

Condition-based survival models

A method for estimating future mortality of ill-health annuitants

Andrew Dean, Longevity/ILS, PartnerRe

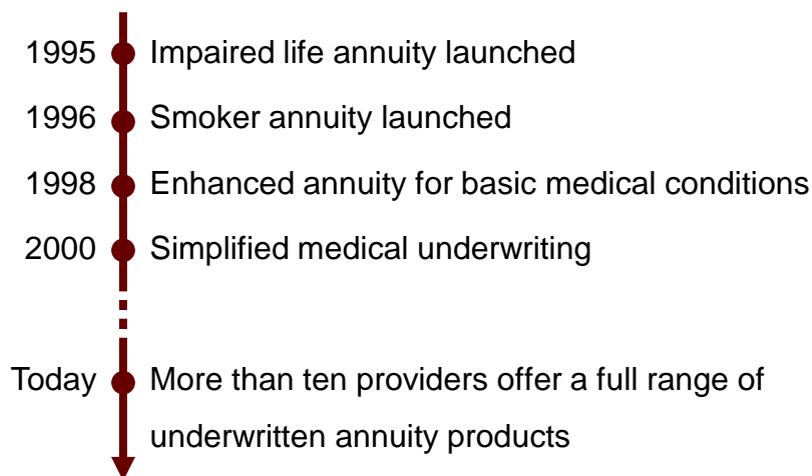
Condition-based survival models

- ▶ Background: the growth of underwritten annuity products
- ▶ Pricing annuities with survival curves
- ▶ Survival models for medical conditions
- ▶ Survival models for multiple conditions
- ▶ Challenges going forward

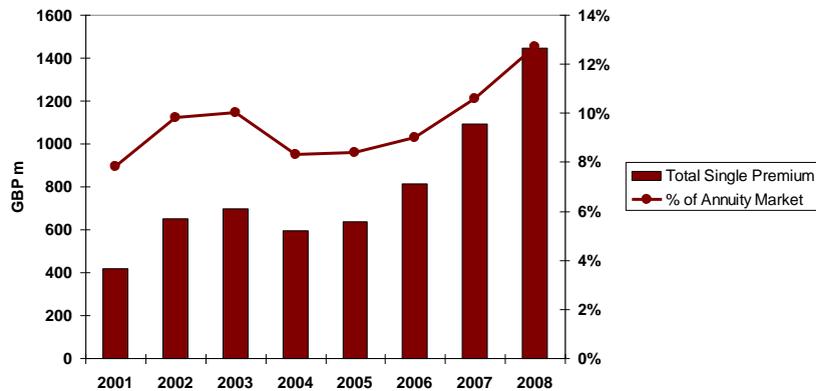
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History of underwritten annuities in UK



Underwritten annuity volumes in UK

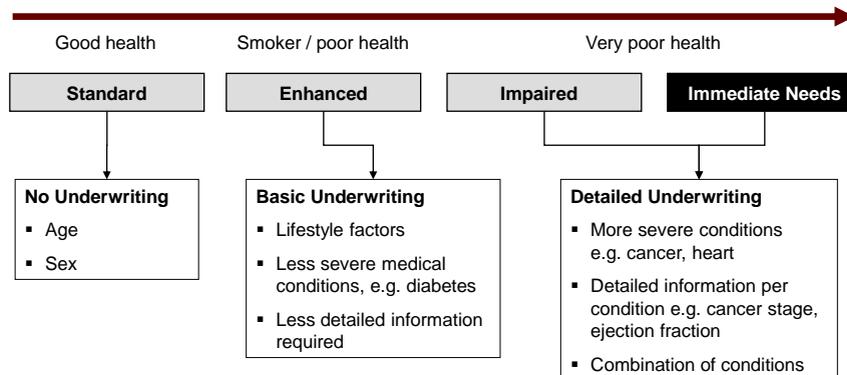


Source: Watson Wyatt

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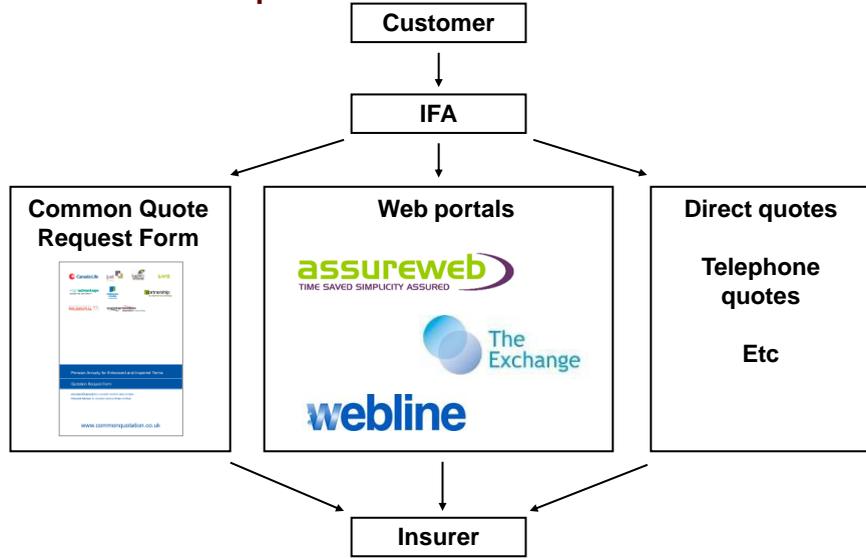
Range of annuities

Health condition



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Quotation options



Common Quotation Request Form

Currently nine product providers



Source: www.commonquotation.co.uk

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Common Quotation Request Form - excerpt

Section 2: Medical Assessment Form - To be completed by the Annuitant

Please disclose as much information about your health as possible before signing this form. An annuity may commence on the basis of the medical information supplied. Failure to disclose material facts about your health may result in any annuity enhancement being reduced or removed in full. Material facts are those that an insurer would regard as likely to influence the assessment and acceptance of a proposal. If you are unsure whether certain facts for your case are material, they should be disclosed.

Please enclose copies of any available hospital letters and a copy of your latest repeat prescription form, if possible.

Height: ft ins or cms Weight: at lbs or kgs

Smoking - we may ask you to undergo a simple non-invasive test and require you to confirm your consumption and the extent of your smoking habit to verify the information you give.

Do you smoke? Yes No Never

Please advise of the years you started and, where applicable, stopped: to

Please indicate the average daily level.

Manufactured cigarettes Cigars ozs of tobacco Hand-rolled cigarettes Pipe

Drinking - How many units of alcohol do you drink weekly?

(a unit of alcohol is equivalent to half a pint of normal strength beer, lager or cider, one standard glass of wine or a single measure of spirit)

Do you have high blood pressure (Hypertension) - Yes No

If yes, please specify last reading: Date of reading: / /

Number and name(s) of medication(s) taken (e.g. Atenolol, Ramipril):

Source: www.commonquotation.co.uk

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Expert underwriting tools

The market wants...

- Quicker quotes
- Better quotes
- Binding quotes

for potential customers

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Expert underwriting tools

The market wants...

- Quicker quotes → Quotation automation
- Better quotes → More detailed medical info
- Binding quotes → Accurate ratings

Expert underwriting tools

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Expert underwriting tool

Expert underwriting tools – example

PartnerRe
UW Workbench

Print Email

Cedant IDs PartnerRe IDs Gender Male Amount
Case Test12345 Case Age 52 Product Life Term
Person Person Status Married Update

| | P50 | P95 | Case History |
|--|-------|-------|--------------|
| Standard mortality | 35.25 | 52.08 | |
| ▶ Lifestyle | 36.25 | 52.58 | |
| ▼ Type 2 Diabetes | 24.00 | 39.50 | |
| Retinopathy - Grade moderate retinopathy - Grade 2 | | | |
| HbA1c - 6.5-6.9% | | | |
| Proteinuria - 1+ | | | |
| Neuropathy | | | |
| ▶ MI | 33.58 | 51.25 | |
| Summary | 23.42 | 39.25 | |
| ▶ Soft factors to consider. | | | |
| Results | | | |
| v0.88 | | | |

Underwriter's comments

Save Finalise Abandon Archive Case

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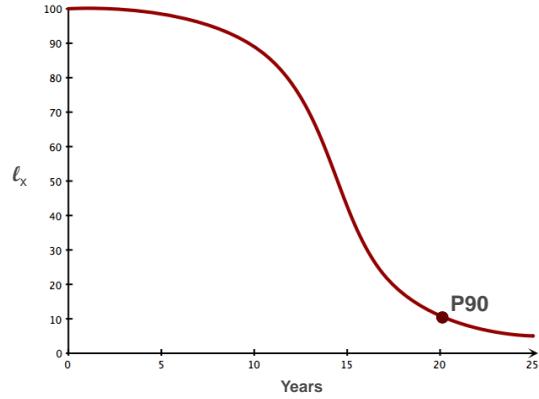
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Pricing annuities with survival curves

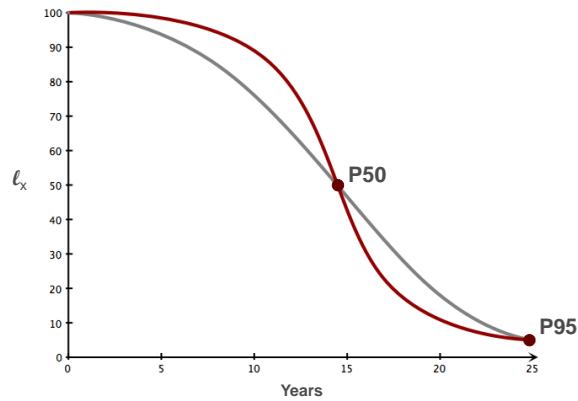
Pricing using 1 rating point



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Pricing annuities with survival curves

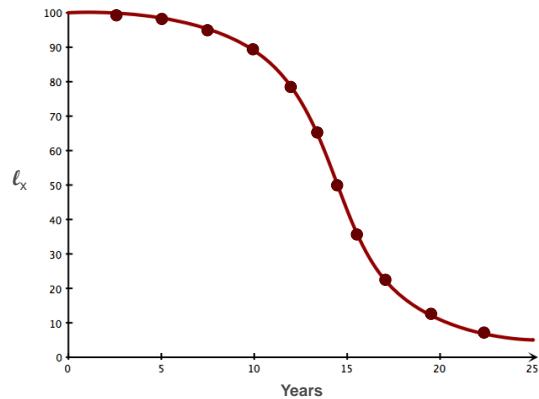
Pricing using 2 rating points



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Pricing annuities with survival curves

Pricing using a bespoke curve



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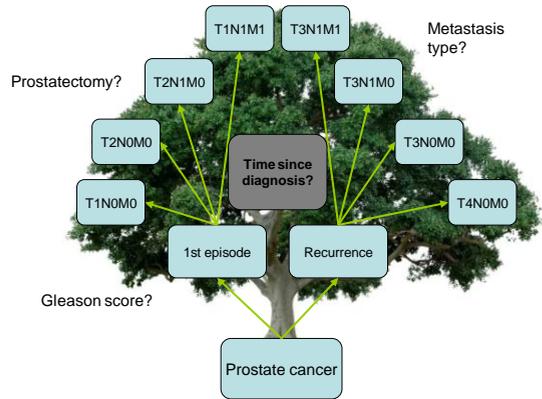
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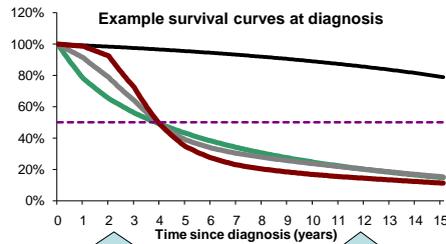
Survival models for medical conditions

Risk Tree example

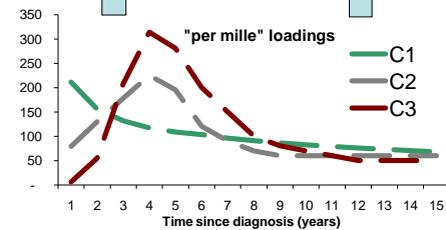


- Adjust for age
- Adjust for gender!
- Other adjustments

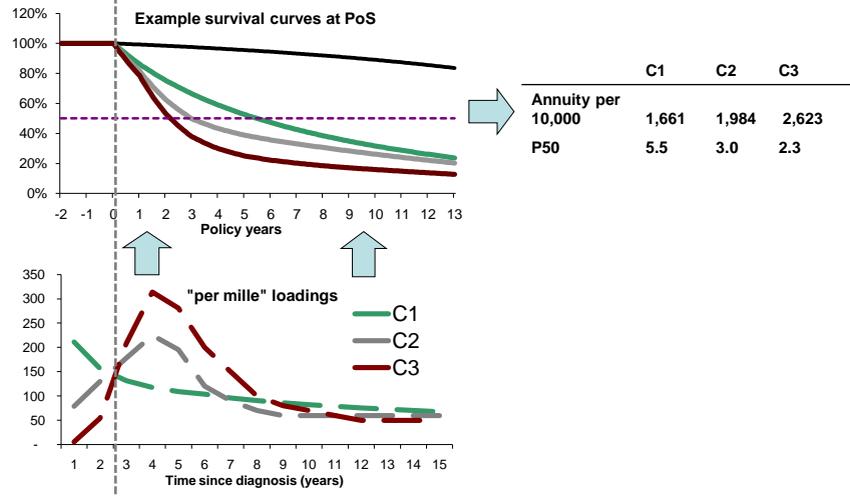
Survival models for medical conditions



| | C1 | C2 | C3 |
|--------------------|-------|-------|-------|
| Annuity per 10,000 | 1,980 | 1,899 | 1,996 |
| P50 | 4.0 | 4.0 | 4.0 |

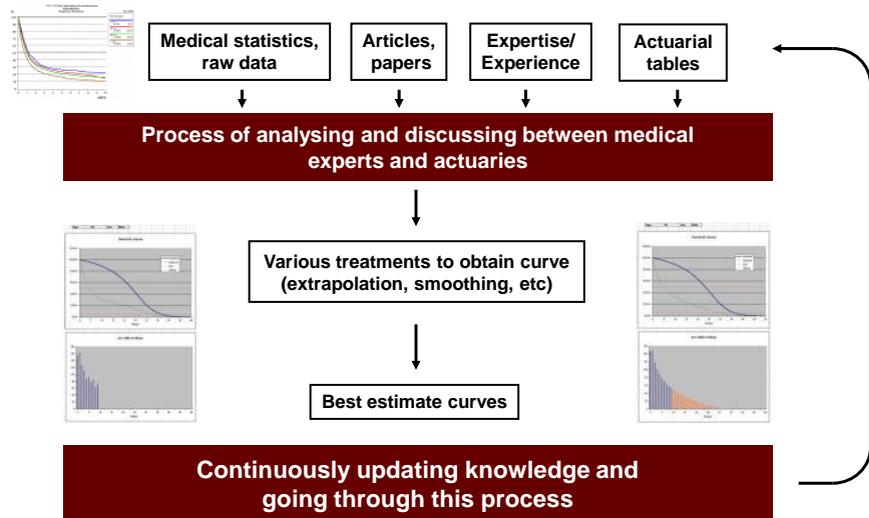


Survival models for medical conditions



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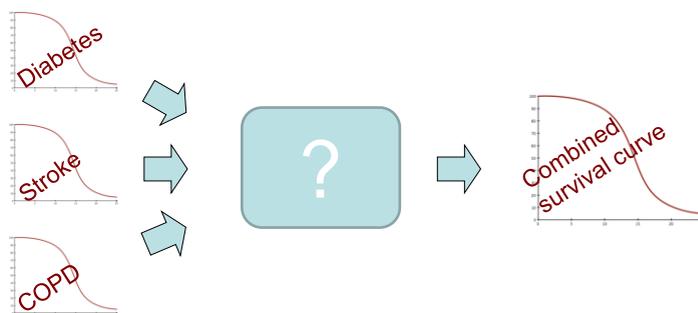
Control cycle



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Multiple conditions



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Challenges

- Relevancy of medical statistics
 - Short term
 - Statistical credibility
- Keeping up with medical advances
- Availability of industry data

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