Superannuation and Investments Practice Committee

Technical Paper: Good Practice Principles for Retirement Modelling

28 February 2022

Contents

Dedication

To the memory of Glenn Langton BA FIAA ASA FIA in appreciation of his unwavering commitment to actuarial quality and collaboration.

1. Status of Technical Paper

This Technical Paper has been prepared by the Superannuation Projections and Disclosure (SPD) sub-committee and the Retirement Incomes Working Group of the Actuaries Institute.

This Technical Paper does not represent a Professional Standard or Practice Guideline of the Institute. It has been prepared for the purpose of informing Members of issues in developing tools and calculation models that assist with retirement strategy design and planning decisions. The Institute is inviting comments and feedback from members in expectation of developing this Technical Paper into a Practice Guideline within the next 3 years. Please email the Professional Practice Documents inbox: ppd@actuaries.asn.au.

The Superannuation Projections and Disclosure sub-committee presented a draft set of principles for retirement modelling at 'Insights' sessions in Melbourne and Sydney in 2016[1] and version 1.0 at an online session on 23 August 2021. Feedback from those sessions was publicised in an Actuaries Digital article[2] and has been incorporated into this version. The original paper for this work was presented by Jim Hennington and Glenn Langton at the Actuaries Summit in 2016 and can be downloaded from the Institute's website[3].

This Technical Paper does not constitute legal advice. Any interpretation or commentary within this Technical Paper regarding specific legislative or regulatory requirements reflects the expectations of the Institute but does not guarantee compliance under applicable legislation or regulations. Accordingly, Institute Members should seek clarification from the relevant regulator and/or seek legal advice in the event they are unsure or require specific guidance regarding their legal or regulatory obligations.

Members should also refer specifically to the following Professional Guidance and ASIC regulations:

- Actuaries Institute PG 499.02 – Projected Superannuation Benefit Illustrations
- ASIC RG229 – Superannuation Forecasts
- ASIC RG 255 – Providing Digital Financial Product Advice
- ASIC RG 167 Part D – AFS License Relief for Generic Financial Calculators
- ASIC Corporations (Generic Calculators) Instrument 2016/207 and Class Order 11/1227

[1] https://actuaries.asn.au/knowledge-bank/past-events/2016
[2] https://www.actuaries.digital/2021/09/08/why-we-need-to-lift-the-current-standards-of-retirement-modelling/
[3] www.actuaries.asn.au/Library/Events/FSF/2016/HenningtonLangtonRetirement.pdf

The TP does not override the requirements in these documents or in any other Professional Standards or Practice Guidelines that are relevant to this area of work.

2. Background – Retirement Modelling

Financial risk and decision-making that used to be shouldered by governments, employers and financial services providers have increasingly been transferred to individuals. This is a global trend and is referred to by The Institute and Faculty of Actuaries in the UK as The Great Risk Transfer[4].

Consumer and behavioural research shows that individuals are often not equipped to deal with the complexity of the decisions required of them. Superannuation is the second largest asset most people will ever own, and generates about half the income received by retired Australians. Deciding how to draw down from superannuation is particularly complex, especially for the over 840,000 Age Pensioners (about a quarter of those over 65) who are currently impacted by complex means tests. They can receive highly erratic cashflows because the amount of a part Age Pension varies considerably with the value of the pensioners' assets rather than the amounts they draw down. Despite this, only a minority of Australians engage with a financial planner.

The government and ASIC[5] believe technology has the potential to help bridge this advice gap. Examples of this are online calculators, projection tools used by planners and digital advice systems. While this TP focuses on the models behind these tools, the principles are relevant to the user interfaces and the documents they produce, which are the artefacts subject to regulator scrutiny.

Australia is sometimes quoted as having the most complex retirement system in the world[6]. It is vital that the technology to help solve the advice gap meets very high standards. Like in other industries (such as health, automotive and construction) the public relies on highly trained experts to design infrastructure that is safe and easy to use but takes risk and complexity into account on their behalf. Consumers need to be able to trust the expertise of the professionals who build and maintain the infrastructure that we all depend on when making retirement planning decisions.

[4] https://www.actuaries.org.uk/news-and-insights/public-affairs-and-policy/great-risk-transfer
[5] https://asic.gov.au/about-asic/news-centre/find-a-media-release/2016-releases/16-278mr-asic-releases-guidance-on-regulating-digital-advice/
[6] https://www.firstlinks.com.au/complex-super-system-world

Actuaries are applied mathematicians who specialize in financial risk management. Actuaries are naturally placed to contribute to the setting of appropriate standards for modern retirement modelling. Retirement modelling involves assumptions about the future and differences in approach can lead to significantly different outcomes. A level of standardisation across the industry can help consumers. This Technical Paper includes a set of suggested 'Good Practice Principles' for Australia's diversified retirement modelling industry. Models are of little value unless retirees can have full faith that they have been built by and audited by appropriately qualified professionals who work to the highest ethical and professional standards.

These principles were developed to encourage good practice across retirement models developed in Australia. However, it is likely that some retirement models might not be able to meet all the principles below, e.g. due to the model's purpose or limitations in design. It is suggested that in such instances, model owners should consider disclosing to their consumers the principles that have and have not been adopted, and the reasons for doing so.

3. The purpose of retirement models

Every Australian deserves a confident answer to basic questions like "How much do I need to retire?", "How much can I spend in retirement with a high level of confidence?" and "How much Age Pension can I expect to receive?" They also need to know how this will change if they contribute more/less to superannuation. However, the mathematics and assumptions to answer these basic questions with high confidence are surprisingly complex and deeply 'actuarial'.

The role of retirement models is to make sense of these decisions and to help people make informed choices. Households who aspire to a lifestyle in retirement that is higher than the Age Pension face significant uncertainty as they convert capital into retirement cashflows. To optimize a household's standard of living (and other objectives) they need to carefully consume capital over the course of their (unknown) future lifespans and through (unknown) market and inflation conditions.

Retirement models are needed by:

- **Retirees**: to make informed decisions about managing capital in retirement that takes into account the Age Pension and risk

- **Financial planning firms**: to ensure their advisers have the tools to model risk and retirement trade-offs in a prudential way that is on par with the standards used elsewhere in the financial services industry (e.g. where financial institutions manage their own risk exposures) and in other industries where consumers face risk

- **Superannuation funds**: to provide engagement / educational tools for their plan members, for product design and for member retirement estimates and advice
- **Regulators & policy makers**: for making policy decisions that affect retirees, as well as modelling the macro-economic impacts of retirement system settings and ensuring intergenerational fairness

- **Those who design products**: For example, adhering to the new Design and Distribution Obligations.

4. Principles about the Scope of a Retirement Model

The scope of retirement modelling can be broken down into four components:

- People – which people, or groups of people are the subject of the model;

- Products – a product could be anything with a financial implication e.g. a salary, a super account, the Age Pension, a home loan, an asset;

- Goals – which goals (as measured by outputs) are in play, including which constraints are solved for; and

- Risks – which risks are considered, and what explicit or implicit assumptions are being made about those risks

Each of these scope points then may have attributes reflecting the level of depth to which it is modelled. The depth of model points should be proportional to the purpose of the model (e.g. you may not need to model the nuances of fees on a super account if the model purpose is to maximize a co-contribution).

Principle 1: Retirement models should provide information and results that focus on the household's financial goals, the most important of which are their lifetime consumption needs and wants

It should be clear whether the household is a single individual or multiple individuals (e.g. a couple) and should cover the rest of their lives – both before and after retirement.

A good model requires being crystal clear about what the user is seeking to understand and/or the decisions they need to make. It should not simply produce projections but should provide relevant information relating to the user's goals in a form that is clear and easy to digest. It

should focus on the most material issues that have an impact on the financial goal(s) of the household. The ultimate financial outcomes for a retired household are the spending they can enjoy over the rest of their lives including the course of their retirement and the value of their estate on death. There may also be needs for a lump sum to repay outstanding mortgages, for instance, particularly at the time of retirement.

Some aspects of a person's lifestyle (e.g. "needs" like food and shelter) are more important to them than others (e.g. "wants" like luxury holidays and new cars). Spending on wants is likely to be reduced in the event of poor market performance. Needs may require a level of precautionary savings to absorb fluctuations in expenses and poorer investment returns.

The most important decisions and trade-offs for one household may be completely different to those of another. Retirees fall into very different segments – for example based on their wealth, family status or age group. This directly impacts the relative importance of the Age Pension in funding their lifestyle. It's also likely to impact other considerations such as downsizing or leaving a bequest.

A 'layering' of goals into needs and wants is an example of a simple framework to deal with priorities.

An alternative approach to goal layering is the application of utility functions which provide a 'scoring mechanism' to attempt to encode the objectives and preferences of a household and reflect the fact that some outcomes have a greater impact on the retiree than others. However, these can be difficult to calibrate for each individual household and can be difficult to explain to users to aid decision making.

Principle 2: Models should be able to demonstrate the variability of future outcomes to facilitate informed trade-offs

Surveys show that top concerns of people in retirement relate to the fear of outliving their savings. Poor market performance, inflation, spending too much or living longer than expected are commonly cited concerns.

Models should be able to calculate the probability of falling short of the household's expected and necessary living standards and other consumption goals(s) or bequests so that people can make informed trade-offs between risk and returns.

Using fixed assumptions based on averages is not appropriate for individuals or households. Few people will actually get the average outcomes, and they should be aware of their

idiosyncratic risk (i.e. risks specific to them as an individual)[7]. Individuals who don't invest in guaranteed products (such as life annuities) need to understand the range of outcomes they face, and the probabilities of the outcomes falling outside the range. A good model should also disclose the key implication of the range of potential outcomes to their retirement living standards and other goals.

Actuaries and quantitative investment specialists are well placed to fit distributions to random variables such as market returns, inflation and a household's (joint) lifespan. See Appendix 1 for an explanation of what an investment simulation model is and how it generates thousands of market sequences that can be used for stress testing. These techniques enable results to be presented with corresponding probabilities or confidence levels that are imperative for retirement decision making.

It is likely that users will value a smooth consumption path, but sophisticated models are likely to assume that consumption will be adapted depending on investment and emerging health experience. The outputs should illustrate the effect of investment and mortality variability on year-to-year consumption. Strategies that allow for the possibility of exhausting the household's assets (such as determining level ABP drawdowns for the life expectancy plus a margin) should suggest trigger points when it would be advisable to reconsider drawdowns in order to prevent such exhaustion.

Principle 3: Models should be able to project all significant assets, liabilities and incomes at the household level

Unless the scope of a model is deliberately narrowed, it is normal to consider retirement modelling at the household level. This may be an individual, a couple or a family, but also includes the financial drivers affecting the household's retirement.

Such drivers include all superannuation accounts, paid employments, retirement income streams, investment assets, other assets, loans, debts, bequests, life interests, taxes, obligations and social security entitlements. Many of these 'products' will generate cash flows (positive or negative) that impact retirement savings and income. Some of these items are interdependent, particularly regarding social security.

As at March 2021, 2.6 million people (62% of the population aged 65 and over) received income from the Age Pension. 38% of those in the age range 65 to 69 received an Age Pension,

[7] A stochastic approach to retirement income planning, John De Ravin, 2014

rising to 82% of those between 80 and 84. 32% of all Age Pensioners received a part Age Pension, a number that has fallen from 41% in 2015.[8] The time dimensions can be explained:

- Younger age cohorts have a greater proportion of their working careers with the Superannuation Guarantee in operation

- As individuals get older and consume their savings, they are more likely to receive an Age Pension later on in life, although interestingly the proportion of retirees on an Age Pension declines over the age of 85 possibly as a result of the longevity of higher income groups.

Because of the materiality of the Age Pension for most Australian retirees, retirement models need to take into account all material factors that the Age Pension means tests consider. This includes:

Both spouses, and their ages All superannuation and non-superannuation savings All income streams including annuities, defined benefit pensions or overseas social security income	Home ownership status Any (part time) employment earnings The fact that on first death of a couple the rates, bands and thresholds change to those of a single household

Table 1: Retirement models should project all material factors that impact the Age Pension means tests

Models that track all relevant products at the household level over time will provide more reliable outcomes than those that make high level assumptions about them. However, a careful assessment of materiality needs to be made as some products will have little impact on retirement outcomes.

Principle 4: Models should consider all issues that will have a material impact on future outcomes so that informed decisions can be made

Often there is no 'right' answer and each retiree needs to make informed trade-offs around

[8] https://www.aihw.gov.au/reports/australias-welfare/income-support-payments-for-older-people

spending today versus certainty about their financial situation in the longer term.

Models should consider the drivers of retirement outcomes detailed in Table 2 below and have the retiree's objectives at heart. They should focus on the most relevant decisions different retirees need to make and to help the retiree to determine what their retirement could look like under different sets of decisions.

There are nine major drivers of a household's financial outcome in retirement, as follows:

Within the retiree's control	Retiree has some influence	Outside the retiree's control
Investment choice and product choice	Timing of retirement	Market performance
Spending level and 'shape'	Undertaking part time work in retirement	Inflation
Accepting a different level of risk	Health and lifespan	Tax and social security rules

Table 2: Drivers of outcomes in retirement

There needs to be a distinction between:

a) what the user needs visibility and control over;

b) what the retiree needs visibility of but can just trust meets professional standards; and

c) detail that retirees may not need to see at all but just assume meets professional standards.

Just like products from other industries (automotive, aviation, computing), most customers don't want exposure to the internal workings and complexities where engineers have needed to make complex judgement calls. They want to see enough detail to make the decisions they have to, but beyond that leave the detail to the experts and be confident that those experts are working to high industry standards.

For example, for a consumer facing tool:

Retirees should see, and be able to change	Retirees should see and trust	Retirees should trust, and only see if interested
• Their retirement age • Their consumption goals	• The range of outcomes they could experience	• Tax & legislative rules modelled including Age

both now and throughout retirement (profiles of spending) ● Their assumed investment risk profile and portfolio choice ● Their household assumptions including single or couple, homeowner or not, other asset and income amounts outside superannuation	with clear description of (a) the top of range probability and (b) the bottom of range probability ● The likelihood of achieving certain outcomes ● Fee assumptions ● How inflation has been accounted for	Pension modelling ● Asset and demographic model assumptions

Table 3: What Retirees are likely to need to see, change or just trust

Where a retirement model is

a) used by a financial adviser to assist their client, or

b) reviewed by an actuarial, investment or other adviser, or

c) studied by any non-professional adviser (e.g. a friend or colleague of the client), or

d) considered by a regulator,

the adviser or regulator needs to be able to carry out due diligence into the assumptions and methodologies used. They may be more likely to need to see and adjust more of the key assumptions. For retirees, there might be reasonable restrictions on the parameters. For instance, real investment returns should probably not exceed 7% p.a net after taxes and expenses.

ASIC may require users to be able to adjust more assumptions than most customers are likely to want to in practice[9]. These requirements can be accommodated via appropriate user interface design so that interested users can do so but without overwhelming other users.

Principle 5: Retirement models for households who are still working should take into account a household's ability to change its circumstances over time

A retirement model should project the movement and interaction of a household's retirement assets and liabilities throughout a person's entire future lifetime. This might include both pre-

[9] See for instance ASIC Instrument 2017/206

retirement (accumulation) and post-retirement (decumulation).

In addition to projecting all significant assets, liabilities and incomes at retirement (per principle 3), a model should also be able to illustrate[10] how a household's total income at retirement may change if certain pre-retirement factors are varied, such as:

- Saving more/less in retirement assets (possibly not limited to superannuation)
- Altering investment mixes and product types across existing assets
- Fees and expenses underlying assets that are currently invested
- Retiring at different ages
- Taking career breaks or plans to work part-time for a period in retirement

Such factors may have a material impact on a household's income at retirement. It is important that households are aware of the actions they are able to take prior to retirement to adequately shape their retirement lifestyle expectations, including the resultant impact on their projected Age Pension income.

5. Calculation Principles

Principle 6: Models should be able to provide year-by-year projections of expenditure and assets and be able to allow for changes in personal circumstances and expenditure levels in any future year to allow for dynamic behaviours

It is vital to identify and then model all drivers that materially impact future outcomes and could therefore impact the retiree's decisions. But there is little point to modelling detail that doesn't impact the retiree's outcome.

As spending patterns are likely to change over the course of retirement (e.g. active phase, passive phase then frail phase) and can include large one-off expenditures and/or inflows (like receiving an inheritance) models should carry out year-by-year projections. These cashflow patterns are likely to impact on the Centrelink means tests and therefore have a knock-on impact on the household's income from the Age Pension.

Likewise, the retiree's chosen asset mix and product mix (e.g. lifetime income products) have

[10] Actuaries Institute Submission to the Retirement Incomes Review. https://treasury.gov.au/sites/default/files/2020-02/actuariesinstitute040220.pdf

a major impact on the range of outcomes they face in retirement. Retirees are naturally going to want to explore the impact of changing their investment mix to understand the impact this would have on the likelihood of achieving their desired outcomes.

Future cash flows need to be adjusted for inflation. It is common to base this on estimates of wage inflation before retirement and price inflation subsequently. Illustrations should make clear what assumptions are being used.

Principle 7: Except where required by legislation, economic and investment assumptions should be set on a central estimate basis. Variability around the central estimate should be accompanied by disclosure on confidence levels

Central estimate is an estimate that represents an expected value over the range of reasonably possible outcomes. It is often referred as "expected value", "mean" or "average". Please note that central estimate may be calculated on geometric or arithmetic basis depending on how it is to be used.

Examples of these are:

- Assumptions for future market conditions including:
    - Average returns and other statistical properties for each asset class (standard deviation, skewness, cross-correlations, auto-correlation);
    - Whether and if so, how or what, kurtosis or regime-switching, has been allowed for; and
    - Interest rates and inflation and their statistical properties;
        - Fees and Costs: including investment management fees, percentage-based administration fees and fixed fees. Where the projection is in respect of a specific product, the fee assumption should reflect the current charging basis (including any indexation or other increases) for the product;
        - Taxes on investment returns should be included at the current legislated rates; and
        - Assumed changes to legislated bands, thresholds and payment rates for the Age Pension.

Principle 8: Models should consider the range of uncertainty for an individual's/household's (joint) lifespan and include a realistic allowance for future mortality improvements

The prevalent superannuation product for retirement in Australia is the account-based pension - where all risks are passed through to the retiree. For households whose spending isn't fully covered by the Age Pension this product requires 'self-annuitisation' – where each individual attempts to convert capital to retirement income over an uncertain timeframe.

A difficulty is that each individual doesn't know how long their own lifespan will be (their idiosyncratic longevity risk) and therefore doesn't know how much they can safely draw from their account-based pension. For couples it becomes a joint-life question given that cashflow is needed for as long as either one of them is alive.

It is inappropriate to use average life expectancy for this modelling. A predictable number of retirees will live to age 90, 95, 100 etc. Actuaries can project how many people in a group will live to each age, but we can't tell each user whether it will be them! Each household therefore needs to plan using a timeframe that gives them a confidence level that they are comfortable with, which is unlikely to be just a 50/50 chance of outliving their planning horizon.

Models need to allow for the probability that some individuals will live to each age in the Life Tables and that for couples 'first death' is also random variable that impacts outcomes such as the household's level of Age Pension. Lifespan estimates should include an assumption for future mortality improvements (systematic longevity risk) such as those published by the Australian Government Actuary

Models should be able to allow for scenarios where the household invests in lifetime income streams (e.g. life annuities) to manage the risk and return trade-off for reducing longevity risk.

Ideally, they should also take into account the individual's health/demographic factors that impact personal mortality rates over time. For example, smokers have shorter life expectancies but wealthier, white-collar workers who own their home are known to have life expectancies much higher than population averages. ABS statistics show a dramatic difference in life expectancies between the various Statistical Area Level 4 regions in Australia.

Principle 9: Models should be able to facilitate annual reviews to take into account the household's actual experience

Markets rarely deliver anticipated returns, and people's health and circumstances change.

It is therefore important to consider what retirees might do when experience is better/worse than what they have anticipated. As per Table 2, a retired household's options for improving their financial situation are limited. The strongest 'lever' is likely to be to reduce their spending level, but it may be possible to work a little more.

An annual review provides the structure to consider changed circumstance and make appropriate changes.

An example of how a financial model can be used to conduct an annual review in the retirement phase is included in Appendix 2.

Principle 10: Models should come with an easy, standardised summary of what has/hasn't been modelled and certain key assumptions

It should be quick and easy for a user to see and compare the depth and quality of different retirement calculators. However, retirement calculators are inherently complex, and the presentation of this information should have regard to the audience. A suggested approach is to focus on the most important assumptions - with particular care to highlight important elements that have not been considered.

Standardised disclosure of the following "key items" would be desirable:

Item	Disclosure	Comment	Example wording
1. Deflator	Wage- or price-based, or zero if in future dollars	This is critical for the interpretation of the results, and comparisons between models	This calculator shows results adjusted for inflation, allowing for both price increases and improvements in living standards, or Future retirement income amounts have been adjusted for price inflation only, i.e. they don't allow for improvements in living standards

2. Retirement income sources	Total income or income from super only	If it's not a total income being modelled, it's not comparable with a total income benchmark like ASFA Comfortable or a replacement rate	This calculator includes both your super and an allowance for the Age Pension in your retirement income This projection deals with income from your super which is only one aspect of retirement income for most Australians. You should also consider income from the Age Pension and other assets you have.
3. Retirement income strategy	How retirement income is determined initially and each year	We need to explain whether retirement income is based on a replacement rate, an income standard, or a solved amount, and the way it is assumed to move from year to year	We have assumed you draw 6% of your super balance each year We have solved for a total retirement income that will last for 25 years from retirement, indexed with wage inflation. There is a x% probability that either you or your spouse live beyond this point. You should consider developing a strategy for if you or your spouse survive beyond this period. We have assumed you move your superannuation into an inflation-linked life annuity at retirement.
4a. Default net investment return (I.e. net of all investment fees and tax)	Both accumulation and retirement phase returns, and the basis for setting the return (e.g. inflation plus objective, asset allocations and returns)	The assumed investment return should be a central estimate* and should be consistent with the inflation rate assumed *Different funds may have different ways in determining their estimate of investment return. Some may use the	The default investment return for pre-retirement is based on a Balanced fund: using 7% p.a. net of super tax and investment fees. The default investment return for post-retirement is based on a Moderate Growth fund: using 6% p.a. net of investment fees.

		same figures as their CPI plus investment objectives stated in their PDS but most often these are set based on say a 2/3 probability rather than a central estimate that is closer to 50%. The basis of the setting of the default investment return needs to be disclosed clearly.	Expected average price inflation: 2% p.a. The returns quoted above are gross of any asset-based administration fees.
4b. Stochastic investment returns	The investment simulation model used, the basis for the simulations and key metrics e. g. means and risk metrics for the main asset classes.	Needs to be appropriate for the purpose of the model being used. Sometimes historical illustrations may be more appropriate than stochastic simulations.	The model uses 5,000 inflation and market simulations obtained from XYZ company. The simulations are calibrated to illustrate the range of future outcomes a retiree may experience. Fees and taxes are applied separately
5. Legislative environment (including limitations)	The rates, thresholds, caps applying noting any measures not allowed for	This could be "Legislation applying for the 202x financial year". But things like the phased increase in SG needs to be disclosed even if not applying in the current financial year	This calculator applies the legislative environment as at 1 July 2019, but does not allow for the temporary reduction in minimum drawdown requirements This calculator has been created to model proposals outlined in the Federal Budget which have not yet been legislated
6. Age Pension basis	Single/couple rate, age/super balance of partner, homeowner status,	Based on current legislation, indexation of the base Age Pension should be	The calculator applies the current Age Pension payment rates for a single person, and the means tests assuming you will be a homeowner at retirement

Where relevant an additional illustration of alternative retirement outcomes to demonstrate other non-legislated Age Pension or threshold increase bases, might be provided.	other assets	linked to the greater of inflation or wages and there is no indexation of supplements. Likewise, indexation of means test thresholds should be based on price inflation.	with $50,000 in other assets This projection assumes you are partnered at retirement, your partner has the same amount of super and you are homeowners with no other assets
7. Administration fees and costs and insurance premiums	The amount assumed for both asset-based and dollar fees and insurance premiums		The calculator assumes an asset-based administration fee of 0.25% p.a. and a member fee of $2.50 per week The projection allows for an asset-based administration fee of 0.5% p.a., capped at $400 p.a., and total dollar fees and insurance premiums of $600 p.a.
8. Indexation of contributions and deductions	Wage- or price-based, or zero		Voluntary contributions are assumed to increase with wage inflation. Insurance premiums and member fees are indexed with wage inflation.

Other disclosure might include:

Features that the model handles:

- Spouse
- Age Pension and means testing
- Non-super savings and additional superannuation accounts
- Other lifetime income streams (e.g. annuities, DB pensions, overseas pensions)

- Part time employment income
- Spending shapes and other goals
- Ability to downsize the home or release equity

Complexities taken into account:

- Market risk
- Longevity risk
- Personalised mortality assumptions
- Joint-life longevity
- Whether it takes into account current market conditions

Other quality control information:

- Who stands behind the model
- When the assumptions and rules were last updated
- A note about status when key legislation changes (i.e. whether new rules have been taken into account)

ASIC currently provides relief whereby a generic financial calculator does not need to be delivered under an AFS License subject to a number of requirements. One of these is to include a clear and prominent explanation of the impact of any significant limitations of the calculator. It also requires a clear and prominent statement of the assumptions and why the provider considers the default assumptions to be reasonable.

ASIC RG229 requires the following to be provided: "Don't make changes to your retirement savings arrangements based on this estimate. Before you make changes, you should get further information or advice." If there are some qualms about suggesting that people obtain financial advice, they might preface this requirement by: "ASIC requires providers to make the following statement."

Principle 11: Models should be built to be easily updated as required to consider changes to assumptions and legislation

There are a range of rules and assumptions that retirement models take into account and which are subject to change over time so need to be maintained. This includes superannuation caps and thresholds, market expectations, inflator/deflator, mortality tables, improvement factors, age pension rules and other key legislation.

Best practice models would store all these parameters in a single repository that is straightforward to update and easy to access for verification purposes.

6. Other references

Consultations & policy:

- Financial Services Inquiry
- Government's Proposed Retirement Income Covenant
- Treasury's Retirement Income Disclosure Consultation
- Retirement Incomes Review
- APRA Member Outcomes Review
- ASIC CP351 and draft Regulatory Guide: Superannuation forecasts: Calculators and retirement estimates

Other:

- Best Interest Duty
- FASEA Code for Financial Advisers
- Design and Distribution Obligations for financial product providers.

End of Technical Paper

Appendix 1: Investment Simulation Models (ISMs)

An Investment Simulation Model (ISM) (also known as an Economic Scenario Generator (ESG)) is a software tool that generates a collection of simulated economic scenarios that represent a full distribution of possible economic futures. ISMs are commonly used by large financial organisations to support risk management, reserving and pricing activities. The theory and science behind ISMs has evolved considerably as computer power has increased and the field of Quantitative Analysis has developed.

The collection of simulated scenarios from an ISM can be used to 'stress test' a financial entity through a plausible range of future market outcomes. Provided the probability distributions used within the ISM are appropriate, we can use the collection of scenarios to map out the range of outcomes a given financial entity faces based on its own exposures to the various risks. For example, to satisfy Europe's Solvency II legislation insurers must demonstrate that they can withstand a '1 in 200-year market event.

When simulations from an ISM are used in a financial model this is often referred to as a stochastic model (compared to those that use only fixed return assumptions).

Improvements in the methodologies used to model risk make it possible for households to quantify issues to a deeper level than was common practice even a decade ago. Sophisticated stress testing tools can be applied to retirement modelling for individual households. This can help retirees align their financial planning decisions (e.g. spending levels) with the level of confidence that suits their risk preferences. Some retirees might want a very conservative approach and if account-based assets were used, require a large buffer of savings relative to spending level. Alternatively, they might choose a guaranteed life annuity where the company issuing the annuity held capital (which would be smaller because of diversification benefits). These strategies would result in a cautious lifestyle that was, on average, below what they might otherwise enjoy. Whereas other retirees may be willing to accept that if a 1 in 20-year market event were to occur then their retirement lifestyle could end and they'd live solely on the Age Pension. This decision may let them enjoy a better lifestyle providing they remain in a lucky cohort who do not experience that 1 in 20-year event. Suitable explanations about the implications of risk decisions are required.

ISM software lets the modeler simulate a full range of factors driving market risk. A good ISM is a coherent, integrated Monte Carlo generator that produces realistic scenarios. If not arbitrage-free, the modeler needs to be able to explain why[11]. The scenarios include a variety

[11] For evidence that regulations and shortage of capital can leave significant apparent arbitrage opportunities see Du, W., Tepper, A., & Verdelhan, A. (2018). Deviations from covered interest rate parity. The Journal of Finance, 73(3), 915-957.

of metrics including interest rates, credit spreads, equities, property and exchange rates, each with a carefully chosen and calibrated probability distribution. The model needs to consider:

- Means for each asset class (often time varying), taking into account starting market conditions;
- Standard deviations that may also be time varying
- Correlations (including both cross correlation and auto correlation); and
- Tail distributions.

The ISM is likely to incorporate an analysis of theory, history and current market conditions as well as having an element of subjective judgement when setting expectations for the future. It needs to be able to produce some extreme but plausible results and generate scenarios that embed realistic market dynamics. Often large teams work on maintaining an institutional ISM and will work with an investment committee to review and update approved assumptions as market conditions and expectations evolve.

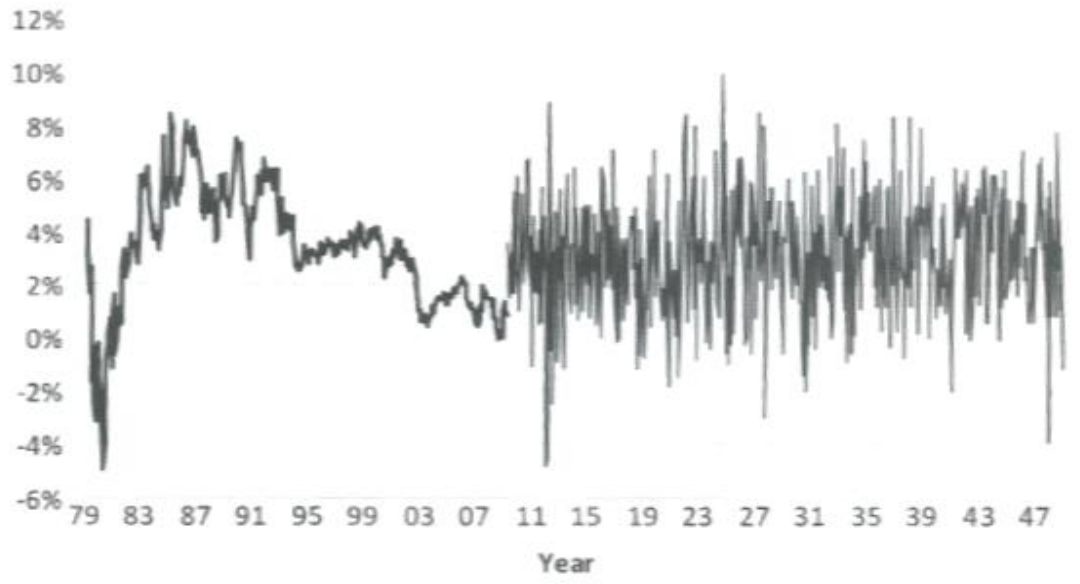
Often the models are built up from a primary metric such as global inflation. Inflation in any year is typically assumed to be a function of (a) inflation in the previous year, (b) an assumed long-term rate of inflation and (c) a random element consistent with the distribution assumed. Local inflation is likely to have linkages to both global and past local inflation plus a random element.

Bond yields might assume a process with linkages to global inflation and previous years' yields both globally and locally. A yield curve is typically constructed from short and long rates meaning that bonds of different maturities can be modelled concurrently.

Equities might reflect a Capital Asset Pricing Model (CAPM) structure with distributions that capture an assumed shape for the tails. Assumptions for skewness and kurtosis should be consistent with what is seen in actual equity markets. Exchange rates typically incorporate a Purchasing Power Parity approach and each future year would normally depend on the previous year.

For each of these variables, models should produce results that credibly reproduce the tails. short-term momentum and mean reversion observable in investment markets. Graphs provide a good way to compare. The graph below is taken from Andrew Smith's chapter in the Actuarial Control Cycle textbook *Understanding Actuarial Management*. Illustrations of extremely poor outcomes should be compared with the investment and inflationary experience of the 1930s and 1970s.

Figure 9.4 Simulated path using independent normal variables



Availability and consistency of ISMs

Developing ISMs is a specialist field. Actuaries are well placed to accurately use ISMs within good retirement models. Actuaries can also help to interpret and explain outcomes from stochastic retirement models (such as defining 'high' confidence as results that occur with at least an X% probability).

Whilst the cost of building an ISM can be high, there are a number of specialist firms who provide services in this area as well as a number of ISM models used in academia. For a list of known providers, please contact the Actuaries Institute.

ISMs are often used overseas, including the USA and Europe. An issue that can arise is that it isn't easy to compare two ISMs or to check the consistency between models. This results in a risk that the choice of ISM could mean different conclusions are reached when comparing one retirement strategy against another. As an industry, such differences should be avoided if possible. Whilst the documentation on the underlying method and assumptions used in an ISM can be reviewed, in practice it will be hard to determine if the data is reasonable, especially at the tails - where appropriate calibration can be difficult due to scarcity of data.

A potential industry approach to overcome this consistency problem is to develop a calibration test for which all ISMs should generate the same results, within a statistically tolerable margin of error. This approach has been used successfully in the field of solvency and capital requirements globally, where the insurance or banking regulator allows a financial

entity to use their own internal models to set capital requirements with the requirements that certain statistical calibration points be met.

The importance of ensuring that ISM assumptions are appropriate was touched on by the Australian Government Actuary (AGA) and Treasury as part of the 2019 Retirement Income Disclosure Consultation which included the AGA's proposed Retirement Income Risk Measure [12].

Page 10 of Treasury's Consultation Paper said:

"Income variation risk measure consultation

If the proposed method of calculating risk is adopted, further consultation would occur on the model to be used and associated assumptions on various asset classes, their returns, correlations and volatility; including collaboration with the AGA, industry and investment model practitioners."

Models utilising data from ISMs also need to be updated regularly as the economic environment changes. The cost to obtain data sets each time can be upward of ten thousand dollars. In other industries (food, health, aviation, automotive) the cost of ensuring safety of customers when building infrastructure is regularly at these type levels. Retirement models impact millions of Australians. The benefits of taking risk into account more than justify these relatively small costs.

[12] https://treasury.gov.au/consultation/c2018-t347107 See page 18 of the AGA paper and page 10 of Treasury's paper.

Appendix 2: Annual Reviews to take into account Actual Experience

An example of how a retirement model may be used to facilitate annual reviews that take into account the household's actual experience:

First year:

1. Obtain current values of all financial resources

2. Identify the household's goals (e.g. essential lifestyle pattern) throughout their future retirement

3. Use the model to confirm that there is a very high probability this essential lifestyle can be achieved for life, in light of the full range of possible future outcomes

4. If not,

    a. enable the user to consider alternative products and/or strategies with the aim to achieve the original goal

    b. adjust their expectations (which may involve downsizing the home and/or reducing what is categorised as essential)

5. If so,

    a. then use the model to explore what level of discretionary expenditure the retiree can reasonably aim for in addition:

    b. Start by assessing their total desired expenditure patterns throughout retirement

    c. Adjust this expenditure so that the chosen pattern can be achieved using 'central estimate' assumptions.

Future years:

1. Check the actual experience the retiree has seen over the past year, including:

    a. Investment returns

    b. Inflation

    c. Actual asset mix

d. Actual spending levels

e. Changes to legislative rules (including the Age Pension level and thresholds)

f. Changes to family situation

g. Changes in health status

h. Changes in needs including what's considered essential going forward

Note: a to d would have likely been reflected in the updated asset level for the new year already.

Revisit and update the assumptions including all of the items in (1) above as well as assumed future mortality rates and legislative rules.

Repeat the above 'first year' process.

Appendix 3: Examples of innovation to explain retirement results to consumers

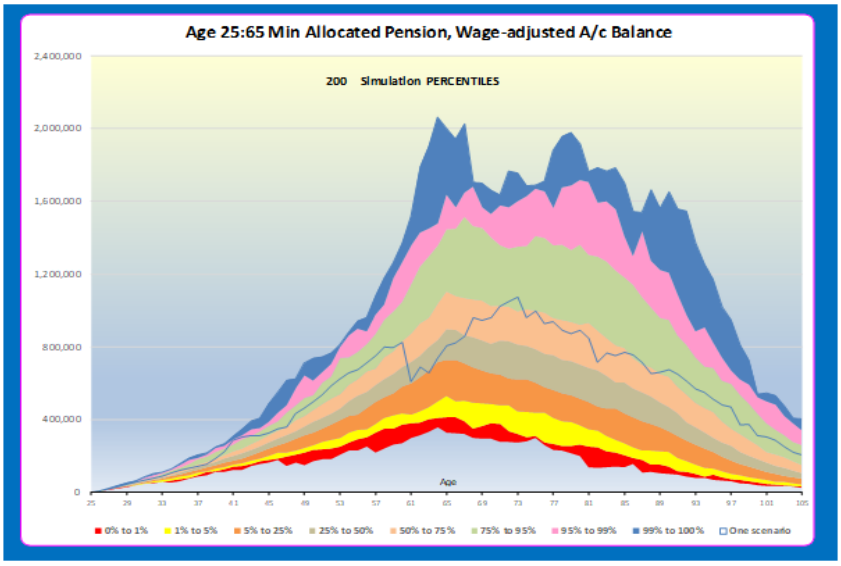
This appendix shows examples of emerging innovation in the area of communicating retirement outcomes and the impact that key household decisions have. The examples come from a range of different providers.

The examples are only 'taster' screen shots and are shown for information only. They may not meet all of the Principles in this Technical Paper. They have been included for the purpose of showcasing the growing range of possibilities for user-interface design in this area. Before drawing any conclusion about the strengths and weaknesses of any example, please note that we have only included a screenshot that comes from a broader user-journey which is likely to include more education and explanation about what the results mean, how to interpret them and disclaimers about any limitations.

For further information about any of the examples, please contact the provider of that particular calculator.

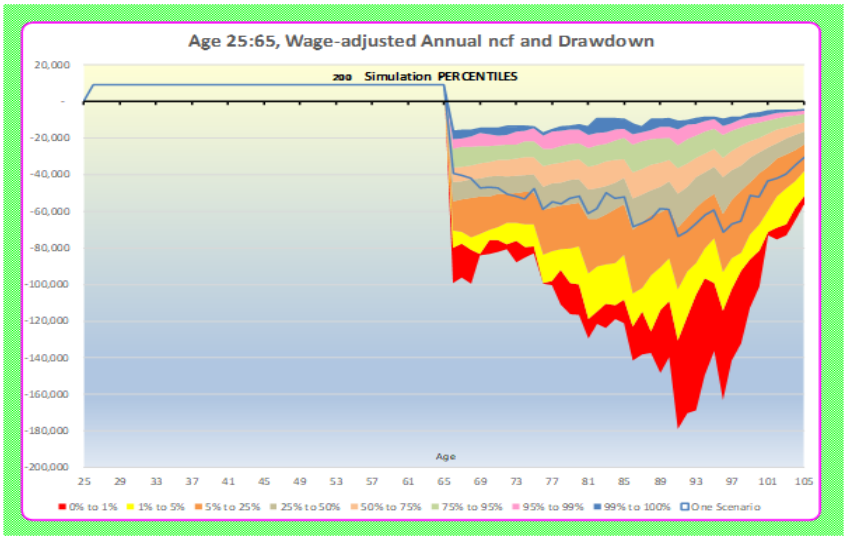
Example 1

Range of projected balance over the lifetime (to and through retirement) and one selected scenario, based on *Austmod*[13] simulation outcomes.

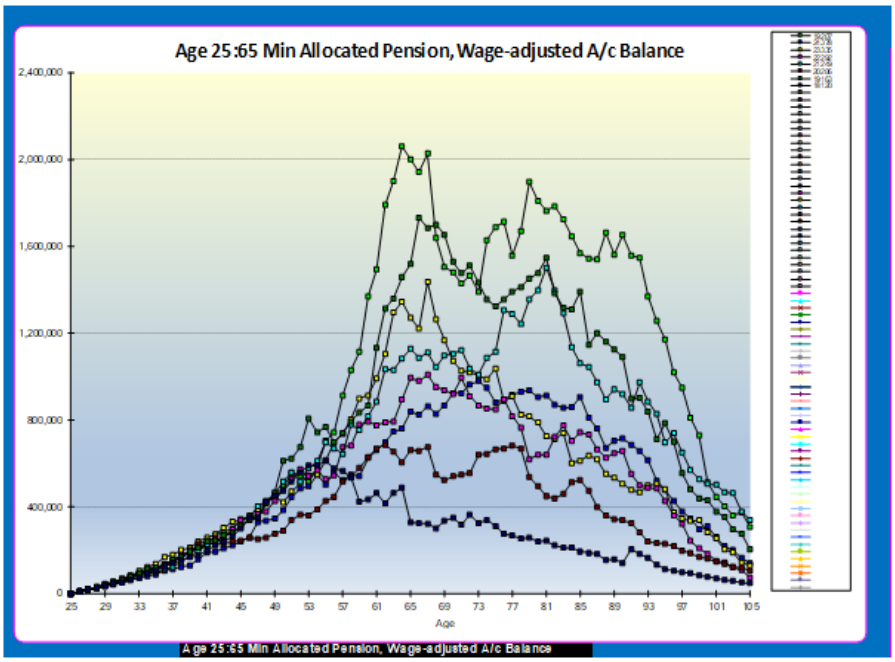


[13] All *Austmod* scenarios are from Colin Grenfell's *Austmod* stochastic and historical investment simulation model. The projections illustrated assume the minimum is drawn from an account-based pension.

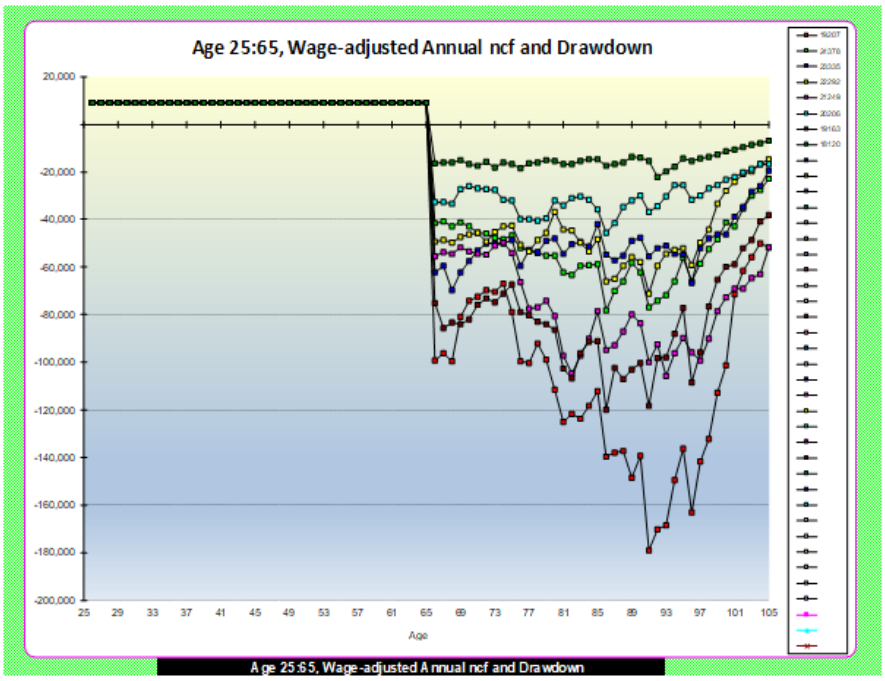
Range of projected net cashflow from superannuation through retirement and one selected scenario, based on *Austmod* simulation outcomes.



Range of projected balance over the lifetime (to and through retirement) based on eight selected *Austmod* scenarios.



Range of projected income through retirement based on eight selected *Austmod* scenarios.



Further information about *Austmod* and the assumptions used is in *"Australian Investment Performance 1959 to 2021 (and Investment Assumptions for Stochastic Models)"*

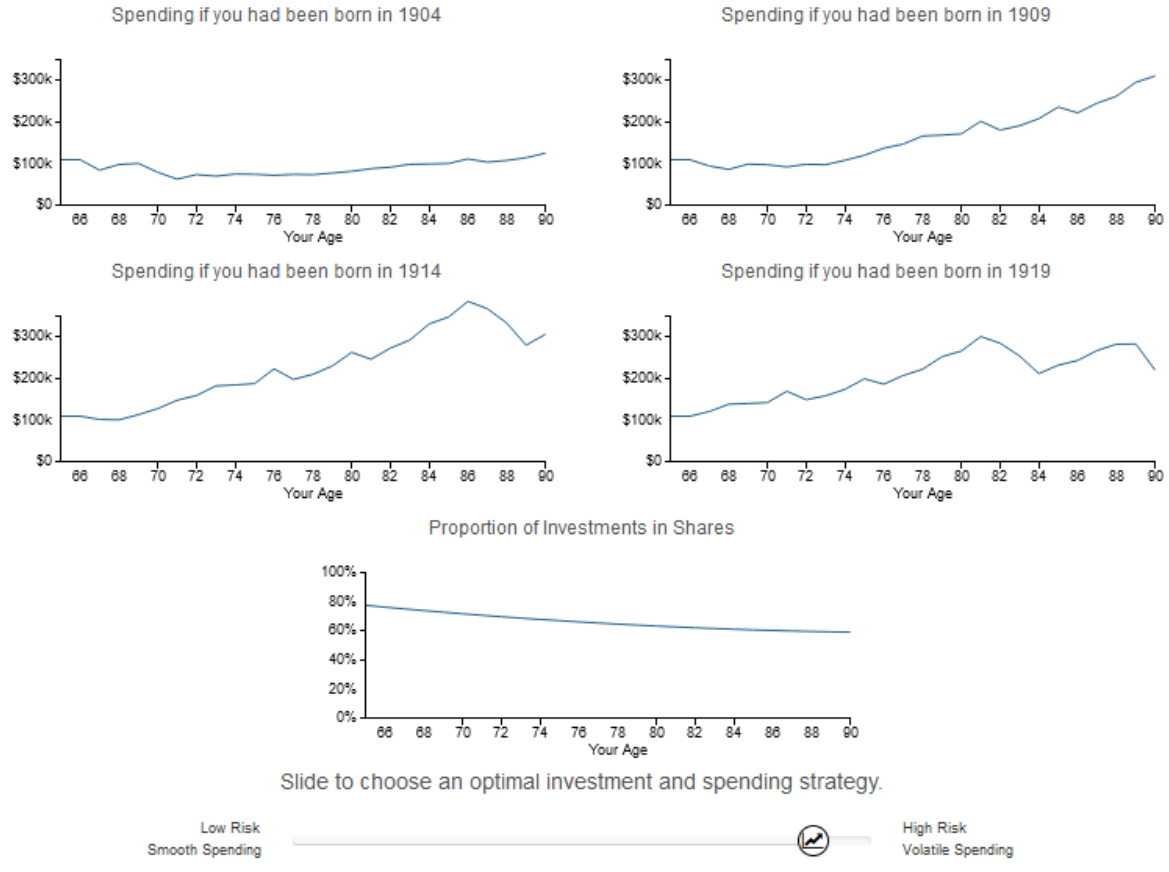
Example 2

Using historical scenarios

There are four scenarios on each page. Move the slider to get a level of spending and volatility across the scenarios that most satisfies you.

The scenarios are based on actual investment returns, after allowing for inflation. They go back over a century so that we can illustrate what you would have spent if you lived to 95. The last graph shows returns as if you were born in 1919 and died in 2014. The other scenarios show what would have happened 5, 10 and 15 years earlier. Future investment returns will be different to the past, but the past gives us the best illustrations of the volatility of returns that we have, and therefore gives the best indication of possible changes to spending.

The approach to investments on this page involves choosing a level of risk that changes the relative mix between shares and interest bearing investments. The bottom graph shows the proportion in shares, with the rest being in interest bearing investments. In the middle range of risk, the proportion in shares reduces as you get older and are less able to bear risks.



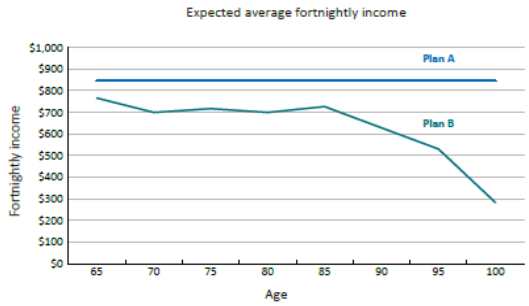
Example 3

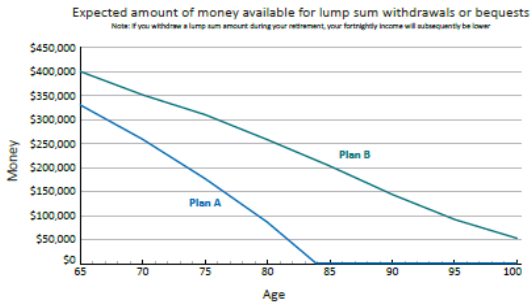
Range of projected retirement outcomes. Two examples from the government's BETA team research which tested a range of approaches on 3,600 pre-retirement members from five industry and retail superannuation funds [14]

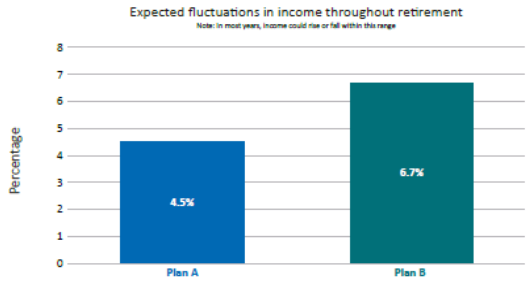
	Plan A	Plan B
Amount of income	This plan provides a **medium-to-high** amount of income Expected average fortnightly income is: **$843**	This plan provides a **low** amount of income Expected average fortnightly income is: **$667**
Protection from running out of income	This plan provides you with **high** protection from running out of income	This plan provides you with **high** protection from running out of income
Amount of money available for lump sum withdrawals or bequests Note: If you withdraw a lump sum amount during your retirement, your fortnightly income will subsequently be lower	This plan provides a **low** amount of money for lump sum withdrawals or bequests Expected average amount of money available is: **$41,000**	This plan provides a **high** amount of money for lump sum withdrawals or bequests Expected average amount of reserve money available is: **$173,000**
Protection from fluctuations in income	This plan provides **low-to-medium** protection from income fluctuations due to changes in investment returns (positive or negative) In most years, income could rise or fall by: **4.5%**	This plan provides **low** protection from income fluctuations due to changes in investment returns (positive or negative) In most years, income could rise or fall by: **6.7%**

	Plan A	Plan B
Amount of income	This plan provides a **medium-to-high** amount of income Expected average fortnightly income is: **$843**	This plan provides a **low** amount of income Expected average fortnightly income is: **$667**
Protection from running out of income	This plan provides you with **high** protection from running out of income	This plan provides you with **high** protection from running out of income
Amount of money available for lump sum withdrawals or bequests Note: If you withdraw a lump sum amount during your retirement, your fortnightly income will subsequently be lower	This plan provides a **low** amount of money for lump sum withdrawals or bequests Expected average amount of money available is: **$41,000**	This plan provides a **high** amount of money for lump sum withdrawals or bequests Expected average amount of reserve money available is: **$173,000**
Protection from fluctuations in income	This plan provides **low-to-medium** protection from income fluctuations due to changes in investment returns (positive or negative) In most years, income could rise or fall by: **4.5%**	This plan provides **low** protection from income fluctuations due to changes in investment returns (positive or negative) In most years, income could rise or fall by: **6.7%**

FIGURE 8: GRAPHS



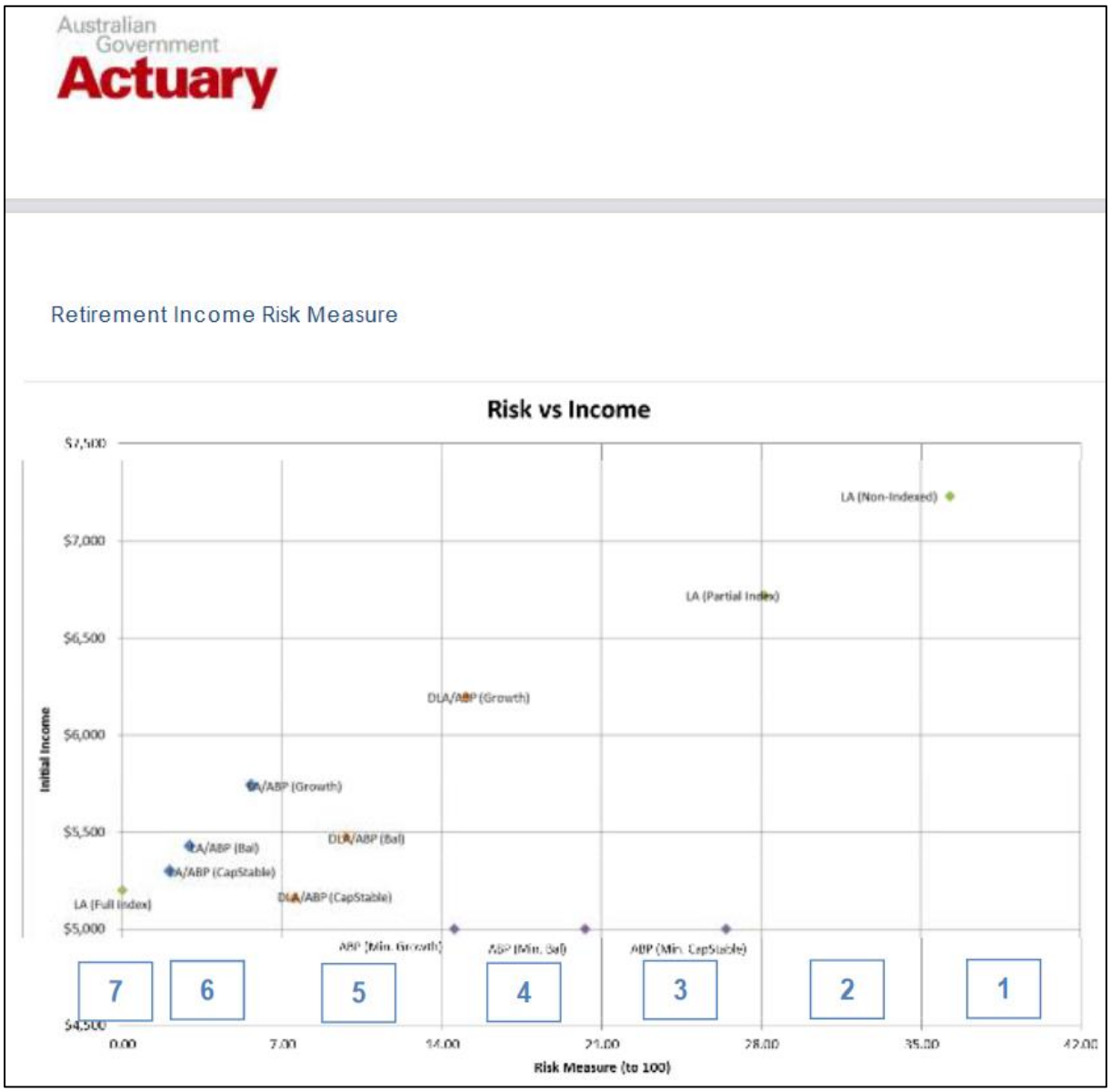




[14] This was the 'winning' approach for presenting key information to consumers as identified by the Behavioural Economics Team of the Australian Government in the paper "Supporting retirees in retirement income planning" Oct 2017. https://behaviouraleconomics.pmc.gov.au/sites/default/files/projects/supporting-retirees-in-retirement-income-planning.pdf

Example 4

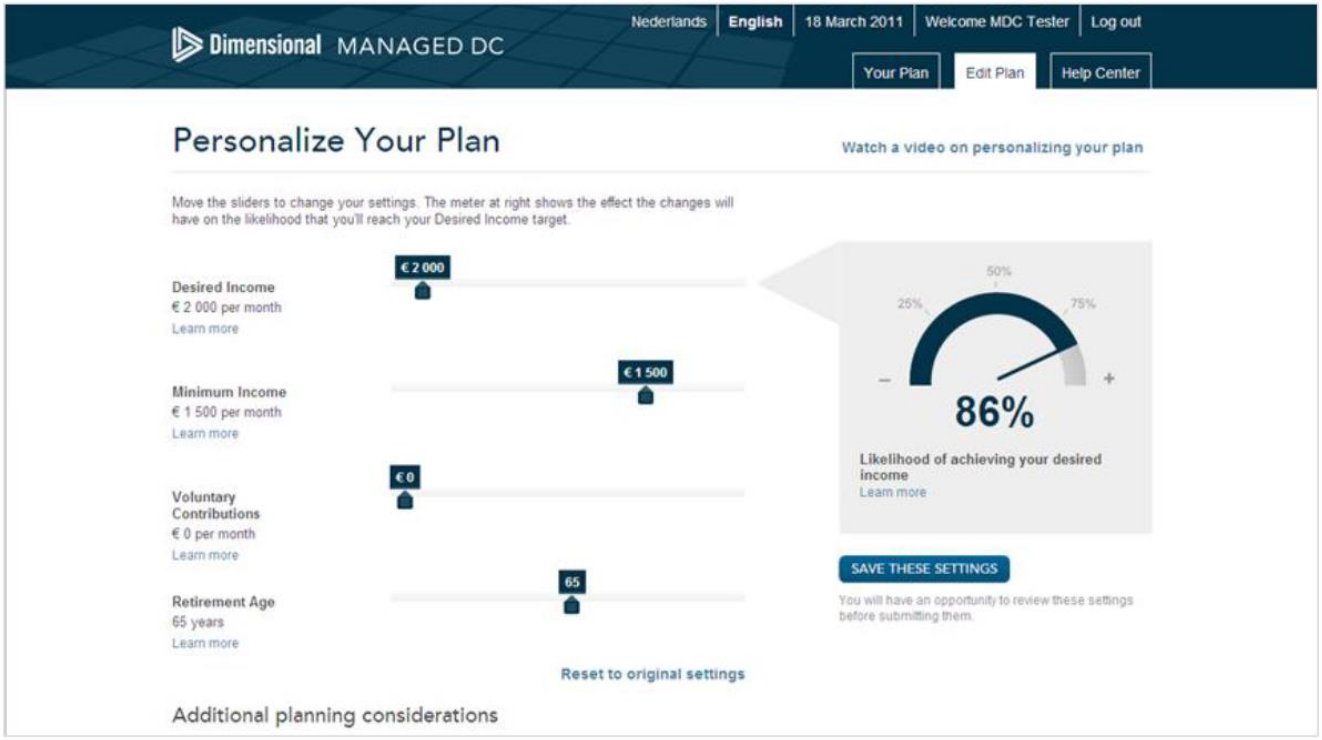
Comparing retirement product projections using risk metric proposed by the Australian Government Actuary[15]



[15] Risk metric proposed by the Australian Government Actuary as part of Treasury's Retirement Income Disclosure Consultation. "Retirement Income Metric" December 2018 https://treasury.gov.au/sites/default/files/2019-03/Retirement-Income-Risk-Measure-FINAL-Consultation-1.pdf p18

Example 5

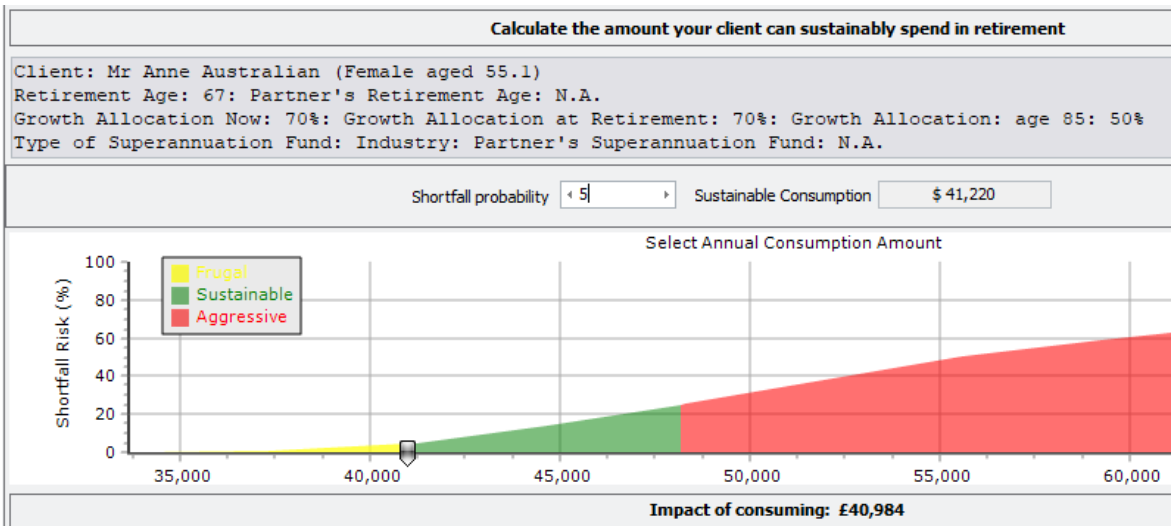
Testing projected outcomes using likelihood of achieving goals [16]

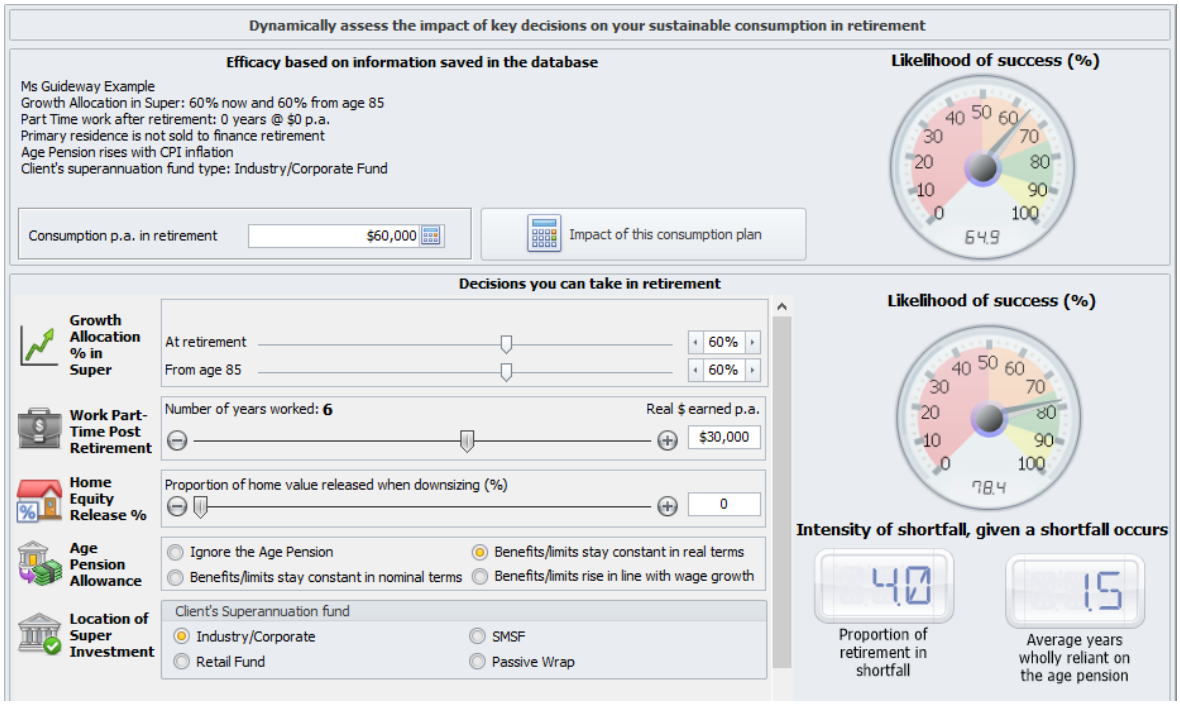


[16] "Dimensional Managed DC – A Next-Generation Retirement Solution" - presentation at the UK Pensions, benefits and social security colloquium 2011. https://www.actuaries.org.uk/system/files/documents/pdf/b02-dimensional-managed-dc.pdf (slide 12)

Example 6

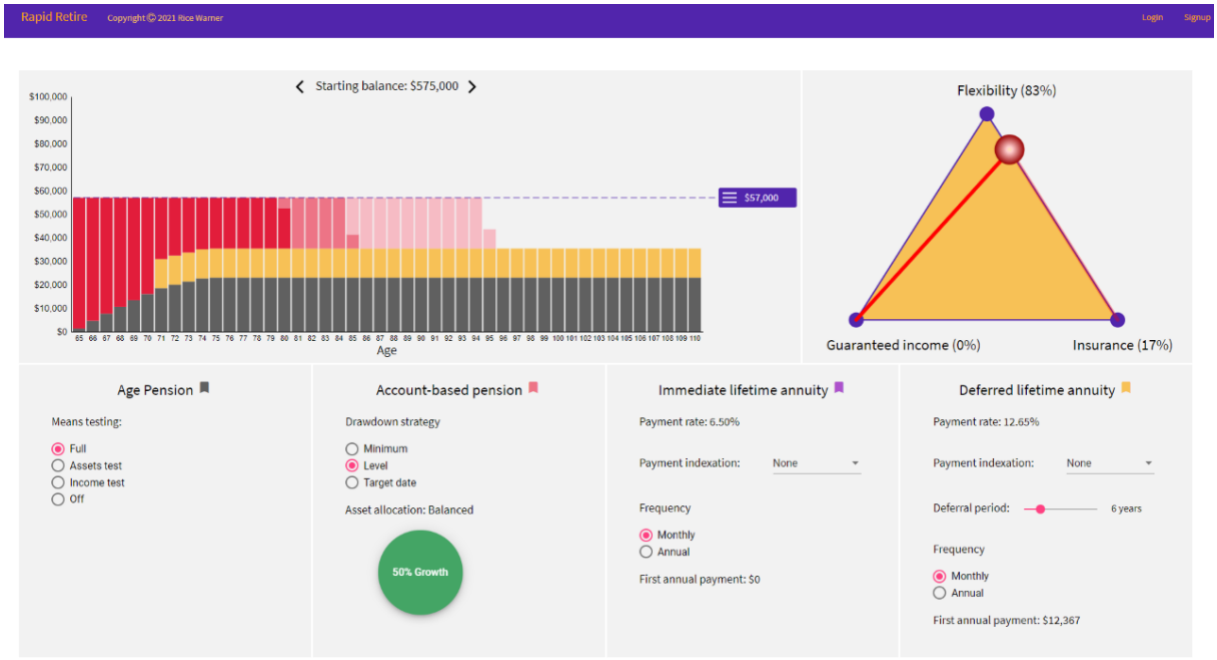
Testing retirement decisions, with risk metrics. Part of RAPS household modelling Suite by 10E24 Pty Ltd. [17]





[17] http://10e24.com/wp-content/uploads/2017/06/RAPS_06_2017.pdf

Example 7 Combining income from different retirement products using colour coding to indicate range, based on Rapid Retire model by Rice Warner



Example 7

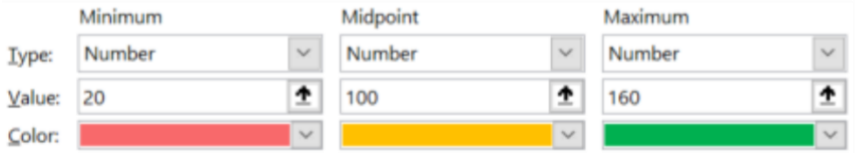
Sustainability of a retirement benchmark to different ages[18]

With the replacement benchmark retained at 65% of final salary, Figure 9 below indicates the results (allowing for both the Age Pension and the Minimum Drawdown) for different salary levels.

Figure 9

Salary	Out of 200 members the number of members whose retirement incomes last until at least								
	Age 80			Age 90			Age 100		
	9.5%	12%	12%+3%	9.5%	12%	12%+3%	9.5%	12%	12%+3%
$45,000	190	198	200	129	170	194	59	96	138
$50,000	176	196	198	91	134	174	21	53	100
$55,000	163	188	198	53	102	146	3	26	68
$60,000	144	180	197	26	77	124	2	9	46
$65,000	129	169	193	13	46	104	1	4	33
$70,000	115	157	186	7	37	93	0	4	30
$75,000	101	142	181	6	32	84	0	4	24
$80,000	93	136	176	5	29	76	0	4	24
$85,000	85	127	171	4	26	74	0	3	22
$90,000	78	120	166	3	22	73	0	1	19
$95,000	73	111	162	3	21	70	0	1	17
$100,000	69	108	158	3	19	67	0	1	17
$105,000	66	104	154	3	17	65	0	1	16
$110,000	61	99	153	3	15	65	0	1	16
$115,000	58	98	149	3	14	64	0	1	14
$120,000	52	98	146	2	12	64	0	1	14
$125,000	52	97	146	2	11	64	0	1	14
$130,000	49	95	144	2	11	62	0	1	14

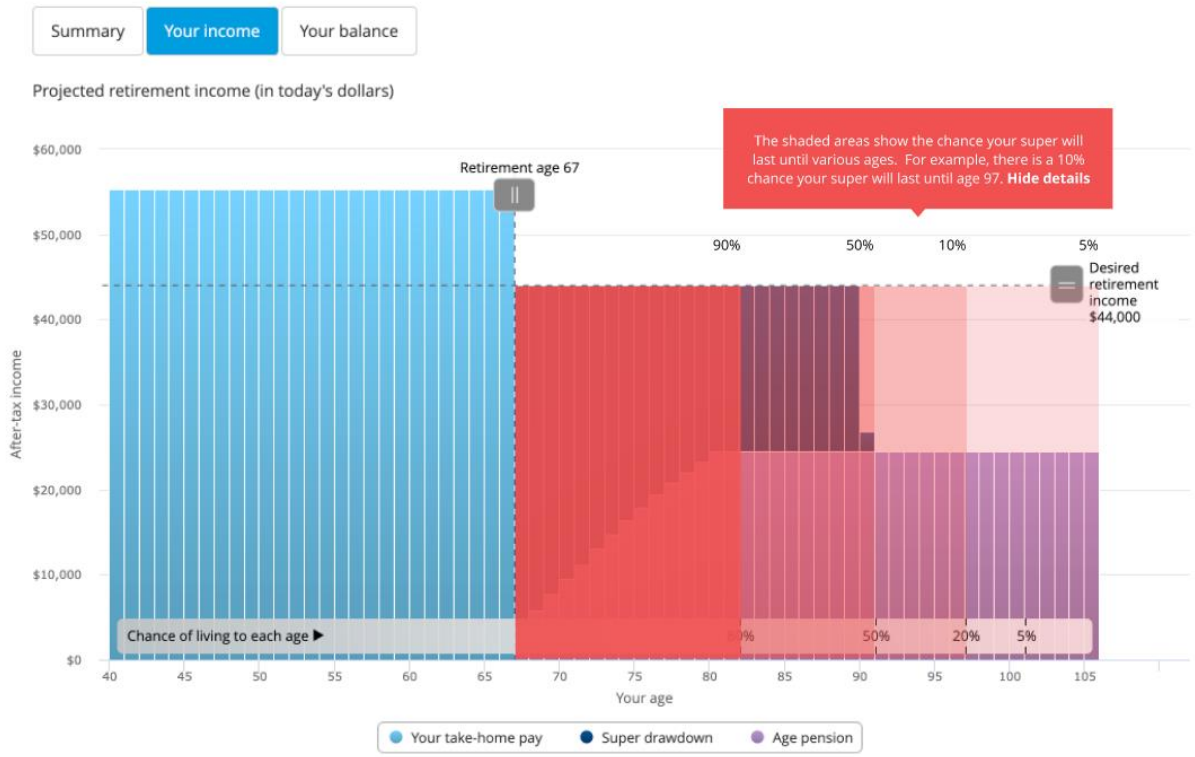
The colour code adopted is:



[18] This is an extract from an Actuaries Digital article titled "SG Level, Benefit Adequacy and Investment Performance Fluctuations – Part 2" by Colin Grenfell posted 9 June 2020. https://www.actuaries.digital/2020/06/09/sg-level-benefit-adequacy-and-investment-performance-fluctuations-part-2/

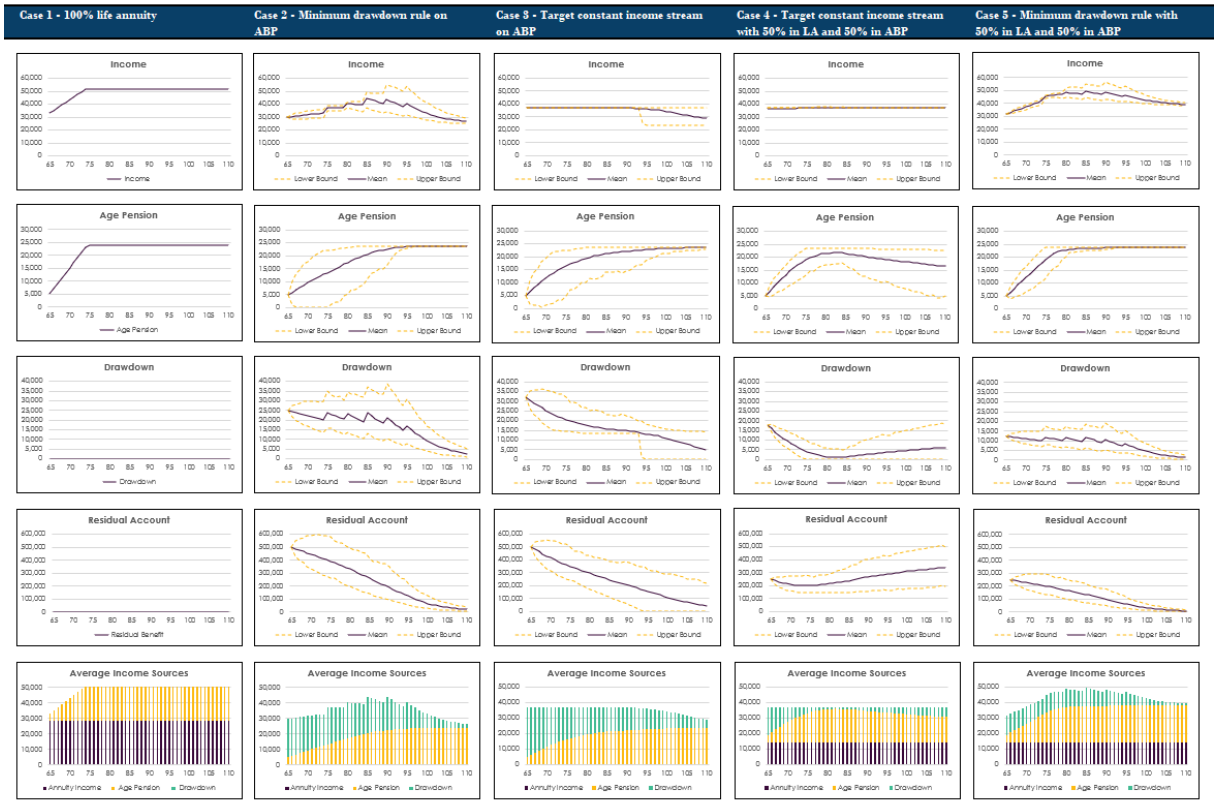
Example 8

Chance super will last to different ages, based on Mercer Retirement Income Simulator customer testing concept 2021



Example 9

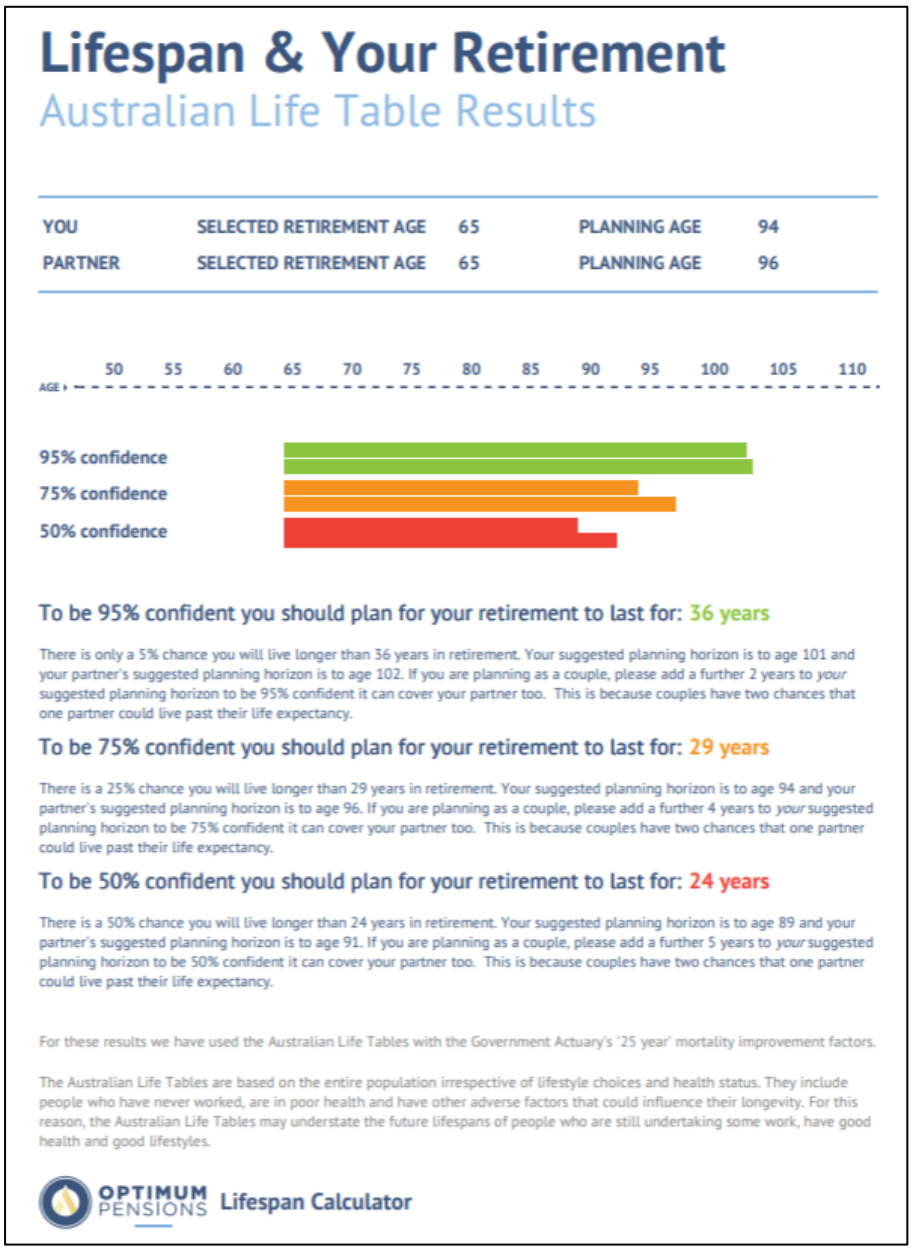
Range of retirement outcomes by components and total – MDUF static model calculator[19]



[19] Member's Default Utility Function (MDUF) is an open-architecture metric to assist the industry to design retirement outcome solutions. The related materials can be accessed through the Conexus Institute website via https://theconexusinstitute.org.au/resources/members-default-utility-function-mduf/

Example 10

Length of time that a retirement plan needs to last to allow for the potential range of lifespans of a couple. Lifespan Calculator by Optimum Pensions



Lifespan & Your Retirement

Australian Life Table Results

YOU	SELECTED RETIREMENT AGE	65	PLANNING AGE	94
PARTNER	SELECTED RETIREMENT AGE	65	PLANNING AGE	96

To be 95% confident you should plan for your retirement to last for: 36 years

There is only a 5% chance you will live longer than 36 years in retirement. Your suggested planning horizon is to age 101 and your partner's suggested planning horizon is to age 102. If you are planning as a couple, please add a further 2 years to *your* suggested planning horizon to be 95% confident it can cover your partner too. This is because couples have two chances that one partner could live past their life expectancy.

To be 75% confident you should plan for your retirement to last for: 29 years

There is a 25% chance you will live longer than 29 years in retirement. Your suggested planning horizon is to age 94 and your partner's suggested planning horizon is to age 96. If you are planning as a couple, please add a further 4 years to *your* suggested planning horizon to be 75% confident it can cover your partner too. This is because couples have two chances that one partner could live past their life expectancy.

To be 50% confident you should plan for your retirement to last for: 24 years

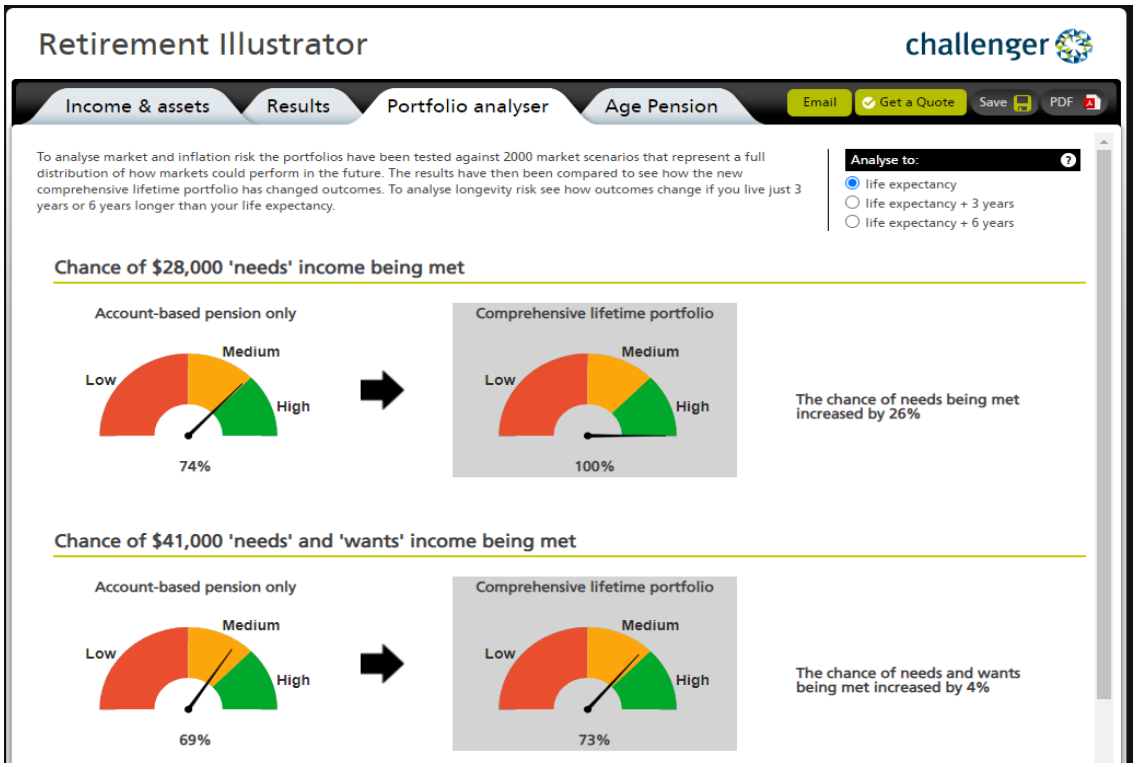
There is a 50% chance you will live longer than 24 years in retirement. Your suggested planning horizon is to age 89 and your partner's suggested planning horizon is to age 91. If you are planning as a couple, please add a further 5 years to *your* suggested planning horizon to be 50% confident it can cover your partner too. This is because couples have two chances that one partner could live past their life expectancy.

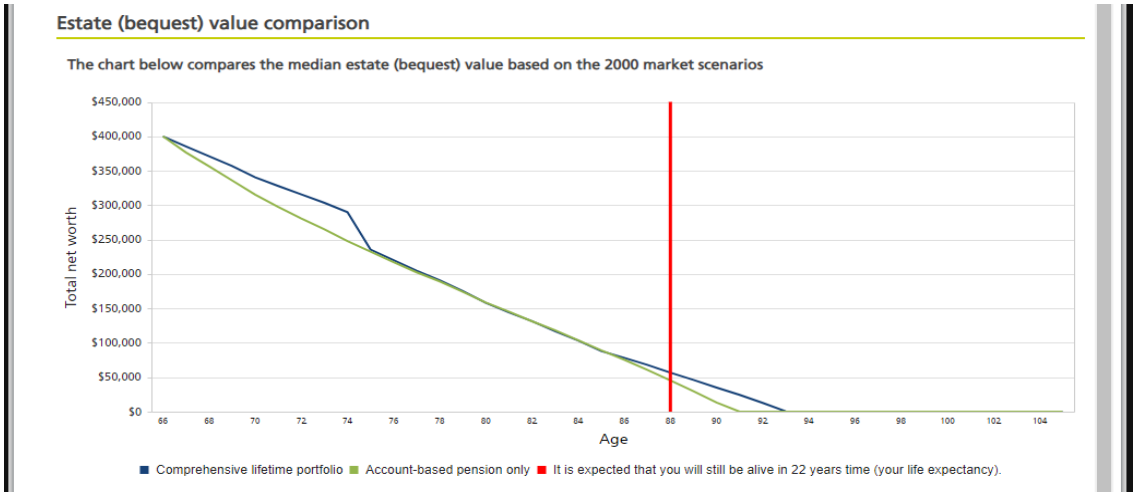
For these results we have used the Australian Life Tables with the Government Actuary's '25 year' mortality improvement factors.

The Australian Life Tables are based on the entire population irrespective of lifestyle choices and health status. They include people who have never worked, are in poor health and have other adverse factors that could influence their longevity. For this reason, the Australian Life Tables may understate the future lifespans of people who are still undertaking some work, have good health and good lifestyles.

OPTIMUM PENSIONS Lifespan Calculator

Example 11 Chance of achieving retirement income goals - Retirement Illustrator by Challenger Limited[20]

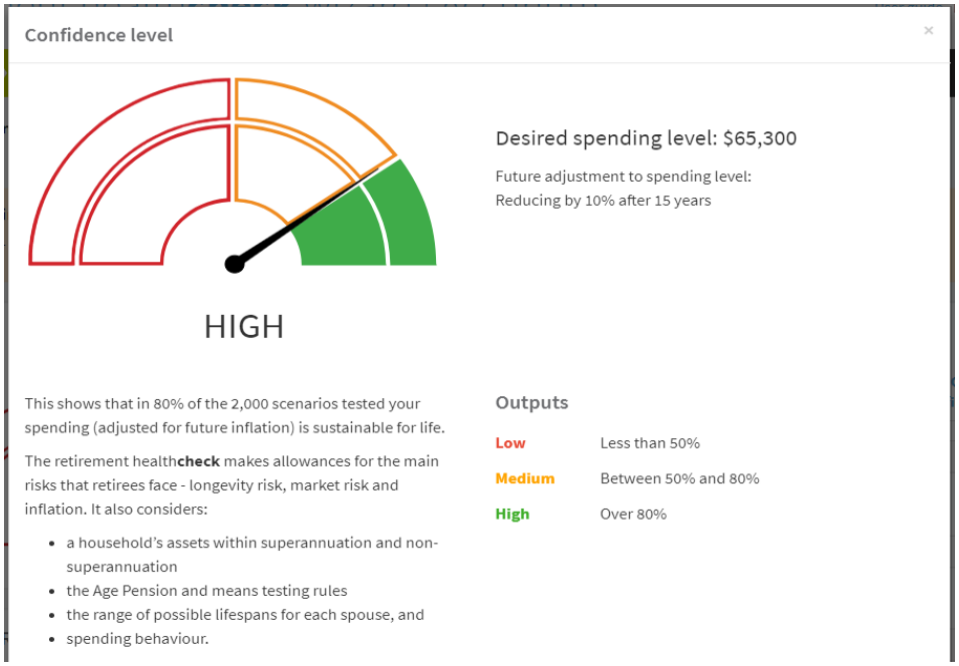


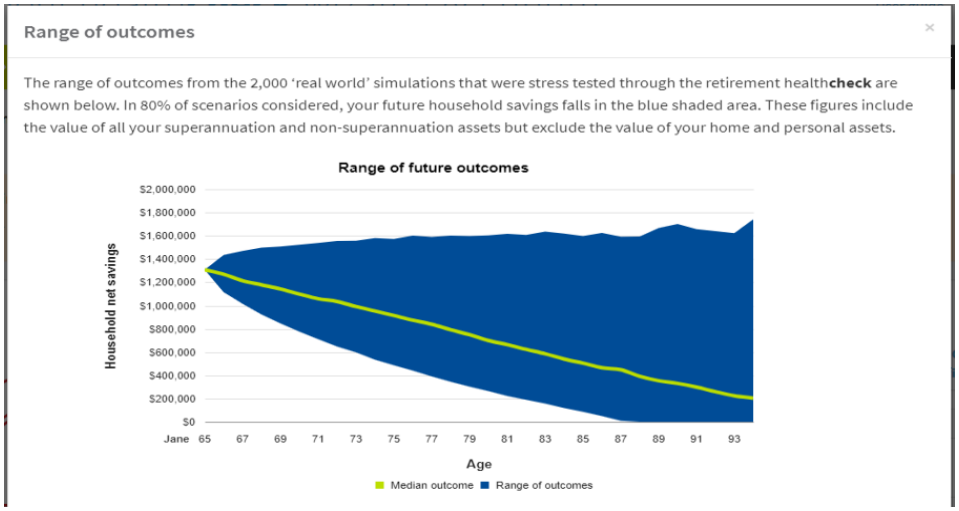


[20] Challenger Retirement Illustrator accessible via AdviserOnline, https://www.challenger.com.au/adviser/adviser-resources/tools

Example 12

Confidence of spending and range of savings – Retirement health check by Accurium[21]





[21] https://www.accurium.com.au/adviser-services/retirement-healthcheck