Actuarial Research Centre

Institute and Faculty of Actuaries

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Update on the ARC's Periodical Payment Orders (PPOs) Event

Staple Inn Hall, High Holborn, London, WC1V 7QJ

20th February 2019, 14:00 – 17:00 GMT

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Background

About the ARC

The **Actuarial Research Centre (ARC)** is the Institute and Faculty of Actuaries' (IFoA's) network of actuarial researchers around the world. The ARC is the IFoA's main vehicle for delivering industry led, cutting edge research programmes that bridge academic rigour with practitioner needs by working collaboratively with academics, industry and other actuarial bodies, to address some of the significant challenges in actuarial science.

About the PPO Working Party

The IFoA's PPO Working Party (WP) aim to investigate PPOs and their effect on the UK insurance and reinsurance industry. The PPO WP has been at the forefront of advising non-life actuaries about the impact of PPOs on the (re)insurers carrying these liabilities and also on their own work (e.g. the relevance of applying life insurance techniques to the management of these liabilities).

One aspect of this is developing an understanding of the mortality experience that has been/is likely to be experienced by PPO recipients. This involves developing an understanding of impaired life mortality as it applies to severely injured individuals and how different such mortality is likely to be from general population mortality.

The ARC's project on PPOs

In early 2018 the PPO WP requested support to commission a feasibility study with the aim of compiling mortality tables of impaired lives who have suffered brain and/or spinal injury following a severe trauma (specific to UK PPO awards). This request was approved by the IFoA's General Insurance Board and subsequently approved by the Research and Thought Leadership Board (RTLB) in July 2018. RTLB further agreed that **the PPO research should be commissioned through the ARC**. The ARC's initial step towards the achieving the aim of this PPO feasibility study was to host an event to discuss the challenges and potential solutions to consider when undertaking this research project.

The Event

The ARC's event on 20th February 2019 facilitated an open discussion between industry experts, insurers, healthcare providers and academics who specialize in the development of such data to help us refine the challenges that would be faced in developing mortality tables for PPOs, and the potential solutions available.

This event was set up as a roundtable session with 45 delegates discussing the 'topics and key questions' as set out earlier in this document. Two key discussion topics (and two sets of questions) were provided to the delegates for consideration in advance of this event. These questions were designed to aid a structured and productive discussion around what the 'requirements' for PPO mortality tables are, and what the potential 'solutions' may look like. The feedback gathered in response to these questions will allow us to refine the scope of our 'call for tender' for commissioned research, which will be issued soon.

It is proposed that data for the feasibility study could be compiled from the most relevant UK medical research database(s) of patient records as entered by GPs (e.g. THIN, CPRD or such other source as identified via the research) with comparison to overall population statistics from the ONS. If successful, the resulting tables could enable more accurate reserving, pricing and capital setting for PPOs by insurance companies and could also be of use to other parties.

Given the relevance of this research for industry, we're also keen to commission and deliver this leading-edge ARC project in partnership with interested parties. If your organisation would be interested in supporting this project, please contact the ARC Manager by emailing arc@actuaries.org.uk for further discussions about how you could get involved.

Discussion topics and key questions

As a guide (in no particular order) for table discussions at this event, the roundtable discussion addressed the following topics and questions:

Topic 1: 'The User Experience'

The questions under this topic aimed to get a feel for what these sorts of mortality tables (if they can be produced) would be used for (also considering different types of organisation e.g. insurance companies, NHS, regulators) and what they would ideally comprise.

1. What aspects of your/your organisation's work could make use of such mortality tables specifically created for this population of lives?

   - e.g. For an insurance company, these tables could potentially be used for:

     a. Best estimate reserving/SCR calculation for existing PPOs (i.e. present value of future PPO payments weighted by probability of survival)

     b. Assessment of lump sum awards where expected lifespan is relevant (i.e. a PV calculation)

     c. Pricing of new business where a future claim may be awarded as a PPO

     d. Commutation of existing PPO reinsurance cover

2. What sources of mortality data/information are you aware of? Which are most used and why?

3. What are the limitations/gaps in the mortality data/information currently available and how do they impact on the work done?

4. Which gaps would most usefully be addressed in priority order and why?

5. Any other observations about all this from a 'user' perspective?

6. How could 'end users' be involved during the research?

7. What sort of outputs outcomes would 'end users' like to see most from the research? e.g. published tables only, software, training.

Topic 2: 'Potential Solutions'

The questions under this topic aimed to get feedback about what can be done in practice and the main opportunities/limitations, given the requirements emerging from the 1st set of questions.

1. At a high level do you think that the THIN and/or CPRD databases capture the right sort of information to be able to be used as a source for this work?

    a. What is actually covered in THIN and CPRD databases?

    b. What does a patient file look like? Is there a proxy template for a typical file available?

    c. How granular is the definition of a condition?

    d. How extensive are these databases? E.g. population covered, age range, deceased lives.

    e. What data protection limitations come with the files?

2. Are there commercial terms to the use of these databases? If so, what are they?

3. What experience has anyone had using these data sets that could inform their use for the current proposed purpose? What learnings/insights are there?

4. Are there other sources of data that should be considered in addition or instead? Although the focus is on UK experience, are you aware of any comparable mortality studies in the UK or overseas that should be considered when developing our approach?

5. On a practical level, what are the potential key stages of work you think would be need to be carried out to produce these tables?

6. What challenges could you envisage arising in trying to undertake this work – both practical and theoretical/statistical?

7. What do you think are realistic timescales for this work to be completed?

Key themes from discussions

Delegates were supportive of this proposed ARC research project and it was acknowledged that the expected research output would bring wider benefit to the actuarial profession, and to others too, by pushing the boundaries of actuarial work through engagement and collaboration with other relevant professions on this subject.

Please note that expression of individual views by delegates and by members of the Institute and Faculty of Actuaries (IFoA) at this event were encouraged. However, the points made at this event are those of the attendees and does not represent the IFoA's views.

The key themes that emerged from the discussions are as follows:

1. Uses

It was agreed that all the bullets identified in Q1, i.e. a) to d) inclusive of 'The User Experience' questions are potentially relevant. The PPO mortality tables could be used for more accurate capital modelling and reserving. Solicitors, claims managers within insurance companies, and regulators (especially PRA) might also be interested in these mortality tables.

The possibility of a wider benefit to the research - i.e. a social good dimension and not just a commercial/technical benefit - was also discussed. For instance, is there a broader use to help inform the impact of certain medical interventions?

Other points raised in the course of this discussion include;

- Possible opportunities of writers of impaired life annuities to also take on these risks
- Comparator to US experience, and comparisons with Ogden tables. An agreed settlement may be achieved quicker if a standard table can be agreed
- Current assessments are based on the opinion of the same pool of medical professionals – this might be seen as being more objective
- The potential use of "approximately appropriate proxy info" – impaired life info from wherever, which might help inform PPO related judgements, was recognised

Data may give information on causes of death, from which hypotheses can be developed about how important these causes are relative to 'normal' deaths within the general population (for similar age groupings) and how these drivers might develop in the future (from medical advances for example) which may then inform guesstimates/projections about the future experience of severely impaired lives.

2. Data

THIN data, which contains information on brain and spinal cord injuries, was indicated as a potential primary data source for developing these PPO mortality table.

It was mentioned that even though THIN data contains a broader group of people with these injuries, it only covers relatively few lives (5-6000 lives), so any tables that is developed using THIN data should have some indication of uncertainty around the best estimate table. A point was also made that a table based on the THIN data would be a good basis for insurers as they could then make their own adjustments to this table or, e.g., look at their own actual over expected, relative to this table. So even though a THIN-based table might have e.g. heavier mortality than the PPO data, it should still be highly relevant and useful for the purpose of this proposed research.

As an example, some information on the patients in THIN born before 1960 (inclusive) was compiled and followed up to January 2017. Read codes compiled by the PPO research working party were used to identify these patients. The information below includes gender, age and mortality or loss to follow-up distribution, and the length of follow-up.

- There are 1726 patients in total with relevant Read codes, born before 1960.
- There are 924 currently registered, i.e. alive patients; 362 dead; 440 transferred out i.e. lost to follow-up.

Gender distribution: 672 Females, 1055 males.

Age at injury	count	Males Registered (alive)	Males Transferred out (lost)	Males dead	Females Registered (alive)	Females Transferred out (lost)	Females dead
Under 20	58	22	16	5	11	3	1
20-29	98	53	18	9	12	5	1
30-39	212	83	43	9	54	19	4
40-45	201	68	41	13	57	15	7
46-49	148	52	19	21	25	23	8
50-59	402	154	63	43	84	38	20
60-69	300	92	38	53	66	17	34
70-79	204	35	23	43	31	30	42
80-89	88	11	7	15	9	16	30
90 and above	11	1	1	2	3	3	1

Table 1: brain/spinal cord injuries on patients in THIN born before 1960 (inclusive).

Follow up length (yrs)	Count
Under 5	442
5-9	225
10-14	274
15-19	236
20-24	206
25-29	112
30 and above	227

Table 2: follow up of THIN patients up to (and beyond) 30 years.

As expected, there would be advantages and limitations when using THIN data for compiling mortality tables.

2.1 Advantages of using THIN data:
THIN includes the data on all comorbidities/treatments prior to the injury or at any other time point, say at 2 years past injury. It also includes lifestyle factors such as smoking, alcohol use and BMI.

It also includes social status info such as Mosaic codes, index of multiple deprivation (IMD) and Townsend score, the latter two in quintiles or deciles.

Cases can be followed up over time, looking at developing morbidity if of interest.

2.2 Limitations of using THIN data:
The severity of an individual's disability may not be able to be fully estimated, as it is the primary care data, not the data from a specialist centre. Lack of any cognitive/psych/physio assessments. However, what is actually available has not been looked at and the read codes may provide sufficient info on severity.

Furthermore, the following data sources were also suggested for consideration;

- The benchmark information, from the US, which is sometimes cited in UK expert witness cases on UK PPOs

- Motor Insurance Bureau (complex injury cases)

- Previous medical studies by firms - Reinsurers may have international data but that could be influenced by different healthcare systems' impact on care and survival rates

- The Medical Defence Union (MDU)

- NHS data (including NHS PPO population and NHS Resolution data)

- It was indicated that NHS Resolution might be able to provide their data and expertise to support this research project.

- Data on people in receipt of public benefits – could GAD help with this?

Additionally, could GAD and/or Motor Insurance Bureau and/or NHS Medical Resolution[1] provide other sources of experience? There is an opportunity for a 'social good' aspect to the analysis (and beyond motor insurer) which would help encourage others to make their data (if any) available for this research.

Cause of death may also be useful data to look at – e.g. are these lives more exposed to the risk of infection?

Whilst other datasets might not accurately represent the level of (impaired) mortality for PPO's given differences in nature and severity of injuries, level of care etc., they could give a useful insight into how relative mortality vs the wider population compares over time since the injury or settlement occurred. Wider studies might give an idea of the shape of any "select" effects in the mortality data, which won't be available from the PPO data itself for another few decades.

3. Issues

Regarding mortality tables specifically created for this population of lives, it was expressed that creating such tables was rather a big ask, because there are so few and diverse PPO claimants. The importance of medical information and advice, and specialist impaired life underwriting experience, could not be overstated in practice – this does not mean that a combination of information from other sources would not be useful, but that using it would take skill and technique.

There is great reliance on the initial medical assessment done at claims stage and it is not generally possible to subsequently go back to the PPO claimant to re-assess/re-underwrite the case. One of the special features of a PPO, in contrast with some impaired-life annuities elsewhere in the world (such as US workers compensation), is that the benefits are normally fixed at outset, subject to an automatic formula that only depended on the person surviving to collect the next payment (barring a variation order cutting in at a pre-arranged date, which would mean the need to review the case at that point). This means that there is no emerging disease development information during the claim

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[1] According to NHS Resolution's Claims factsheet 2018 the status of claims for clinical negligence made against the NHS received since 01/04/2008 as at 31/03/18 was:

Status	Numbers	Percentage
Resolved without a Damages Payment	29,257	30.87%
Resolved with a Damages Payment	43,628	46.04%
Resolved as a Periodic Payment	*796*	*0.84%*
Outstanding claims yet to be resolved	21,089	22.25%
Total ('files opened')	94,770	100%

period. If there were some emerging disease development information, and one could look, say 10 years after the initial PPO award at how the claimant was doing, one might be able to reassess the life expectancy from that point and perhaps feed that information back into the initial judgement of life expectancy – i.e. learning and improving estimation approaches going forward, which is currently not present for PPOs.

There were discussions on whether awarding PPOs might itself impact on life expectancy. Whilst some disease information, and mortality experience, might be more readily available in the general population medical data, the experience of PPOs might not be comparable, if because of the PPO, the injured person is better cared for and may consequently have a longer life expectancy. Therefore, the selection effects as a result of the choice people take between a PPO versus a lump sum needs to be considered, as those who select a PPO might live longer than the average person who has the same condition.

Discussions about the amounts currently reserved by insurers for their current PPOs suggested that these PPO reserves are not large enough to make another reinsurer willing to take the liabilities on at that price. The most important elements driving the reserve held for PPOs are probably the inflation / investment return relationship. Apart from those claimants who are expected to have a very short remaining life, this financial assumption is a more significant / sensitive driver than the impaired life mortality assumption.

The importance of allowing for future mortality improvements was highlighted. This would involve monitoring how medical advances and technology are affecting trends and concepts of 'maximum potential life expectancy' (e.g. based on the 90th percentile), which might be difficult to predict.

4. Potential Solutions

Given the likely paucity of PPO data, it is unlikely that a set of mortality tables could be developed directly from experience. However directional or relative insights could be gained, which would be worthwhile e.g.

- o How experience is shaping up relative to what would be expected based on other relevant mortality studies (Strauss et al on TBI and SCI)

- o Mortality experience relative to what standard population mortality would have predicted

- o Shape of mortality, e.g. effects of duration since accident

- How different is the mortality experience of people with equivalent impairments between those receiving PPOs (who may get better care) and those not
- May be some high-level insight on the impact of socio-economic circumstances on mortality rates

To an extent, the opportunities and limitations to this proposed project were covered in other parts of the discussions. Delegates had less to say about this part, in view of the statistical and detail limitations present in PPO data itself. Some additional points discussed are as follows:

- It was noted that it is probably not going to be feasible to develop a full set of mortality tables given the lack of data, but there would be value in, for example, assessing;

  - whether the available non-UK data (e.g. Strauss's US data) could be a reasonable fit for UK experience

  - how standard UK population mortality rates can be adjusted to provide a fit to the shape of severely impaired mortality (e.g. whether age rating, % increase in mortality rates or fixed addition – or combination of these)

- In terms of challenges and timescales, the proposed research should:
  - be able to link health/disability data to death data
  - set criteria for adequate data – what factors are "must have" and what is "nice to have"?
  - look at experience of lives who took a lump sum - it was noted that the lives in receipt of PPOs may be expected to have better mortality experience than non-PPO claimants who have suffered comparable injuries
  - get insight from neurologists. What studies has the Association of British Neurologists undertaken on mortality and brain injuries?
  - be careful that any analysis also allows for different cohorts coming through
  - understand timing of impact of any improvement (i.e. how often to update PPO mortality tables and at what cost?)
  - manage end users' expectations over when results might get published.
- Extensive collaboration and imagination, as well as relevant experience, potentially involving practitioners sitting down together with researchers on an occasional basis to refresh ideas for "useful solutions" in relation to "big data / statistical" approach would be useful
- It was suggested that rather than a top down approach to devise a set of mortality tables, the underlying causes of death could be considered for this population of severely impaired lives versus the equivalent for the general population. The data used to determine the

additional multiplier factors that apply to each cause of death versus the general population according to the impairment/severity (i.e. a process of deconstructing the drivers of mortality) should also be considered. This could be important when thinking about the impact of medical/technological advances

- Based on initial analysis of Brain/Spinal injuries within THIN by an academic who attended the event, there are some 1700 patients with relevant codes born before 1960. Could numbers of similar impaired lives born later (perhaps by decade) be examined, to get a feel for trade-off between numbers of lives covered and exposure?

- Ongoing liaison should be encouraged between the academics doing the study and practitioners (from the insurance sector and those outside it e.g. GAD) over quite a long period to elicit and test out ideas - i.e. some sort of continuous investigation rather than a one-off initiative. Perhaps fold into the Continuous Mortality Investigation (CMI) framework in due course?

- Key conditions to look at should include; Spinal injuries, Brain injuries, and Cerebral palsy (medical negligence for newborns). Future mortality prospects might also be linked to where policyholders/sufferers live and their specific conditions.