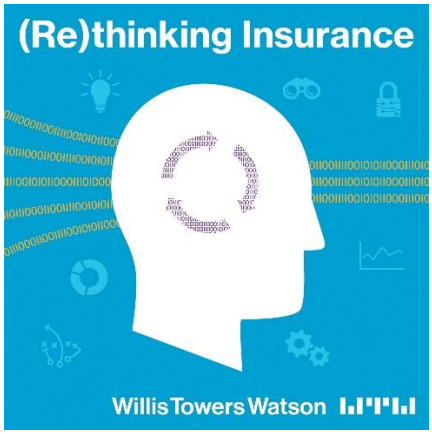

Episode 19: The effects of socioeconomic status on mortality and morbidity

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RICHARD MARSHALL: The pandemic has only really served to highlight existing health inequities in our societies, with those in the most deprived socioeconomic areas having been significantly more likely to die from COVID-19 than those in the most advantaged areas.

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CARRIE KELLEY: Welcome to (Re)thinking Insurance. I'm your host Carrie Kelley. On today's podcast, we'll be discussing recent trends in mortality assumptions setting, focusing on how companies are attempting to understand the impact of socioeconomic status on mortality. My guests today are Matthew Edwards and Richard Marshall, both Directors at Willis Towers Watson, who have expertise in mortality assumptions and development and modeling. Welcome back, Matthew.

MATTHEW EDWARDS: Hello. It's good to be back. Thank you.

CARRIE KELLEY: And welcome, Richard.

RICHARD MARSHALL: Hi, Carrie.

CARRIE KELLEY: All right. I'm happy to have you both on the show. Now, as you may know-- I think you've both done podcasts before, but we like to learn a little more about our guests before we jump into our main topic. And what I'd like to know from each of you is what someone would actually find if they Googled you and what do you actually wish they would find. So Richard, I'll start with you.

RICHARD MARSHALL: Well, what someone might find is that I'm a rugby league coach at Salford, or that I'm a renowned cornet player. They might even find that I'm a Senior Vice President within AstraZeneca. Sadly none of those are actually true. I would probably hope that people would find nothing at all about me online. But if they were going to find something, then it might as well be that I'm at heart a mathematician and can't resist anything that promises to include Greek letters in abundance. So it's probably appropriate that I ended up in mortality modeling.

CARRIE KELLEY: All right, so Matthew, last time you were on, we learned that you're a published author. People will have to go back to our episode 8 on COVID-19 and pricing protection products to learn more about that. So Matthew, do you have any other hidden talents up your sleeve if we go far enough down the Google wormhole?

MATTHEW EDWARDS: Yeah, I'm not sure if this would appear on Google. But as you're asking about some of my hidden secret, obsessions, if you like, one thing which was a secret which had sort of became less secret recently, we had a sort of-- within the insurance team, a sort of X Factor, Britain's Got Talent type of contest a few weeks ago actually. So I had to bring out my juggling skills, which were--
[LAUGHTER]
--could be the next career option. So the particular video I try to compete with was-- started off with me having two arms and three axes. And I threw some of those up in the air and I ended up still with two arms--
[LAUGHTER]
--which is always a good thing. And still with three axes as my little alternative career option should you wish to throw me off the podcasting career path.
[LAUGHTER]

CARRIE KELLEY: Impressive. It's definitely a success if you end up with as many arms as you started with.

MATTHEW EDWARDS: Occasionally with cuts, but they still function.
[LAUGHTER]

CARRIE KELLEY: So let's jump into our main topic. We've seen an increased interest in understanding how socioeconomic differences impact mortality. How are companies using this information?

MATTHEW EDWARDS: Yes, it's been a very big thing in the insurance field for the last 10 or 20 years ago, and sometime before that, had been a widely accepted factor in public health. And I think that degree of understanding and acceptance has increased. And I guess we'll talk later about how that's becoming more and more of a factor with the pandemic as well and how things may change post-pandemic.

But just answering your question, I guess more if you'd like explicitly in terms of what's driven that and how that's been changing, in the past-- meaning, say, 15, 20 years ago-- life insurers would obviously be aware of some degree of differentiation between those policyholders who had larger sums

assured, larger face amounts benefits, and those with smaller. And in fact, with that distinction between high and low benefits as a form of socioeconomic proxy. And insurers would allow for that just through a very simple weighting of their analysis by amount to the mortality analysis you weighted by amounts, such as it allows for the high amount policyholders to come through with lower mortality. So that would be a very simple way of allowing for that.

And then around about 15 years ago, in the UK, due to the combination of I guess two factors-- one was the abundance or the proliferation of multifactor analytical methods, so in particular GLMs, Generalized Linear Models, insurers started looking at their own data with postcode and realizing that if you allow for postcode properly with these analytic techniques, you actually identify and quantify a very strong socioeconomic effect via postcode in addition to the benefit amount. And in a very competitive market-- so you have the two features of the data analytics and the competition. Given those two, insurers started using postcode as a rating factor on the retail annuities.

And it had a-- it makes a massive longevity difference. So if you take a relatively typical example, it would be a male, 65-year-old, and the different of postcode or socioeconomic class over and above pension amount, in fact, could be right around about a 10-year difference in life expectancy. So a massive difference if you're and obviously a massive difference if you're the individual concerned. So that starts to become common in pricing. It's one of these things that once one firm starts doing it, everybody else has to follow basically.

And then there's a secondary effect as well as the individual retail pricing. There's also, around about that time in the UK, we started having this explosion of interest in the bulk annuity market. So in US terms, PRTs, Pension Risk Transfer. And then firms realized that if they want to transact on a small scheme, then they could actually come up with a very good mortality estimate of those policy-- of the pensioners just through looking at their postcode or postcode and obviously age and gender and pension amount without needing to go back and try and work out the mortality history of those schemes, because some of those small schemes just didn't have a reliable history.

So that became another factor almost forcing everybody to be using postcode much more actively as a rating factor for those types of business and then onto other types of business. So this is now just widely accepted. Richard, what have I left out from that introduction?

RICHARD MARSHALL: Well, Matthew, I think that it's important to note that it's not only base mortality rates or current mortality rates that are affected by socioeconomic differences. In fact, things such as existing health conditions being different in the higher and lower socioeconomic groups and social determinants of health being different depending on which group you're in will mean that changes in health policy, medical and technological advances, and also behavioral changes adopted by those groups will affect how mortality rates improve over time.

So we might see a reasonable degree of variation between different socioeconomic groups in the mortality improvement rates that apply to those groups. As an example, those in the more deprived socioeconomic groups may be more likely to smoke. If we imagine a scenario where smoking continues to reduce, then we would expect to see bigger gains in the more deprived groups who have

a greater ability to give up smoking than in the less deprived groups where already relatively few people smoke.

CARRIE KELLEY: Matthew mentioned postcode. But in general, what types of information are companies typically using when they're trying to set these assumptions split by socioeconomic status? I presume we don't typically get a lot of socioeconomic stratification data in what we've normally been pulling for creating mortality assumptions. What kind of issues does that create?

RICHARD MARSHALL: Yeah, well, as Matthew suggested, certainly for annuity writers, the sort of evidence that would be used would be the size of a pension pot being annuitized or evidence connected to the postcode, the place of residence of the individual that's taking out the annuity. It's quite possible that all the other things that are known about the policyholder can be used, things like occupation, which might be known for a pensioner, pension scheme. And also the marital status of an individual might be relevant.

It's certainly become the norm in the UK that at least a postcode amount will be used when assessing mortality to quote for an annuity. For other countries with less developed annuity marketplaces, perhaps there is still a good deal of scope for the use of that information to provide more granular annuity assumptions as long as the regulators and the regulations in that country permit.
But protection writers, on the other hand, writing individual business, there'll be a greater focus on individual underwriting. So perhaps whilst socioeconomic effects might still be relevant, the current health and the lifestyle of the individual taking out the policy will be much more important in determining the premium that they pay with a clear risk-based approach to underwriting the higher sums assured more extensively.

If we think about group protection business, on the other hand-- so we might be taking group life, group health-- then there'll be a greater reliance on the assumed socioeconomic spread of lives within that group, say the company, the employer that's providing that cover for their employees. Then it's unlikely that there'll be sufficient data available on each employee in a group protection policy to allow an accurate assessment of socioeconomic status of the individual or their lifestyles and health conditions.

But if you know let's say that you're dealing with a financial services company with a high proportion of individuals that come from very advantaged backgrounds educationally and also have higher than average salaries, then you might estimate that a large proportion of those individuals would come from say-- let's say the top 20% of the socioeconomically advantaged areas of the country where they can afford to live. And from that, you'd be able to derive information about their likely health status on average across the group. So it's not to say that simply not having the information about an individual would prevent you from making some assumption about how socioeconomic effects would affect their mortality.

So where companies are not using this information to support assumptions setting, there's an implicit and unknown cross-subsidy between the lives in the portfolio. Those who are more advantaged would be cross-subsidizing those from less advantaged areas. So a change in the sales mix or a change in lapses and selective lapses in light of a competitor introducing more differentiated rates would expose

that insurer to losses due to that cross-subsidy no longer being able to be funded from the better risks that were assumed to be held.

CARRIE KELLEY: Then maybe in terms of talking a little bit more about how companies can actually create these assumptions-- we've already touched on that a little bit in talking about the data needs. But maybe, Matthew, you can talk about how if companies who may not have a lot of credible data, what they could do versus what companies who may have significant data around this. What they would do as far as assessing the portfolio.

MATTHEW EDWARDS: Yes, it's an interesting question both in its own right, and also I think the answers sort of shed some interesting light on other aspects, which is many things which firms have been doing are effectively allowing for socioeconomic status as a form of proxies. If you look at smoking, smoking has been a very big rating factor for term insurance for a long time now in most markets. But smoking isn't just about whether you're a smoker or not, in the physical aspect of putting the cigarette in your mouth. It's actually also a socioeconomic proxy. So when a firm starts using the smoker/non-smoker differential, that was picking up the socioeconomic effect.

So in a similar way, you can get a very obvious proxy from occupation. An occupation is clearly a great risk factor for group life. And it always comes up in other aspects. I remember doing a very interesting analysis of mortality for a relatively well-known airline. And it was a very distinctive thing-- there's a massive differential in mortality between cabin crew and pilots and the engineering staff, for instance. So there are ways of getting at this aspect of socioeconomic status even without all the right data.

I think postcodes are becoming more and more commonly-- they were obviously collected because people have to provide a postcode for their address, and likewise, a zip code in the US-- but also more and more commonly, analyzed. So that just tends to be the most useful proxy for socioeconomic class, partly because it's sort of objective, easy to get. I mean, people quite rightly say if you live in a particular postcode now, you may have lived in a different place 10 years ago, 20 years ago. So ideally, we like it as of your whole sort of life history.

But the fact is, there's this question of having to draw the line somewhere, and say we need rating factors which give us a degree of protectiveness. They're never going to be perfect. We just need to transmit our policyholders-- either existing or potential new policyholders-- into reasonably homogeneous risk categories. And if we aim for perfection, we'll just be disappointed. So effectively, it was a bit of a compromise between how accurate you need to be given the market you're in and what data you've got, and just trying to balance those slightly conflicting priorities.

CARRIE KELLEY: As you've been examining the impact of socioeconomic factors on mortality, have you seen any trends related to COVID and socioeconomic status?

RICHARD MARSHALL: It's been interesting, if a little disheartening, to see quite marked socioeconomic and ethnic variation in outcomes from COVID-19. The pandemic has only really served to highlight existing health inequities in our societies, with those in the most deprived

socioeconomic areas having been significantly more likely to die from COVID-19 than those in the most advantaged areas. And this covers a range of effects.

So firstly, likely higher rates of infection in more deprived communities. So they're more likely to be in more crowded, multigenerational accommodation. They're less likely to be able to work and shop from home. So they're more likely to be exposed to the virus on public transport or in the workplace. They're less likely to be able to afford to isolate in the event of having symptoms, or being informed that they're a likely contact with someone who has tested positive.

So perhaps they're at greater risk of getting the virus in the first place. But then secondly, they have a greater risk of complications requiring hospitalization due to the higher rates of existing prior conditions-- so comorbidities. This does explain some of the effect that we've seen. But various studies have shown a residual effect with socioeconomic deprivation and certain ethnic groups being more likely to end up in hospital. And then finally, there's a greater risk of death once in hospital, even if receiving the same care. So a study by the Intensive Care National Audit and Research Center or, ICNAC, suggested that there was a significant mortality uplift for those intensive care patients who were from the most deprived quintile of the UK population.

MATTHEW EDWARDS: Following up on that, Carrie and Richard, it's interesting that, for many years in the UK and, I suspect, in many other countries, that there's been a lot of concern about the socioeconomic differentials in mortality, longevity. And in trying to, as, I think, our current prime minister calls it, to try to level up and try to improve the longevity, the life expectancy of those at the lower end.

Clearly it has been much more the white collar half of society who have been able to lock down and carry on with Zoom meetings and recording podcasts and so on while the more blue collar end of societies have been the ones who have kept industries going, kept supermarkets going, kept the electricity generators going, and so on and so forth. And clearly they've been out and about and therefore exposed to the infection.

So, if anything, the whole nature of that response has exacerbated an existing socioeconomic divide rather than in any way helping to heal it. And that's before we get into the question of vaccination.

CARRIE KELLEY: Right. On the topic of vaccination, do you expect some of these trends you've been talking about to change at all as vaccine rollout continues?

MATTHEW EDWARDS: Yeah, it'd be nice to think that ultimately everybody will be vaccinated and therefore that there'll be no socioeconomic differential there. But what we've seen in the UK-- and apologies for not being able to summon up statistics from other countries-- but certainly in the UK, there's been quite a notable socioeconomic differential in vaccine uptake. So looking at the stats which the-- have been produced in the UK toward-- to the end of May, so released in the middle of June, it was showing-- using what, in the UK, we call the IMD, the index of multiple deprivation, which is the sort of standard way of measuring socioeconomic class to ten deciles, 1 to 10-- the differential between the top and bottom ones in vaccine uptake, for both doses, was 73% at the lowest end, up to 84% at the highest end, so there's about a 10% point-- more than a 10% point differential.

The vaccination hesitancy effect or lack of uptake is, again, exacerbating that socioeconomic differential. We've already seen it from the point of view of both infectivity and mortalities of post infection. So at the moment, it is not very positive. But hopefully we'll end up in a situation where we have almost everybody vaccinated. And it'll just be seen as a-- hopefully, just a 2021 aberration which may be, in some way, equalize in the future.

RICHARD MARSHALL: I guess, beyond the question of COVID-19 itself it still remains to be seen what's going to happen with long COVID and also the longer term health service impacts that might come about as a result of delays caused by COVID-19 and how long those effects persist. So we might see urgent cancer referrals, which have fallen in aggregate by hundreds of thousands over 2020, taking a long time to catch up and therefore maybe tens of thousands of cancers not being diagnosed until a later stage; by which time the prognosis for the cancer patients will be worsened. And we might see that that also has some socioeconomic shape with people in different socioeconomic groups perhaps having access to private health care versus public health care and whether they have changed their help-seeking behavior to different extents over 2020. It may also mean that, let's say, changes in income have affected, in the case of privately funded individuals, whether they're able to access, afford cancer therapies and other therapies that they may need. So I think insurers will want to understand what the impact of socioeconomic variation will be in the longer term impacts of COVID-19 rather than solely in the number of deaths that come through from COVID-19 itself. And they'll want to determine whether there's a likely material variation of that future experience within their own portfolios.

CARRIE KELLEY: And how do you see companies thinking about modeling these impacts going forward?

RICHARD MARSHALL: I'd expect to see that companies with sufficient policy volumes would be improving their modeling capabilities to allow them to make a proper allowance for socioeconomic effects. That could be collecting better data of certain types for particular policies, particular types of policy to allow that analysis to take place. It could be by linking from their existing data to additional third party data sets which would allow them a better understanding of those socioeconomic advantages or the effects of deprivation.

A really good starting place would be simply to map individual policyholders to one or more measures of socioeconomic status to allow that more sophisticated analysis to be implemented with sufficient data. That might be using generalized linear models or even more complex techniques like gradient boosting machines. I'd expect to see a greater use of driver-based modeling as well to assess the best-estimate views of mortality over time and how they might vary with socioeconomic status in the future based on a proper understanding of the drivers that are likely to have a greater impact on mortality improvements for the more and less affluent policyholders in an insurer's portfolio.
So to give an example, if we were talking about smoking reduction, then, if we believe that smoking is much more prevalent in deprived groups of the population and much less prevalent in the socioeconomically advantaged groups, then a big drive to reduce smoking might be expected to have a greater effect in the less affluent, the more deprived, population than in the more affluent group, assuming that you had similar rates of take up of that changing behavior. So this might mean

considering adjustments to the rates of improvement that are assumed for different socioeconomic groups for an insurer's portfolio.

And whilst improving the modeling, and therefore the pricing, that-- I would expect companies to be paying additional attention to governance of their assumptions to make sure that, when they're allowing for socioeconomic effects, that these don't become a proxy for, say, ethnicity. We need to be careful that having a socioeconomic disadvantage which might be experienced by certain ethnic groups that vary by country would not then convert into potentially discriminatory pricing for insurance products.

MATTHEW EDWARDS: Interesting, Richard, the emphasis on driver-based modeling. And just to clarify, the driver-based modeling approach is very much around getting a better view of how things are likely to move in the future, so over and above what the base mortality is now. And what I think we've seen-- and obviously we've enjoyed working on this with various clients. Richard is helping those clients with the driver-based modeling just to understand what is actually happening with mortality, what might change in the future, both for best-estimate and also for capital modeling where you need to think through potentially extreme changes to things such as smoking prevalence or national health expenditure and so on.

And that's been particularly useful, I think, over the last decade because, as many listeners will know, back in the 1990s, the 2000s, we all got used to several percent of mortality improvements every year. And those of us have almost taken that for granted which is probably good for us as a society, as individuals, but probably less good for the pension funds and the annuity writers. And then clearly over the 2010s, that-- historically very, very large improvements just dwindled, halved, more than halved.

And then, thinking through those drivers, does it help to have us think through what's really been happening there, what's likely to happen in the future. And then, of course, again, as you've been leading on this, Richard, we can apply the exact same technique to thinking about other aspects such as climate change. So, given what we might expect to happen with climate change, what are those drivers? What might their effects be on mortality-- morbidity, and mortality, and longevity? So it's a very wide range of things that this type of approach can help with.

But fundamentally, it's about understanding what's likely to happen and trying to quantify those impacts. And again, we're never going to be-- we can never guarantee that we're right about everything. But it's having a [INAUDIBLE] like that helps to sort of understand what's most likely to happen, what are the variabilities of the ranges. And that again does help us to think through all of these aspects much better than was typically the case 10 years ago.

CARRIE KELLEY: So for each of you, what would you want listeners to have as a key takeaway from this podcast?

MATTHEW EDWARDS: Difficult summing up such an interesting topic in a few words with so many ramifications as well. But I guess the key thing would be some degree of just awareness of this very material variation in morbidity and mortality rates by socioeconomic class and also by some of the

proxies for that but also in how those variations may-- may move in the future and also, not just movement of, if you like, the biological aspects of morbidity and mortality, but also the behavioral aspects. So, you know, demand elasticity itself also varies by socioeconomic status.
And therefore, if you're thinking about an insurer pricing, they need to be bearing in mind both the demand curve, the demand characteristics of policyholders as well as the morbidity and mortality aspects now and how those might move in the future. So it makes for a very complex picture, but insurers just need to try and understand that complex picture better in order to price both competitively and profitably and-- and, as Richard was implying, also make sure that they're pricing fairly with particular regard to any risk of ethnic or other protected characteristic bias.

RICHARD MARSHALL: Yeah, and, for my part, I think the key takeaway would be that socioeconomic variation in mortality and morbidity is not something that is novel or mysterious but, rather, it's well evidenced in academic literature that inequalities in a wide range of social determinants of health will result in different health and mortality outcomes for different groups. It's therefore a natural extension to an insurance pricing basis. And, given that there are modeling approaches that allow insurers to understand and quantify the effects on claim experience, it's only a matter of time before insurers who are not pricing using these factors, socioeconomic effects, will be at a competitive disadvantage.

CARRIE KELLEY: Well, thank you both for joining me today.

RICHARD MARSHALL: Yeah, thank you very much for having us.

MATTHEW EDWARDS: Thank you. It's just a shame as it's so short. I was hoping for a three-hour podcast, but apparently the listeners wouldn't want that.

CARRIE KELLEY: And thank you, everyone, for listening to Rethinking Insurance.

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