustly correlated in the context of new interventions of a variety of different types.

On the sociological side, it is also really important. A lot of people just don't want to know when they're sick. They don't want to know that they have a cancer diagnosis. It's similar with biological age, when the ability to actually do anything with this newfound knowledge is very limited or is perceived to be very limited. A lot of people just don't want to know. I think a huge amount of public education is needed to encourage people to understand their biological age. It's becoming something that people can actually act on.

JAY: I would disagree. Let me address the claims that we can actually measure somebody's biological age. It's not currently possible to measure anyone's biological age, period. We can't say you're chronologically 60 and biologically 55 with any degree of confidence. Let me be clear about that.

Now, that doesn't mean that there aren't tests being developed to give us clues about the rate of biological ageing. Or that we may not necessarily be able to place you quantitatively into a given score or age. We may be able to say that somebody is ageing more rapidly or more slowly than the average person in the population. There's a lot of information that can be used by, for example, the life insurance or health insurance industries that can place people more reliably in certain risk pools.

Methylation age is one of the metrics developed relatively recently that has a lot of promise. My colleagues and I have developed a metric based on face age, which illustrates the documented relationship between how young or old you look relative to your chronological age. It's not a statement that you're this many years younger or older, but it seems to be a reasonable biomarker giving you a clue that you might be ageing more slowly or more rapidly.

There is a whole suite of metrics being developed to get us towards a biological age metric of some kind. I think it's just being sold to the public too soon. What's out there today is more gamesmanship than anything. You cannot calculate anybody's biological age based on anything that we can do today. However, there are tools that we can use to place people more reliably in particular risk pools.

STUART: I find the concept of biological age fascinating. Physicians can make a relatively accurate estimation of frailty and potentially life years remaining from visual assessments. It's really compelling to think about when those assessments are more technology enabled and where that might take us.

Looking at life years remaining might be a way of helping people, particularly when they're thinking about retirement planning and their financial futures. Talking about life years remaining is perhaps more meaningful to people than the concept of chronological age. People intuitively and quite wrongly compare their own

chronological age with the chronological age of previous generations. It would be very cool if people looked at their biological age rather than chronological age and could in theory then come up with a highly personalized life expectancy forecast.

Of course, even a personalized life expectancy forecast doesn't help much with predicting our individual lifespans. There's a lot of natural variation in lifespan, and more than half of us will exceed our life expectancy, often by several years.

PAUL: Thank you all, gentlemen, for your contribution. I think this discussion goes to show that this is going to continue to be a very lively area over the coming years.

3.2 Roundtable: The rise of the superfund

Adam Saron, Chief Executive Officer, CLARA Pensions
Antony Barker, Managing Director, The Pension Superfund
Jay Shah, Chief Origination Officer, Pension Insurance Corporation

Moderator: Angela Tyrrell, Senior Vice President, Longevity Leaders

ANGELA: What is longevity risk and how has it traditionally been managed?

ANTONY: All of us are dealing with the settlement of pension promises. Life expectancy has seen an upward trend over the last twenty or thirty years, albeit that the rate of pace of increase has slowed down recently. These changes have been driven in part by people making better lifestyle choices, but also by medical advances such as major organ replacements or improving cancer survival rates. The question is "how do you fund this extended lifespan?" This is a major challenge for pension sponsors and insurance companies as well as governments and regulators.

Many defined benefit (DB) pension schemes were largely set up in the 1960s and 1970s, almost as a way of deferring salaries for their workforces. For a few decades it was a fairly easy ride for these companies driven by few guarantees, high equity status, rising stock markets and dividend-based actuarial valuations. Since the 1990s the investment strategies of these schemes have focussed instead on fixed income investments which mirror the change in value, if not the size, of those original pension promises. But that doesn't get away from the dual problems of longevity risk or inflation risk that drive how long for and how much you have to pay.

There are some well-established ways of hedging and de-risking inflation, either through using government securities or other assets delivering inflation-linked income. The challenge for us all is how to de-risk longevity, both at a trend level and as a step-change. There aren't that many natural hedges in the market, and historically corporate sponsors have looked to transfer that risk to an insurance company like the Pension Insurance Corporation (PIC).

JAY: The longevity risk hedging market is increasing year on year. Our estimate for 2019 was around forty billion pounds worth of transactions taking place, a significant increase on previous years. While transaction numbers are growing, they are still a small slice in the context of the entire DB universe, even just in the UK.

PIC offers bulk annuity products to the UK market in the form of buy-ins and buy-outs. It's a relatively straightforward proposition and structure offering a highly secure product to provide pension benefits for members of defined benefit pension schemes within the insurance regulatory system. There are various safeguards in place providing a hundred percent guarantee for all benefits even in the very unlikely event that an insurer fails.

ANGELA: So, what is the superfund model, and how does it differ from traditional insurance?

ANTONY: At the request of government, Superfunds are offering an alternative to move that legacy risk from one closed occupational pension scheme to another ongoing occupational pension scheme. That is largely what our structure is at The Pension Superfund, a tax-approved Pension Protection Fund eligible occupational pension scheme trust. Instead of being supported by an operating company covenant it is supported by a financial covenant in the form of a partnership holding material financial commitments from the former sponsor and new external capital providers, that should ensure members get at least 99% certainty of receiving their promised benefits in full. Consolidation is a common practice in many industries to get economies of scale and better governance and we are using existing trust structure to bring those benefits to the pension industry.

Within that model we will also be hedging longevity, which we see as a very high risk particularly from a step-change perspective. While we periodically might use insurance-type solutions, our business model is not (unlike CLARA's) explicitly to move liabilities on to insurance companies. We'll probably look to go

directly to reinsurance through a captive model when it makes sense to do so.

ADAM: The outcome that CLARA will achieve, from the perspective of the sponsor, is the same as what The Pension Superfund propose. We allow the sponsor to fulfil their pension obligations by removing that obligation to us and CLARA as a consolidator takes on the risks. Longevity risk is a big part of that. But where our approach differs markedly from the Pension Super Fund is the other group of stakeholders not yet mentioned, the member. Our model is designed to be member-first.

The way we achieve that is, like The Pension Superfund, we provide new external capital. We do expect the transferring sponsors to pay their share of historic obligations, but crucially the capital that we provide travels the full journey with members. When a scheme comes into CLARA it becomes a section of the CLARA Pension Trust. The capital that we provide is dedicated to that section, and neither the capital nor the return on that capital comes out until every member has their full benefits secured in the insured market.

The way that we like to describe the model is that CLARA is a bridge to buy-out. I guess that's the other big difference between us and The Pensions Superfund – we're explicitly not a run-off model. We are very conscious that as a bridge to buy-out, when we come to buy that insurance contract, we are effectively buying longevity protections within it. We are very aware that at some point in our lifecycle we will need to be buyers of longevity protection. Like any risk it needs to be managed, at the right time and at the right price.

ANGELA: Why are these new models needed?

ADAM: When you look at the UK market for private DB pension schemes, the vast majority are closed to new members and increasingly closed to future accruals. There are currently two big consolidators in that market. At one extreme you have the insurers consolidating pension liabilities and assets out of pension schemes into insurers very successfully for thirteen or fourteen years. I think since the insured market has existed the total value of bulk annuity insurance is about 150 billion against probably 2.2 trillion of remaining liabilities. Insurance is making a difference but too slowly.

At the other extreme where you have sponsor failure, the Pension Protection Fund is the consolidator. But in between these two extremes there are no other solutions. The market is crying out for alternative ways to manage longevity risk.

ANTONY: The size of that hinterland is enormous. Perhaps one to two percent of funds manage an insurance buy-out in a year. Another one to two percent end up, unfortunately, entering into the Pension Protection Fund (PPF) following the insolvency of their sponsor. Despite the significant value of insurance transactions this year and last, it is not keeping pace with the growth in pension liabilities due to their annual inflation and statutory revaluation increases. Hence the total problem is still getting bigger.

There are about five and a half thousand defined benefit pension schemes still in existence in the UK. Their sponsoring companies have a legacy financial problem – there is rarely an HR benefit still associated with running the final salary scheme, and a lot of them closed ten or fifteen years ago - using up a lot of management time and a lot of corporate capital. If they have the money to do so they can offload the problem to an insurance company. If not, they need an interim measure.

All three options – insurers, the Pension Protection Fund and superfunds - are trying to deal with the same problem but at different ranges on a spectrum. There are more complementary areas than there are areas of difference.

JAY: I'm in agreement with Antony and Adam about the issue itself. There are a large number of smaller pension schemes in the UK suffering from, among other things, poor funding levels, poor governance as a result of their size and lack of buying power leverage for asset management or administration providers. But I don't think that the superfund is necessarily the right solution to the problem.

The concern I have with the superfunds – and I'm talking generically rather than with regard to Antony or Adam's specific models – is that they don't address this issue. Various superfunds coming to market are trying to position themselves as being very different from insurance companies, which I don't think is true. An insurance company is guaranteeing that they will pay the right pension to the right person at the right time with no cutbacks. They are able to do that because they source capital from

"Since the insured market has existed the total value of bulk annuity insurance is about 150 billion against probably 2.2 trillion of remaining liabilities. Insurance is making a difference but too slowly."

private investors looking to make a return on the risk. Insurance companies and superfunds seem to be doing the same thing and making the same promise. I think it's quite dangerous to expect DB pension members to make a legal distinction between one that is technically a pension fund and one that is technically an insurance company, when they are doing essentially the same thing.

Like ourselves, superfunds will be run as commercial organisations looking to make a profit for their shareholders who are putting in the capital. For that to work commercially, the price that a superfund would charge to a pension scheme for essentially the same product that an insurer offers can't really diverge far from the existing insurance model.

What superfunds are really offering is the same guarantee and product as bulk annuity insurers, but with a lower level of security. In itself I don't have an issue with that as long as it is made explicit. If it is to be made explicit it should be governed by exactly the same regulations as insurance companies, with an explicit deduction from capital that superfunds have to hold. A customer can then see that if a superfund holds less capital it comes with a higher level of risk. We shouldn't fool ourselves into thinking that somehow you can provide a cheaper proposition with the same level of security. If the price is cheaper, it's because it's a riskier proposition. Customers ought to be able to fully understand that.

ADAM: From our perspective most people are able to understand quite clearly that while consolidation is about making pension schemes safer, it's not providing the same level of security as insurance. In CLARA's case we are offering a bridge to that the purchase of an insurance product. Employers and trustees understand that the cost for the additional security is that it's not quite as secure as insurance. Both we and The Pensions Superfund are incredibly clear about that. I don't think there's anything wrong with saying that we're making pensions safer, but maybe not quite as safe as insurance.

I think every trustee, if they could wave a magic wand, would love the option to buy-out for their members. Insurance is like the Rolls Royce to get you through your pension – it's big, its comfortable, its safe. But if you can't afford a Rolls Royce, does that mean that your only other option is to walk? Do you know what, a Volvo is a pretty decent car and it's probably going to get you where you need to be.

ANGELA: What about the regulatory framework, how does that differ for superfunds vs for insurers?

JAY: The regulatory framework for insurers is stringent – painfully stringent at times. But it works and its properly understood. Currently for superfunds there is a question mark as to whether they should be regulated by the Department for Work and Pensions (DWP) or the Prudential Regulatory Authority (PRA). If they are to be regulated by the DWP it is generally accepted that the Department would need to scale up volume and skills base of people to do so. It begs the question would we really build a second regulator to do essentially the same job? So that suggests that superfunds ought to be regulated by the PRA.

ANTONY: It's important to get the clarity between government departments and government agencies. They're all staffed by the same individuals who often rotate across government. So, I struggle to see how the Pensions Regulator would have a hiring challenge. I set up the Pension Protection Fund and it was very easy to get people to transfer across from industry or from the public sector to join that lifeboat fund. I don't see the staffing side being a challenge.

JAY: I agree in that it's entirely possible for them to get the resources to do that. But what would be the point? Why create two very sophisticated regulators essentially to do the same job? Why not have the PRA regulating two superfunds if by and large, the oversight required should be either identical or at least very similar to insurance companies?

The superfund model has been described as a good option for some schemes given where they are right now, while not necessarily providing the same gold standard that insurance companies represent. But we have to acknowledge that pension schemes as they stand in the UK are significantly underfunded, a situation that has been allowed to evolve under the current pension regulatory regime. So how is it right to create a new model under that same regulatory regime and ignore the insurance regulatory system which has done pretty well over the last several decades?

ADAM: I absolutely agree that insurance is the gold standard outcome for members of closed DB pension schemes. As a member-first solution that's exactly why our solution is built as a bridge to the buy-out market. But the reality is that consolidators are pension schemes, and pension schemes are already regulated not by the DWP but by the Pensions Regulator. They are a speciality regulator in the private market to the tune of about two trillion pounds worth of pension liabilities and have been doing so fairly successfully. The bulk annuity market is much smaller. In that sense, insurance is the exception,

"I don't think there's anything wrong with saying that we're making pensions safer, but maybe not quite as safe as insurance"

albeit a growing exception and a valuable one.

There is also a crucial difference between being a pension scheme and an insurance company. It's a subtle one, but important. A pension scheme is comprised of two balance sheets – the scheme itself which is governed by an independent board of trustees, and the financial interest controlled by the pension sponsor. In an insurance company, there is a single balance sheet. There is one board of directors who, unlike the trustees who owe their fiduciary obligation to members, owe their fiduciary obligation to shareholders. That said the combination of the Financial Services Compensation Scheme and the PRA provide a very valuable protection.

ANTONY: I'm pleased that Adam mentioned the Financial Services Compensation Scheme because we should acknowledge that insurance companies can fail. Individually, insurance companies can't guarantee the promises that they make. However as an industry they can, through the backstop of the Financial Services Compensation Scheme. The pensions industry now has similar backstop in the Pension Protection Fund. I think we can agree that if companies never failed there would be no need for a lifeboat fund of this kind. There'd be no need for bulk insurers, or for consolidators either. But companies do fail, and there needs to be an exit route for trustees to secure an outcome for members.

Trustees are looking to pay people's pensions with higher degrees of certainty and a lesser degree of risk. There is no "no risk" solution. That's why the Financial Services Compensation Scheme exists. Yes, insurance is the gold standard, but there need to be alternatives.

I'm sure Adam is in the same position as us of being approached by a lot of smaller pension schemes. They might have flaws in their data, they might be too small, they might have too many deferred pensions. It doesn't really matter whether they've got the money to do a deal or not, they're getting roundly refused by insurance companies who aren't interested in taking them on as a liability. It's a real challenge, particularly for those coming out of PPF assessment whose only source of ongoing funding is the existing assets of the scheme. The longer the situation perpetuates, the worse the deal is for the members in the arrangement.

ANGELA: There's no doubt that the longevity risk market is gathering steam. 2019 was a record year for bulk annuities. To wrap up, I'd like to know what each of you see 2020 bringing?

JAY: We can look at the pattern of the last few years. In 2017 the bulk annuity market was twelve billion. In 2018 it was around twenty-four or twenty-five billion. Last year it was upwards of forty billion. I don't know whether volumes in 2020 will be equivalent to 2019 but it certainly wouldn't surprise me if they are similar. It's certainly going to be a significant market.

ADAM: We would expect similar volumes to 2019. We do expect there to be more competition amongst the bulk annuity providers and potentially new entrants in that market, which for us as the ultimate buyers of that product is very exciting. But closer to home we are hoping to get to a point of being approved by the pensions regulator and moving on to our first transactions.

We've given Jay a hard time today, but he makes a number of fair points. We are a commercial operation and we're very much looking forward to transacting. The pensions regulator has been incredibly diligent in its dealings with us. Jay will be happy to hear that they have been giving us a suitably hard time too, as is only fair. That process will take as long as it takes, and we'll cooperate to get over the standard that they set. Hopefully we look forward to taking on our first members next year!

ANTONY: I forecast it being the first of a number of record years of schemes transferring into commercial consolidators, if only on the basis they couldn't have done it before. It also will continue to be another strong year for insurance companies as the market expands and risk transfer in its varying forms becomes increasingly affordable.

At the end of the day we're all trying to deal with the same problem in slightly different ways. I do have discussions with other insurance companies about the opportunities for insurers and consolidators to come together. Perhaps the analogy is, we're operating in two very large fields on the same farm, but occasionally it will make sense to work together across the hedge. Ultimately, we want to ensure that the risk of providing pensions is not stranded with companies and individuals who are not either skilled, resourced or funded to be able to deal with it. That opportunity is probably best transferred to organizations like those that the

"We have to acknowledge that pension schemes as they stand in the UK are significantly underfunded, a situation that has been allowed to evolve under the current pension regulatory regime"

three of us offer. No doubt others will come into the market in the future and lead to a superfund industry that is not just members first, but **members better.**

Section 4:
Wellness for Prevention

4.1 Roundtable: Sex, ageing and wellbeing

Samantha Evans, Director, Jo Divine
Adam Lewis, Chief Executive Officer, Hot Octopuss
Louise Newson, GP & Menopause Specialist, Newson Health
Moderator: Jackie Marshall-Cyrus, Ageing Innovation Strategist

- Menopause and sex
- Myth busting
- Innovation and marketing for ageing consumer

4.2 Whitepaper: National healthspan and lifespan modelling in the UK

Rupert Dunbar-Rees, Chief Executive Officer, Outcomes Based Healthcare

- Examining UK population health data
- Measuring Healthspan
- What does this mean for lifetime costs of care?

4.3 Whitepaper: 10 consumer trends driving the preventative wellness market

Angela Tyrrell, Senior Vice President, Longevity Leaders

- Intersection of the longevity and wellness markets
- Impact of consumer trends on wholesale longevity
- Examining detractors

4.1 Roundtable: Sex, ageing and wellbeing

Samantha Evans, Director, Jo Divine
Adam Lewis, Chief Executive Officer, Hot Octopuss
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Moderator: Jackie Marshall-Cyrus, Ageing Innovation Strategist

JACKIE: Today we are discussing sex and well-being in later life or advanced years. In a post-pandemic society, how are the rights and privileges of older adults relevant to the topic of sex, as they would be to medical safety or welfare?

ADAM: First up, it's important to address the perception that sex stops at 50. It's complete misconception but it's the way that the media and society portray sex and sexuality, with stereotyped images of young beautiful people. Sex over 50 just isn't covered. It's not a topic that people want to talk about or hear about. It isn't written about. It isn't broadcasted. So, there is a misconception from younger adults that people get to a certain age and lose their sexuality. But that is a load of nonsense. People's mindsets might change as they get older, their bodies might change, but there's no reason for sexuality to stop. I think the fundamental issue here is the total lack of discussion and acknowledgement of sex in later life.

LOUISE: I'd like to add that people do change after the age of 50. As you know, the average age is the menopause is 50. And during the menopause, our hormones - oestrogen and testosterone – in women are reduced. With that, there are lots of psychological symptoms, but also physical symptoms. It's not just an age-related stigma, there's a menopause stigma as well. A lot of women find that their sex drive reduces, not just because of having menopausal symptoms, but just the way that their bodies are changing as well. Some of the women I see in my clinic tell me that they have low self-esteem. They have reduced self-worth. They have low energy. They have poor sleep. Their bodies often change, and they tend to put on weight. They have muscle pains, joint pains, headaches, recurrent urinary tract infections. And then they have physical barriers such as vaginal dryness, which occur in around 70 percent of women. All these together create a huge barrier to women over the age of 50 being able to explore their sexuality in a way that they should do. So, there is a lot that we need to address before thinking about actual penetrative sex.

SAM: I completely agree. One of the big problems is the lack of practical advice for women to enjoy sex in later life, especially post-menopause. They might go to their GP and be told to use a bit of KY jelly which is the worst thing that you can do, it's a terrible lubricant. Whereas I find talking with customers in confidence gives the opportunity to give some simple advice or tips. For example, the act of recommending a good sexual lubricant and vaginal moisturiser can completely transform someone's sex life.

It's also important to normalise later-life sex in a professional manner. Because, going back to what Adam said, older sex on television or film is often portrayed in a tongue-in-cheek manner. There's always some sort of messiness or it's viewed as cheap. Netflix has done a lot to improve that, but in mainstream media people tend to be mocked for being older and enjoying good sex. The older woman must be a cougar, the older man is a stud. The sex that you see isn't the real sex that happens in people's bedrooms.

We're also told that women don't want to have sex. But in my experience, there are a lot of older women who want to be sexually active, whereas it's their male partner who is unable to. A story that we don't often hear in public discourse is erectile disfunction as a result of chronic disease.

JACKIE: Absolutely, the thinking is often that it is women who have the problems, particularly associated with menopause. But a lot of women go through menopause with increased sex drives,

"While the cynic in me wants to roll my eyes, the pragmatist acknowledges that anything driving consumers to take more ownership of their own lifelong health management is a good thing"

it is not just about dysfunction.

LOUISE: Generally, libido reduces during menopause because oestrogen and testosterone decline. But some women have an imbalance in this decline, so oestrogen will fall more than testosterone. So relatively speaking, although their testosterone is low, it's proportionally higher than oestrogen. In that case, as you say, women may have an increased libido.

JACKIE: There is also a huge problem with the treatments prescribed for menopause that can exacerbate problems. For example, we understand that a number of GPs prescribe antidepressants which are known to depress people's libido.

LOUISE: Sadly, a lot of women are still offered anti-depressants because a common symptom related to menopause and perimenopause is low mood and anxiety. There is no evidence that antidepressants help the low mood associated with menopause, but like you say they can negatively affect libido. So women with a low libido anyway are given treatments that lower it further. Some types of hormone treatment also inhibit testosterone and can lower libido. That said it is generally accepted that the benefits of Hormone Replacement Therapy (HRT) outweighs the risks.

It's so important that women have individualised care regarding menopause, and also that they talk about any resultant libido problems. Even though sex is perceived as a bit naughty to talk about, it's a natural function and really important that we're not made to feel bad about it. I've been in medical conferences where people are snickering and laughing about sex, and actually it shouldn't be like that. We know that couples who have regular intercourse have better health, better mental health and better wellbeing. We have got to "man up" to the fact that sex is so important.

It's not just about penetrative sex either. A lot of women tell me that they're not holding hands anymore, or that they don't want to be hugged because they've changed so much physically. I also see a lot of women in same sex relationships. If both women in a couple are going through menopause at the same time it can be doubly crippling and needs to be talked about.

JACKIE: So, the myth is that the desire to have sex stops at 50, How can we change that?

LOUISE: One of the most important things is for us as individuals to be empowered and ask for help. We need to get over this embarrassment. If somebody has erectile dysfunction or vaginal dryness or pain that happens to be in the vagina as opposed to on their finger they shouldn't be embarrassed about presenting with it. If I had a rash on my arm, I'd show my friends and talk about it. We need to be comfortable talking about sex (or lack of) in the same way.

About 70% of women I see in my clinic haven't had sex for at least two years. I doubt they or their male partners are discussing that with their friends in the pub. But by sharing these experiences more openly they can share ideas for change. Right now there's a lot of stigma – I'm sure Adam and Sam will agree – about using sex toys for example. It's seen as a bit dirty or seedy.

SAM: Our products are recommended by the NHS, but I have to say that toys designed for the female body are much easier to sell to healthcare professionals than male sex toys. We have a women's health brochure that gets given out across the country. We also created a men's health brochure that has unfortunately had no sway whatsoever. It's quite frustrating because I'd love to get male toys like Pulse in front of urologists dealing with men on prostate health issues or other erectile issues.

The fact is, a lot of health professionals, once you tell them about certain sex toys or explain why they shouldn't recommend certain sexual lubricants because of poor ingredients, really want to know more. The reason that clinicians don't open up conversations about sex in their surgeries is because they don't know where to go next. They don't want to tell people to go to the high street, they have no idea what to recommend. We advertise in women's magazines and I know some GPs who keep copies in their drawers to whip out and say to patients "go to this company, go and buy one of those, make sure you're happy with your orgasms." It's just brilliant, I love it when someone says to me "my GP told me to buy one of these toys." I think it's so proactive.

"There is a misconception from younger adults that people get to a certain age and lose their sexuality. But that is a load of nonsense"

ADAM: I think one priority needs to be to take the topic of "senior sex" and put it front and centre of popular opinion. Write about it. Talk about it. The more you talk about something, the more desensitized it becomes, the less stigma there is attached. I'd also like to see more useful imagery attached to senior sex. I think there's a big misconception that older people cannot be youthful or naughty. My grandmother was the naughtiest person in the room when she was in her 80s, that was just her personality. And personally, I don't think that this is portrayed enough in commercial imagery. Instead we get dreary, old fashioned photos of older people attempting to be intimate. At Hot Octopuss we intentionally use imagery of people in their 50s, 60s and 70s that have some youthfulness about them in the same way that we'd portray other groups. I think that's also something that younger people can then connect to and empathise with, to decrease stigma.

SAM: Yes! I find it so frustrating. I'm often followed by sex toy companies that are just setting up, and I'll go onto their shiny clean website with pictures of exclusively young people which instantly puts me off. Older people are just going to think "well that's not for me." I have the same response when I see fashion brands supposedly aimed at my age group (I'm 52) using models who look about 30. Please, use age-appropriate models! Imagery drives me potty as an older woman getting older, we're always portrayed as old, dowdy women.

The other thing to remember is that not everyone is online. It's one of the reason's we've found success advertising in magazines. Not everybody is comfortable with ordering online, particularly if they're on a shared computer that might also be used by grandchildren. We still receive cheques and postal orders in the post every week. People phone us up to check that we're a real company.

JACKIE: Could part of the problem be that we're actually consolidating the myths and misconceptions and stereotypes if we couch this issue around age? We have a national sexual health strategy that tends to focus on people earlier in the life course – education and policy tends to revolve around things like sexually transmitted disease and pregnancy. However, as people progress around the life course there's a tendency not to recognise the need for advanced services. For example, women are getting pregnant later in life, so what about education for pregnant women who are premenopausal? There's also evidence that people in later life are contracting all sorts of sexually transmitted diseases. What about sexual health policy to address this?

LOUISE: I completely agree. When we think about sexual health we are often thinking about teenagers and young adults. There is so much time and energy focussed on sexual health of young women, whether it's contraception, smear tests, mammograms, pregnancy. Then suddenly at the age of 50 they fall off a cliff in terms of face time with clinicians.

There is a sexual freedom for older women that perhaps they didn't have when they had children or teenagers running around the house. There is also no obvious need to use contraception post-menopause. So, if you look at the rates of some sexually transmitted infections there is a peak over the age of 50. Which is really very negative if people aren't being offered the right help.

JACKIE: Adam, we're talking a lot about women's issues and sexuality, but what about men? How do you innovate for guys?

ADAM: Well the opportunity for innovation around erectile dysfunction is plain. As we get older, as with women, our bodies don't behave in quite the way that they used to. And it's not just about getting older, but also things like having to take medications which might have an effect on your ability to maintain an erection. In this day-and-age, somebody might turn to Viagra or another medical intervention. But not everyone can do that, for example people with high blood pressure or some people are just not that way inclined. Often that's where the education or options end, especially if you go and see a GP. At Hot Octopuss the question is, can we create viable alternatives to medication and the answer is that yes, we can.

There is also an issue around educating older consumers about the products available to them, rather than designing specifically for an older market. Adult products aren't marketed to the older community in the way that they should be. There are great products being developed that are suitable for all ages, but between their sales channels and marketing imagery the target market is exclusively for younger adults. There is a need to market these products better for all ages so that older consumers see that it is suitable for them and has a benefit to them, and not just because they are of a certain age.

SAM: I often get asked by journalists, "so what toys do older people use?" Obviously, there are certain toys to help with certain issues, but they are the same toys used by younger people. I think we need to take age out of the equation – in fact, a lot of our older customers have better sex lives than many of the younger people I know.

JACKIE: It seems that there's a certain lack of permission that society does not grant to older adults to lead a life of sexuality and intimacy. But if society gave that permission, what is the potential size of the market?

"One of the big problems is the lack of practical advice for women to enjoy sex in later life, especially post-menopause"

SAM: It's massive, because we're all going to grow old and the population is living longer so people are having sex later. Our oldest customer is 95. Coming back to the conversation about STIs, I spoke with a very large condom brand recently and asked them if they use older people in their advertising. Their response was "no, they're not our demographic". Well they are missing a trick because older people need their products.

ADAM: Anybody who says that fifty-plus is not their demographic is just crazy. It's a demographic who have been shown to be incredibly interested in sex and sexuality, and it's a demographic with money to spend, and in desperate search for knowledge and information. It's really great for the likes of Sam and my businesses who have seen this niche, but actually the only reason it's niche is because there are only a few of us catering to it. In reality it is a huge segment of the market, but it remains the best kept secret.

JACKIE: I think we all agree that there's a huge amount of myth in this space, including both society and healthcare professionals failing to acknowledge the

sexuality of people at a certain stage of the life course. With that, thank you all for a very insightful discussion, and I hope to see more activity in this field in the future.

"We know that couples who have regular intercourse have better health, better mental health and better wellbeing. We have got to "man up" to the fact that sex is so important.

4.2 Whitepaper:
National healthspan and lifespan modelling in the UK

Rupert Dunbar-Rees, Chief Executive Officer, Outcomes Based Healthcare

It appears that in the UK we are spending an ever-increasing proportion of an ever-increasing lifespan in poor health. It also appears that the effect of poor health is not shared equally among all people in society. This is based on work undertaken by Outcomes Based Healthcare in collaboration with NHS England and NHS Improvement (NHSE/I), Public Health England (PHE) and Arden and Gem Commissioning Support Unit (AGEM CSU), examining centrally held data sets as part of a national pilot to measure healthspan. In this paper I'm going to share some details underpinning this work and how it relates to longevity research underway both nationally and internationally.

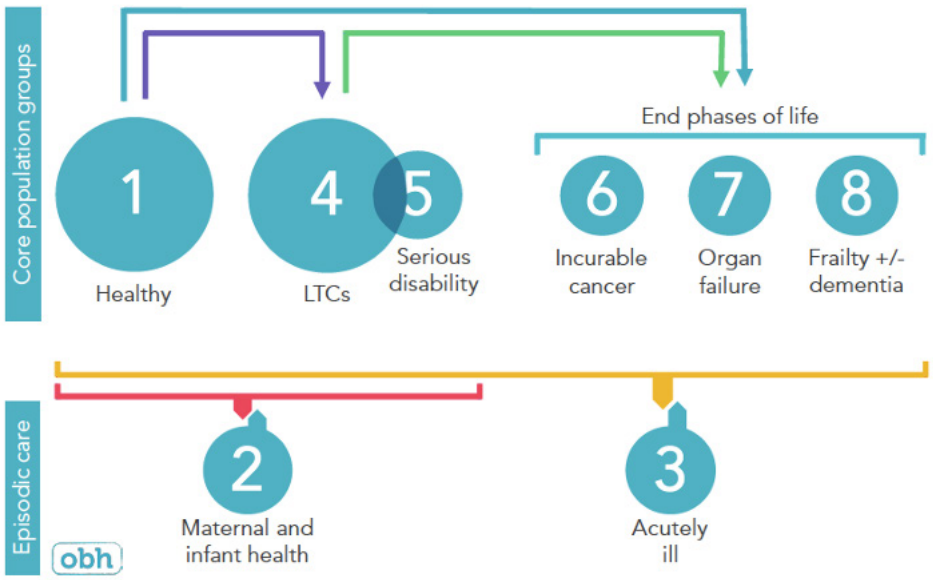
When we examine NHS data sets we measure population segments, looking particularly at the point at which people move from being Healthy or 'Generally Well' into another segment such as Long-Term Conditions, Frailty/Dementia, Disability, Organ Failure or End-of-Life. That is what we call HealthSpan™, or Healthy Lifespan®. However, this is not the only movement which is important. For example, we might also look at somebody's progression from having a stable long-term condition to the point that they develop organ failure. That is a significant progression and usually associated with worse health outcomes, and poorer wellbeing. It is important to measure these flows dynamically and longitudinally over time, using person-centred data which span multiple different care settings.
Segmentation categorises the population according to their care needs and priorities. The 'Bridges to Health' model is a person-focussed approach, with the main goal of optimising the health of each population segment.

Over the past 3 years, Outcomes Based Healthcare (OBH) have adapted some features of the core model around the specific requirements of population level outcomes measurement, and specific local requirements of health and care systems in the UK. This allows for detailed analysis of progression of health status over time, as well as measurement of care requirements for the core population groups within the model.

As you can see from Figure 1, people broadly flow from Healthy or Generally Well into having one or more Long Term Conditions, possibly with serious Disability, to Incurable Cancer, Organ Failure, Frailty and/or Dementia, or a combination of all three. We do know, however, that many people stay in the Healthy/'Generally Well' state well into their nineties or sometimes beyond. There is an obvious benefit here, not just to the individuals but to society, and we need to look at how to enable people to stay for as long as they can in this state.

Figure 1: OBH adaptation of the 'Bridges to Health' segmentation model

Source: Outcomes Based Healthcare ©2017

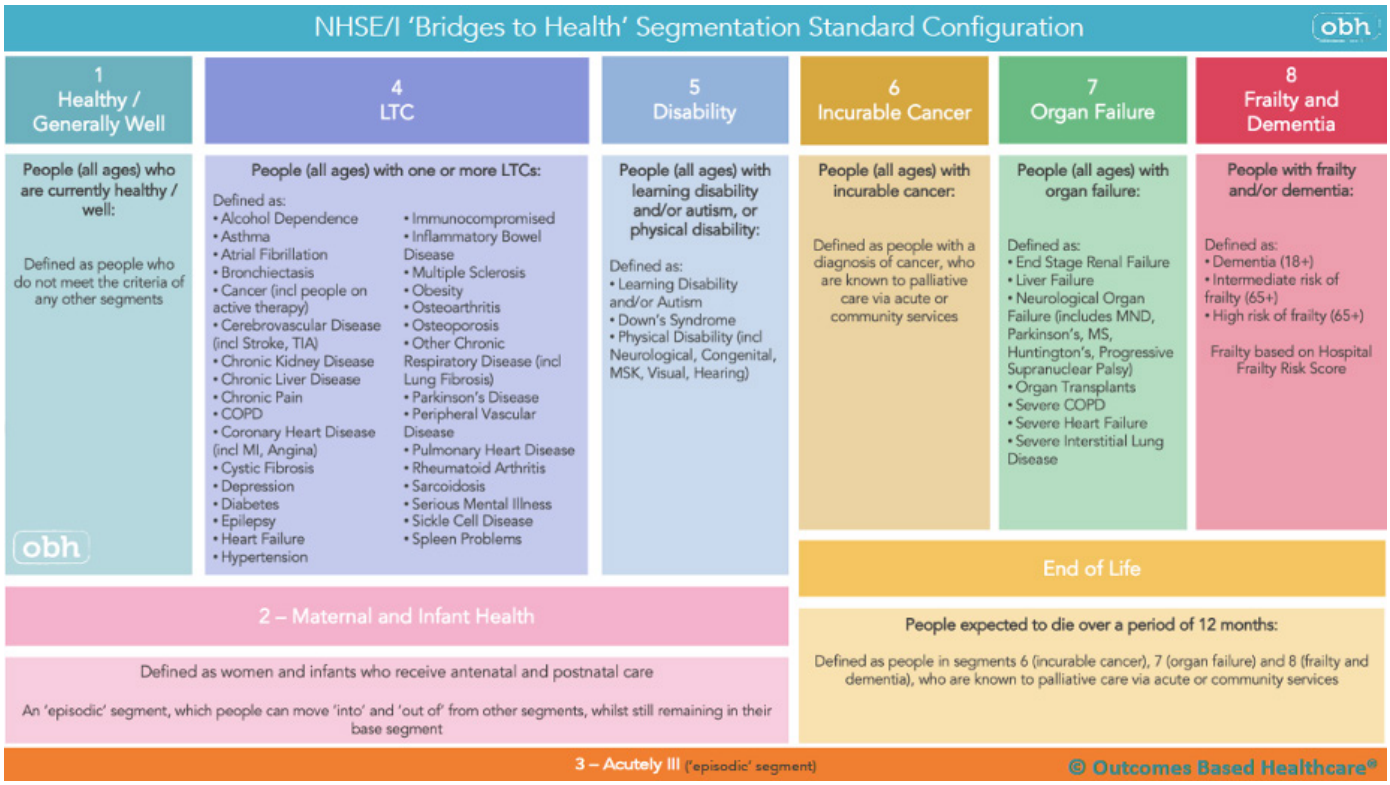


"We also all need to recognise that we are next in line to be elderly. For that reason, if no other, we should be looking to catalyse a shift in social attitudes to ageing"

OBH's approach to segmentation is based on the 'Bridges to Health' model (Lynn et al. 2007)

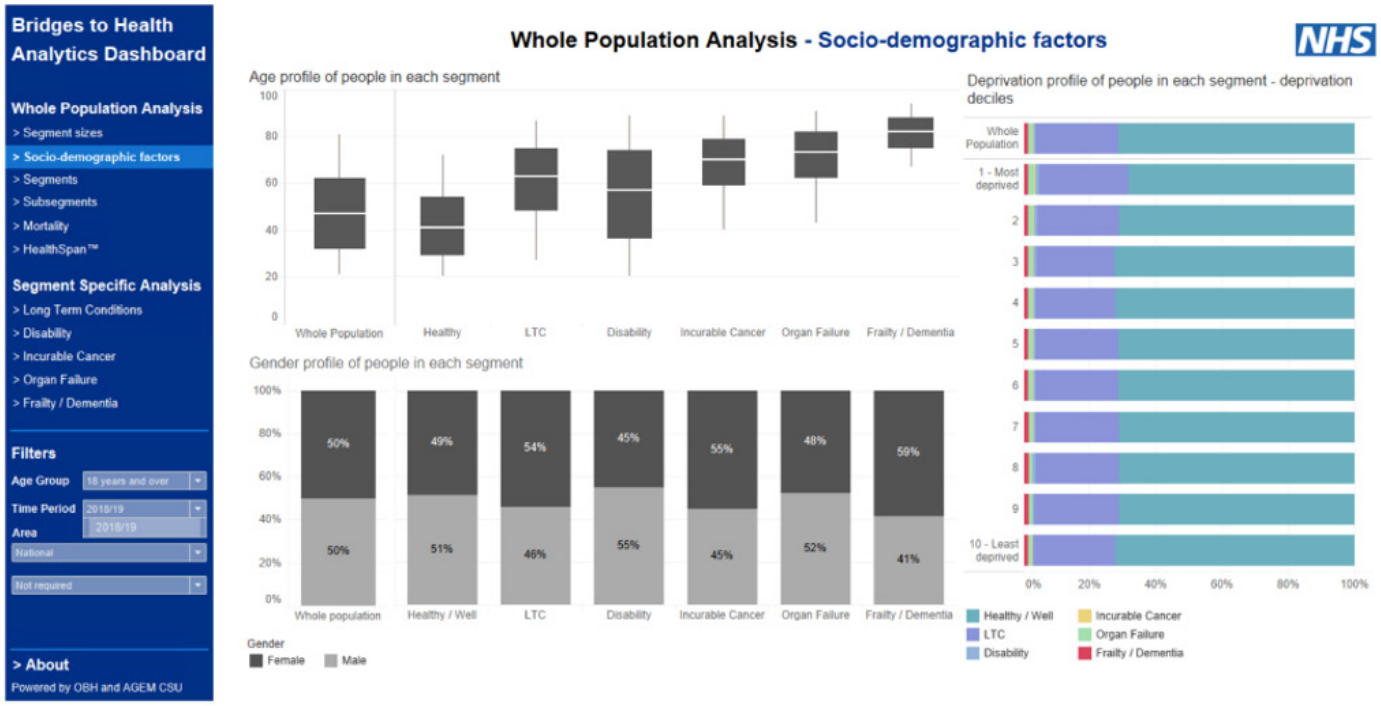
Figure 2 provides some of the details underpinning OBH's model. After the Healthy segment, the largest segment of our model is the Long-Term Conditions segment. There is not a lot of consensus nationally and internationally on what is considered to be a chronic or long-term condition, and there's some debate around back pain and various skin conditions in particular. For the purpose of our work with NHS England we've included those conditions where there appears to be consensus on what a long-term condition is. Similarly, in the disability segment, there are different ways of defining disability that we've set out in the model. There is no right answer here in terms of defining population segments, and we try to evidence-base as many of those decisions as possible.

Figure 2 – NHSE/I 'Bridges to Health' segmentation standard configuration



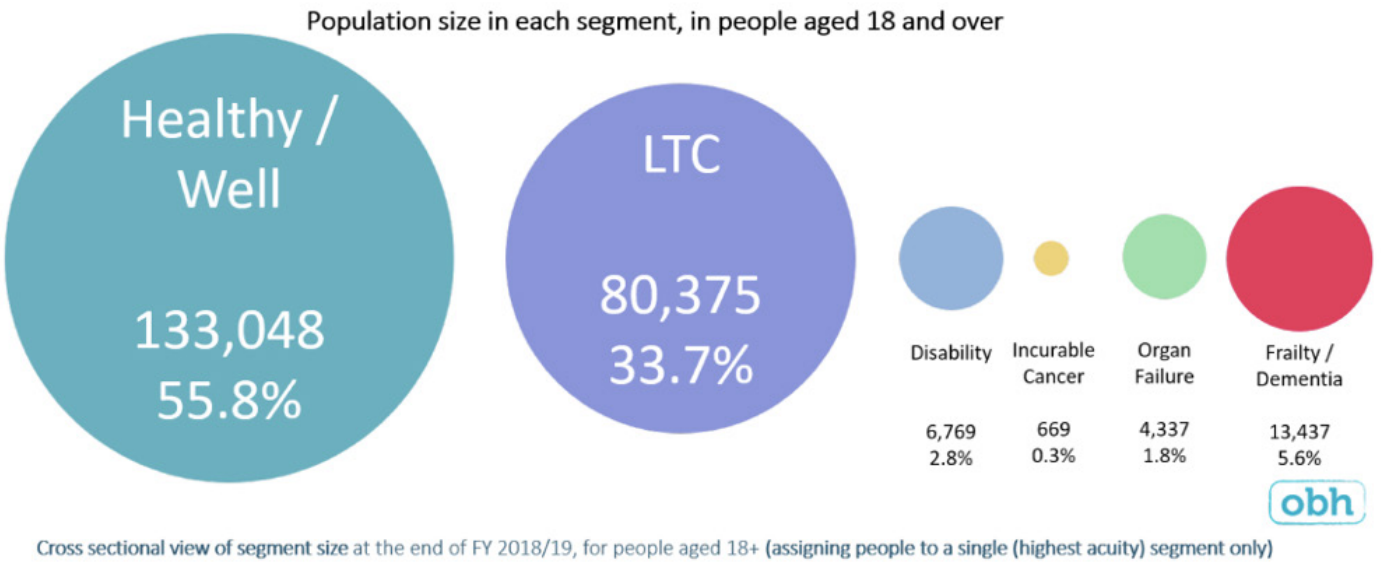
So, what does it look like when applied nationally? Figure 3 shows some work we've done to make sense of some centrally held data sets (anybody registered with a GP in England). We calibrated the segments across benchmarks such as the Quality and Outcomes Framework and various conditions registers. This allows us to measure flows through population segments as people acquire certain conditions along the life course. We can see the demographic profile of people in society rising from the Healthy/Well cohort with a young median age of 40 up to Frailty/Dementia which is closer to 80. There is a wide distribution of ages in those with disability as you might expect. We can also see the role of deprivation, whereby the least deprived inhabit a relatively higher degree of Healthy/Well population segments compared with the most deprived.

Figure 3 – NHSE/I 'Bridges to Health' segmentation standard configuration



If we drill down to a local area (where OBH have more comprehensive data sets) it may give an indication of the national picture. Figure 4 shows a typical local area in the financial year 2018/2019, measuring adults over the age of 18. The Healthy/ Well segment generally encompasses approximately 50 percent of the population. Approximately one third of the population have one or more long term conditions. Those in the Disability or End of Life phases account for a relatively small percentage of the population at any one time, although it's important to recognise that often people in those populations tend to disproportionally account for acute and community care expenditure.

Figure 4 – Typical local area segment population sizes (18+)



We can look even more closely at the point that people flow from being Healthy/Well into the Long-Term Condition segment. There are a number of conditions which tend to occur more frequently when people move out of the Health/Well segment, into other segments. We measure the condition which people first leave the healthy cohort with ("gateway conditions"), so those which have a high incidence/prevalence as well as younger age of onset will tend to dominate as the most common conditions, such as Depression. People might have additional long terms conditions thereafter that are often associated with later life, such as COPD and Coronary Heart Disease, but when we take a population view, conditions like depression, arthritis, cancer and asthma tend to present first and therefore rate most highly.

It is worth noting that these are not necessarily one-way movements. Using local data sets it is possible to measure movement both out of and back into the Healthy/Well segment, and then cumulatively understand population HealthSpan. It is also important to recognise that we don't know the extent to which these "gateway conditions" are truly a 'gateway' in terms of sequence, or whether there is some causality to subsequent conditions. This is still an open research topic to determine whether by addressing one of these gateway conditions proactively it is possible to slow down the journey from one to many long-term conditions.

This leads us to the idea of measuring HealthSpan. Healthspan measures the cumulative effect of either delaying or preventing the onset of long-term conditions. One of the challenges that bedevils this kind of work is that if you delay or prevent one condition, you may develop another instead. Therefore, there isn't really any benefit in the outcome for the individual. Unless you take a whole-population view, it is very hard to address those concerns. By monitoring population-level changes in the proportion of life spent in good health, OBH's objective HealthSpan™ measure aims to address this.

So how does HealthSpan differ from existing ways of measuring healthy lifespan? There are two common ways of measuring healthy lifespan at a whole population level – healthy life expectancy (HLE) and disability-free life expectancy (DFLE). These are self-reported survey samples for a small percentage of the population who are asked to rate their health subjectively. So, they provide a good measure of how healthy people feel they are, which is important. However, this does not necessarily mirror the objective view of how heathy people are. HealthSpan allows us to track real data in real time, including the effect of interventions, and obtain an accurate measure of the extent to which the health system supports people in staying well, whilst also allowing us to measure the financial impact of keeping people well.

So, what does that look like on a national level? At first sight, our data suggests that people remain Healthy/Well into their mid-50s. Further work is being conducted to refine this number as it's slightly higher than expected when we examine the (more comprehensive) local area data sets. However, estimates from the model currently suggest that approximately 65 to 70 percent of somebody's overall lifespan is spent in good health. This percentage is lower than previous estimates based on HLE or DFLE data, which indicated about 75 to 80 percent of somebody's life is spent in good health. This difference could account for the increased expenditure in health care that we've experienced in recent years in the UK, certainly prior to the COVID-19 pandemic.

HealthSpan also allows us to identify greater discrepancies as a result of deprivation than previously observed. The gap between most and least deprived at a national level is quite significant, with an even greater divergence in some local areas.

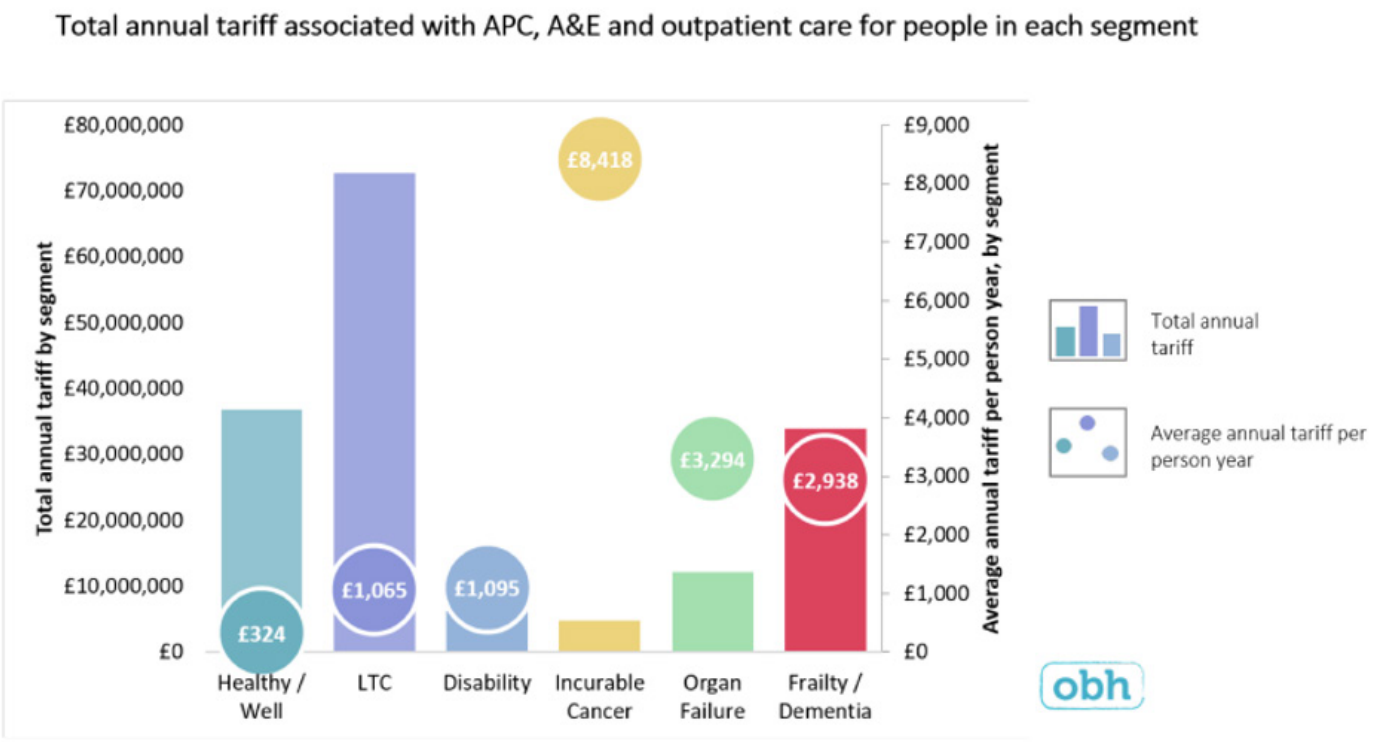
What does this mean for lifetime costs of care? Figure 5 is based on our work in local areas and is typical of acute healthcare expenditure per segment. People who are in the Healthy/Well segment cost around £324 a year in acute outpatient A&E and admitted patient care. Given that this figure is based on a total population of approximately 300,000 people, and Healthy/Well people account for just over half that group, cumulatively per area this amounts to around £40 million. Those in the Long-Term Conditions segment cost approximately double that figure. When we look towards end phases of life the per capita health care expenditure gets disproportionally high compared with the other segments.

The key message here is that the longer people stay in the Healthy/Well segment as a proportion of their overall lifetime, the lower the overall lifetime cost of care. This relates to the Compression of Morbidity Theory which James Fries described in the 1970s. Using the HealthSpan data we can start to research whether it is possible to compress morbidity, and what an extra year of healthy life might mean financially. The data that we're working with at the moment suggests that it is possible to compress morbidity into the last few years of life, and that it is actually possible to increase HealthSpan

faster than lifespan. If we do that, it is possible that increasing lifespan does not necessarily result in overall increasing lifetime costs of care.

In fact, if we improve the HealthSpan to lifespan ratio sufficiently we may expect the overall lifetime costs of care to fall, with a greater number of years spent at (in this case) £325 per year rather than close to £9000 per year in the case of Incurable Cancer, for example. It is very important to be clear on this point - otherwise we will be forever trapped in a situation where economists quite rightly point out that we cannot afford increasing longevity. The emerging evidence from this work suggests that by increasing healthy lifespan but lowering overall lifetime healthcare cost, we may be able to lower healthcare costs at a national level entirely.

Figure 5 – Typical acute healthcare expenditure per segment



Period view of **total and average (per person-year*) tariff for admissions in FY 2018/19 (for admitted patient care, A&E and outpatient care),** for people aged 18+ (assigning people to a single (highest acuity) segment only)

***Note**: this is an average annual tariff per person-year, rather than an average tariff per admission.

4.3 10 consumer trends driving the preventative wellness market

Angela Tyrrell, SVP, Longevity Leaders

It has become evident that the lifestyle choices we make throughout our lifespan impacts our health and wellbeing in later life. As Eric Verdin, CEO of the Buck Institute for Research on Ageing points out, the key areas to be addressed if we are to increase our longevity are things like nutrition, exercise, sleep and stress. If we are to look at equality in how we age – a key remit of the UK Government's Ageing Society Grand Challenge – these are things that can be improved regardless of an individual's socioeconomic position. Information-distribution today is not without its major flaws, but it does have the advantage of being far-reaching and (should we be inclined to distribute in this way) reach across socioeconomic or cultural divides.

Ironically it is the voices and actions of today's young people that are driving much of the cultural change needed to improve health and wellbeing in later life. I think of this movement as the preventative wellness or "wellgevity" market. That is, how our personal health and wellness management throughout our lives impacts our life expectancy and healthspan in later life. Here are ten consumer trends that are driving that movement:

1. Digital tracking tools

Whether it's counting steps, logging calories, tracking ovulation or recording sleep patterns, we have never been more plugged in to what is happening in our bodies. The tiny supercomputers that we carry in our pockets or on our wrists have given us the ability to record, interpret and intercept patterns of behaviour that influence our health, hopefully for the better. While not without their problems – for example, they can open the door to unhealthy obsessive behaviours - digital tracking tools make basic health education and management available to a wider pool of people than those who can afford expensive private services.

2. Consumer biological testing

The big one is personalised DNA testing by the likes of Ancestory.com or 23andme. But other services are emerging to help consumers get a deeper understanding of their bodies at a biological level, like Chronomics' epigenetics testing and uBiome's (admittedly failed) microbiome testing. As with digital tracking tools, consumer testing services offer the promise of more effective health management throughout our lives. They are however, more expensive and hence prohibitive to some socioeconomic groups. The business model for effective, informed intervention is also still to be cracked.

3. Personalisation

In the face of readily accessible tracking and testing, a demand for personalised solutions is to be expected. We are living in the age of "Me Me Me" where "my truth" can be readily exchanged for "the" truth and anybody can star in their own music video, their own digital story or even their own printed picture book. It makes sense that we're also demanding personalisation of our health management tools. While the cynic in me wants to roll my eyes, the pragmatist acknowledges that anything driving consumers to take more ownership of their own lifelong health management is a good thing. Personalised nutrition is one of the most interesting trends disrupting the food industry and has the potential to completely change how we manage our health at an individual level. Likewise personalisation of skincare could have an important role to play in mitigating skin ageing.

4. Responding to climate change

Arguably the most iconic trend of our time will be the acknowledgement of climate change and the demand for action. At the level of individual health, this could have rather a positive impact. Consumers are becoming more mindful of how they travel (think of Greta Thunburg's highly publicized sailboat hitchhike across the Atlantic last year). At a more local level this means driving less and turning to alternative means like walking, cycling or public transport, all resulting in higher activity levels or incidental exercise. Having climate change at the forefront of public consciousness is also influencing our dietary habits, making "plant-based" cool again and steering both consumers and food vendors to be more adventurous with fruit and vegetable intake.

5. Meat alternatives

Red meat consumption has become synonymous with carbon emissions. This is driving a booming

industry in alternative meat products made from plants, insects or even grown in laboratories. I would argue that the field is too young to claim (and validate with robust clinical studies) that these products have a positive impact on health but what is interesting is the impact they can have on changing consumer behaviour. As with the increasingly prevalence of plant-based diets, simply having the access to alternative meat products is encouraging consumers to examine their dietary habits more closely. As a result they will hopefully make sensible nutritional choices that have a positive impact on their long-term health.

6. Alcohol alternatives

This one is more clear-cut. The detrimental effects that high levels of alcohol consumption have on our long-term health prospects have been thoroughly validated. The trend towards alcohol-free alternative beverages enables us not only to consume less alcohol, but to re-examine our relationships with alcohol. Actively cutting back on alcohol consumption will have a proven effect on our long-term health and longevity.

7. Natural products

Another prominent consumer trend is the demand for reducing unnatural chemicals in everyday products. When we're looking at health, food is the field that springs straight to mind. "Natural" can be a helpful marketing ploy but the research does back up the idea that reducing added preservatives or flavours like highly processed sugars and salt is beneficial to our long-term health. Another field being driven to change by this consumer trend is personal care and beauty. I'm less familiar with the research in this space but common sense suggests that the fewer petroleum products we put on our faces the better.

8. Mental health awareness

One of the most positive consumer trends to emerge in the past few years is a growing awareness of mental health. The accompanying destigmatisation is paving the way for diagnosis and proactive treatment of a range of diseases. Research is emerging to suggest that depression and other mental health conditions may result in an increased risk of dementia in later life. We don't yet have the longitudinal data needed to determine whether increasing awareness and treatment of mental health conditions will result in reducing cognitive decline in later life. But one hopes...

9. Meditation and mindfulness

Meditation and mindfulness programmes – especially via digital channels such as apps or podcasts – have really gained momentum in recent years. There are a wealth of outcomes to choose from, whether you're looking to reduce stress, improve sleep quality or breathing or accompany a physical activity such as yoga. What may once have been brushed aside as New Age or "hippy-dippy" is now mainstream and even encouraged, and beneficially so. Stress has a known negative effect on longevity and healthspan, and these mental practices offer an effective toolkit to counter stress.

10. Ethical leadership

In 2020 corporate and social responsibility at a business level has gone beyond a "nice-to-have" or fluffy PR exercise. It's become a business-critical priority from board-level and throughout. In order to retain customers and to avoid being called out and publicly, catastrophically shamed, consumer businesses need to demonstrate ethical leadership and a strong CSR policy. This change could have long-term benefits for the health of their employees. Ethical leadership gives employees a sense of purpose. It should also ensure that staff wellbeing is front of mind: reducing stress-inducing practices, facilitating healthy lifestyle behaviour and minimising financial worries. Workplaces are absolutely key to preventative wellness practices, and finally the growing demand from consumers seems to be steering things in the right direction.

So, there we are, my top ten consumer trends that are driving the preventative wellness market. Of course, nature abhors a vacuum, so other consumer trends are emerging with the potential to undo all of that good work. For example, there is evidence to suggest that our increasing reliance on digital social tools is negatively impacting our ability to form personal relationships. These tools can also lead to increased levels of anxiety, negative thoughts and obsessive behaviours, all damaging to our long-term health and longevity.

Join us in 2021:

3rd annual

LONGEVITY LEADERS WORLD CONGRESS

The COVID-19 pandemic has thrown ageing and longevity into sharp public focus. It is now critical that we understand the biology of ageing to improve the underlying health of our populations, improve immune response and reduce disease. Financial wellbeing and security in later life urgently needs attention. The care sector is in desperate need of innovation and support. And the way that we work and connect with one another has shifted dramatically and permanently, with significant implications for ageing populations.

The Longevity Leaders World Congress is the definitive global meeting with the mission of extending human health span, delivering healthy ageing and financial wellness in the context of longevity. As three-conferences-in-one, it digs deeply into each facet while shared plenary and networking sessions provide opportunities for interdisciplinary exchange: Ageing Science, Ageing Well & Longevity Risk.

HEALTHSPAN SHOW

Throughout our lives, we age. How we manage our health and wellbeing during this time has a huge impact on our physical and cognitive health in later life. Luckily the consumer market is ripe with tools and products to help people actively engage with their health. Nutrition, beauty, fitness, lifestyle, mental health and fertility sectors all stand to benefit from the promise of keeping people healthier for longer.

Healthspan Show sits at the intersection of two massive trends – longevity and wellness. It is a business conference and exhibition for entrepreneurs developing wellness solutions to facilitate ageing well; researchers uncovering new information about how lifelong wellbeing impacts healthspan and lifespan; large corporate organisations tapping into wellness for both product innovation and corporate responsibility purposes; and investors looking to capitalise on two massive intersecting markets.