

All-Actuaries Summit

GETTING CLOSER
THINKING BIGGER

2-4 May
2022

Melbourne Convention
and Exhibition Centre
(Hybrid Event)



**Actuaries
Institute**



Actuarial Modelling and the Retirement Income Covenant

**Michael Dermody, Leandro Ao,
Danny Bechara, Anthony Saliba**

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Retirement Income Covenant: Meeting the Challenges

**Michael Dermody,
Leandro Ao, Danny Bechara**

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Agenda

1

Retirement Income Covenant

An introduction to the Retirement Income Covenant and what this means for funds.

2

Member Focus

Primary objectives based on obligations, circumstances, and preferences.

3

Modelling Approach

Member preferences and cohorting, longevity, and economic and return modelling.

4

Measure and Output

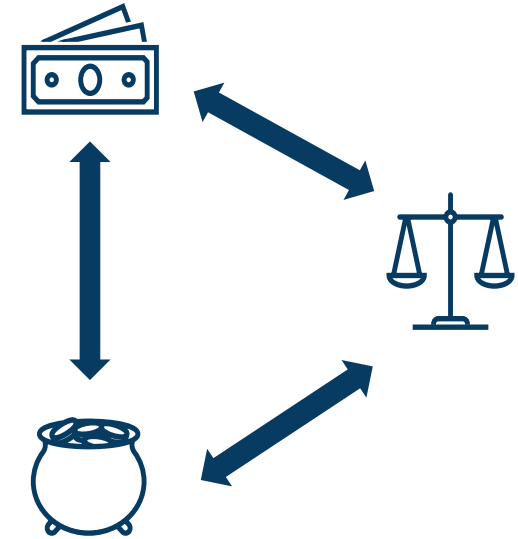
Examples of the types of measures and outputs that help to inform trustees and members about retirement income strategies.

1. Retirement Income Covenant

Retirement Income Covenant

52AA Retirement income strategy requirements - registrable superannuation entities

- a) to maximise expected retirement income over the period of retirement
- b) to manage expected risks to the sustainability and stability of retirement income over the period of retirement of the following kinds
 - i. longevity risks;
 - ii. investment risks;
 - iii. inflation risks;
 - iv. any other risks to the sustainability and stability of the retirement income
- c) to have flexible access to expected funds over the period of retirement

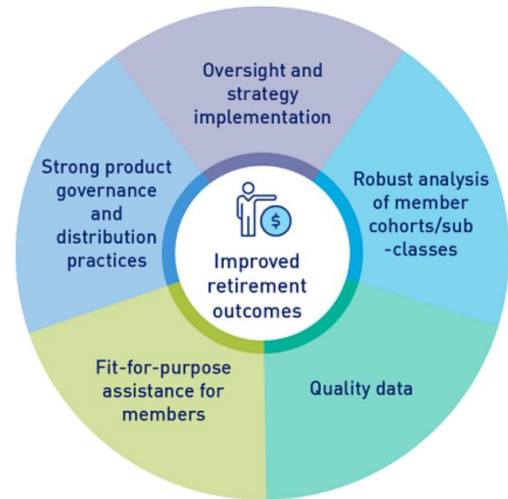


Short Term Actions

By 1 July 2022*:

- **Assess outcomes** of existing products & member assistance (DDO, AOA, BPR)
- **Identify members** retirement income needs, **present plan** to build capacity to meet needs
- **Record** in writing “reasonable steps”, decisions & reasons
- **Update** Business Plan
- **Publish** strategy summary on website

*Figure 2: Key areas for RSE licensee consideration



***Source:** APRA letter to RSE Licensees (7 March 2022)

Medium Term Actions

Medium term: July 2022 – June 2023 & annually thereafter

- Retirement income **strategy** in place and published on website.
- Regular **monitoring** (including embedding in Member Outcomes/Design and Distribution Obligations (DDO) review process)
 - **Annual Outcomes Assessment (AOA)** – are current products meeting member outcomes? Are cohorts right?
 - **Business Performance Review (BPR)** – are current products and services performing to meet members' retirement income needs? Are target market determinations (TMDs) appropriate?
 - **Alternative options** - build new products, find a partner, enhance services, review information, offer advice, refer
- **Update Business Plan** to capture review findings



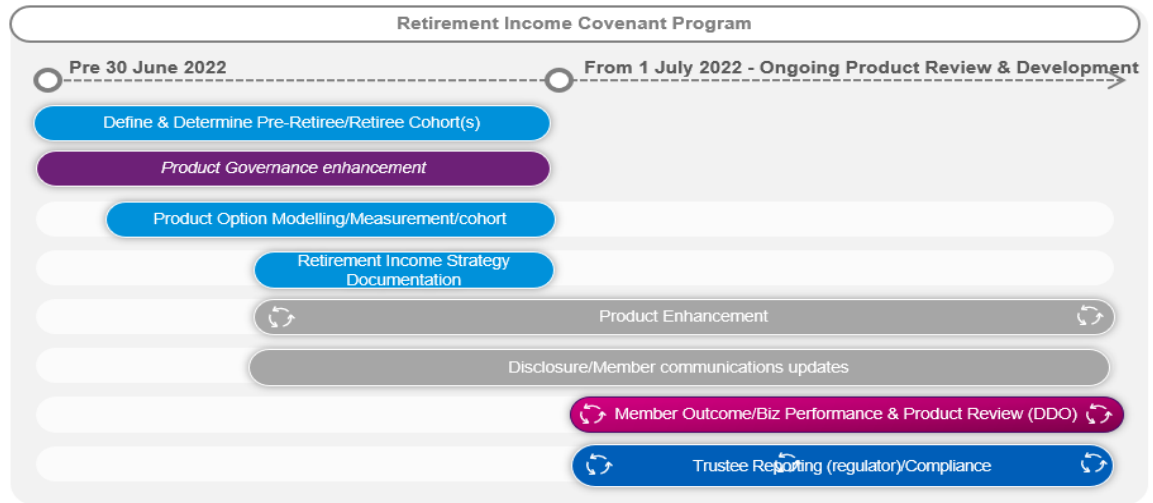
Timeline for Funds

APRA will take best approach and expect other funds to lift.

Funds will have short time frames – need to have a good enough effort for 1 July 2022 to ensure compliance

Challenges for Funds:

- Governance
- Cohort setting
- Products
- Advice Models & Offering



Sample Product Offers

Product Example	Flexibility	Longevity protection	Investment protection
Example of evaluation metric:	Ability to access capital drawdowns when needed (excl. Min/Max Regs)	Income which lasts as long as the retiree's lifetime	Protection against market risk
<i>Group Self Annuitisation</i>	Potential access to capital depending on design	Income will last a lifetime, but the level of income can vary over time	Typically no protection
<i>Account-based pensions</i>	Full access. Drawdown limited only by account balance	Only through asset allocation and managing withdrawals	No investment protection
<i>Downside-protected Account based pension</i>	Drawdowns at any time, possibly less a surrender penalty	Investment strategy provides choice in downside protection	Limited losses
<i>Guaranteed Account-based pension</i>	Drawdowns at any time, but possibly lose protected income guarantee	Income guaranteed to last for certain period, e.g. 20 years	Income guaranteed to last for certain period, e.g. 20 years
<i>Annuity</i>	Drawdowns only allowed within the withdrawal period	Income will last a lifetime	ARPA-regulated life company-backed product providing protection against market risk

2. Member Focus

Retirement Income – Foundation of Strategy Development

Best Understanding
of Members



Best Understanding
of Outcomes



Best Retirement
Income Solution

Member Circumstances

- Age
- Assets
- Marital Status
- Health

Member Preference

- Income level
- Risk aversion
- Access to lump sums
- Bequests
- Retirement age/work plans

Available Strategies and Products

- Benefit Design and Discretions
- Underlying Investments
- Guarantees
- Fees

Future Economics/Markets

- Investment Markets/Returns
- Variability
- Correlations
- Risk Management Costs

Longevity – likely levels and potential variability

Strategy/product that best matches outcomes to member preferences / circumstances

Focus on the Member

Primary Objective

- General fiduciary obligations
 - Members best financial interests
 - Requirements of RIC
- Lead to: Provide strategies best for member



Diverse Membership

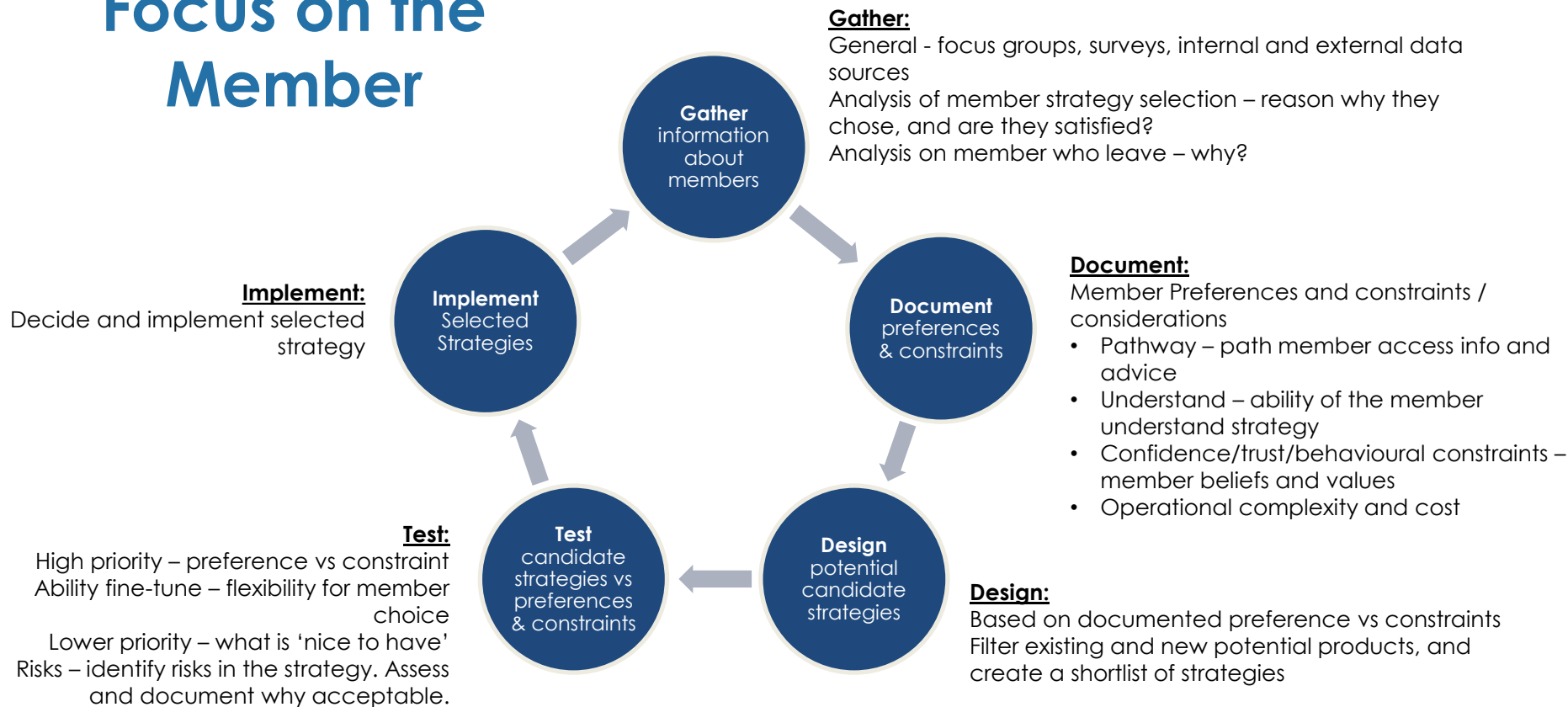
Fund's have analysed their membership and found:

- Diverse circumstances
- Diverse preferences



Reasonable to expect
most funds will need to
offer products across the
spectrum

Focus on the Member



Current Guidance & Advice Services

	Workplace	Intra-fund	Limited Personal*	Comprehensive Personal	IFA Referrals [^]	Digital Advice
Large Fund #1	✓	✓	■	✓	✗	✗
Small Fund #2	✓	✓	■	✓	✗	✗
Medium Fund #3	✓	✓	■	✓	✗	✗
Small Fund #4	✓	✓	✗	✗	✗	✗
Large Fund #5	✓	✓	✗	✗	✗	✗
Medium Fund #6	✓	✓	✗	✓	✓	✗
Medium Fund #7	✓	✓	✗	✓	✗	✗
Large Fund #8	✓	✓	✗	✓	✗	✗
Small Fund #9	✓	✓	✗	✓	✗	✗
Medium Fund #10	✓	✓	✓	■	✓	✓
Small Fund #11	✓	✓	✓	■	✗	✗

Data as at mid-2021

*All comprehensive Personal Advice providers are permitted to limit the advice. In this context, the providers shown providing comprehensive advice here a broad APL and cover a broad scope of advice (e.g. aged care, shares, etc.).

[^]Refers to a formal arrangement to refer to a network or panel of independent financial advisers (IFAs).

3. Modelling to meet the RIC challenges

Modelling – Considerations



Cohorts and
Sub-Classes



Investment
uncertainty



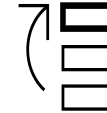
Longevity



Trade-offs and
Values



Risk Measures



High vs Low Priority
& Preferences

Step by step

Member



Researching
Cohorts

Member educations
to identify
preferences

Preferences could
be more diverse
than one might
expect

Trade-offs



Understanding trade
offs - Risk vs
Reward

Transparency

Simplicity in
explanation

Value



Able to evaluate
the outcomes of
products/strategies

Measure



No single perfect
measure to
compare products

Tailoring required

Key points of
difference between
products and
strategies

Decision



Initiative and
interactive
presentation so
member and trustee
can actively
engage

Some members may
further seek personal
advice

Longevity Risk

Trustees need to understand both expected and potential for uncertainty of longevity.

	Expected Longevity	Potential for Uncertainty
Trustees need to understand	Population mortality (unadjusted) is not a good estimate for retirees, but data available is limited.	• Systematic: uncertainty about what the true life expectancy/mean of outcomes is for cohort • Idiosyncratic: uncertainty each individual member faces about how long they will live
How to overcome these challenges	Use local and international data points, and develop data collection capabilities to understand own membership experience.	• Systematic: starting point – analyse existing frameworks for other purposes (e.g. 20% reduction in mortality per APRA Life Insurance Capital Standards) • Idiosyncratic: communicate with members to understand their risks

In all cases, can apply the Control Cycle approach and iterate to improve.

Different types of asset modelling

Potential approaches from simple to complex:

Model	Example	Advantages	Disadvantages
Best-estimate / Central estimate	Commonly used	Simple best estimate / central view to communicate	No measure of variability
Stress and scenario testing	Commonly used in retirement income	Can provides scenario based outcomes that are intuitive	No probabilistic distribution of outcomes
Monte-Carlo simulation of mean, variance and covariance	Widely used in research work (e.g. Nagle, Rubinsztein, Saliba paper, AGA)	- Assumptions available from assets manager and investment consultant - Assumptions consistent with portfolio construction - Simple correlations	- Requires subjective setting of assumptions: tail-distributions, economic relationships etc. - Known weakness in capturing stylised facts – e.g. realistic non-linear behaviours
Classic stochastic investment model	Wilkie, SUPA (from Monash)	Free resources & strawman of a more complex Economic Scenario Generators.	- Require calibration and assumptions setting - Less advanced on stylized facts
Modern industrial grade Economic Scenario Generator ('real world' scenarios*)	Widely used for insurer's ALM, SAA, risk capital, etc.	- Expanding from classic financial economics models, and capture recent market stylized facts - Be-spoke asset class possible	- Judgement & expert knowledge required to calibrate / review - Require communication and education to stakeholders e.g. trustees

*"risk neutral" scenarios are used for valuation and hedging, but are not suitable for outcomes projection.

Using Modern ESG for Retirement Income

Using an industry-grade Economic Scenario Generator (ESG) brings the following benefits to trustees in assessing retirement income strategy:

- **Probabilistic view of outcomes** based on real-world long-term assumptions and initial conditions, cascading from interest rates to other return variables
- **Modern rate and assets models** – e.g. Multifactor term structure model, SVJ equity model, correlation captured through cascade structure
- **Robust validation** of scenarios against target parameters
- **Capturing key stylized facts** – term structure, negative rates, extreme equity shock scenarios, regime switching. Ability to evaluate outcomes under more extreme downside scenarios.
- **Well placed to analyse complex product offering** – e.g. be-spoke structures, guarantees, innovative design, etc.

Our sample evaluation analysis* utilizes Conning's GEMS® ESG to simulate economic outcomes.

Key points:

- **Thinking on initial conditions and long-term** – time sensitivity of conclusion made
- **Education and communication to the Trustees** – what is important to trustees for their role?
- **Turning simulated data to insights** – what percentile? VAR/CTE? How to identify paths for investigation? What diagrams to create?
- **Further alignment to a fund's own investment view** – inflation model is also important

*"This document is for informational purposes only and should not be interpreted as an offer to sell, or a solicitation or recommendation of an offer to buy any security, product or service, or retain Conning for investment advisory services. The information in this document is not intended to be nor should it be used as investment advice."

4. Measure and Output

Approach to Evaluate Retirement Income Solutions

Graphing

Income Paths

- Percentiles
- Mortality
- Probability

Death Benefit

Access to Lump Sum

Measures

Types of Measures

- Percentiles
- Mean vs Median
- Adequacy against Cost of Living
- Level of Shortfall
- Volatility
- Pension multiples etc.

Example Member (for a cohort)

Age



68 Years Old

Marital Status



Single Female

Balance



\$225,000

Home-ownership



Homeowner

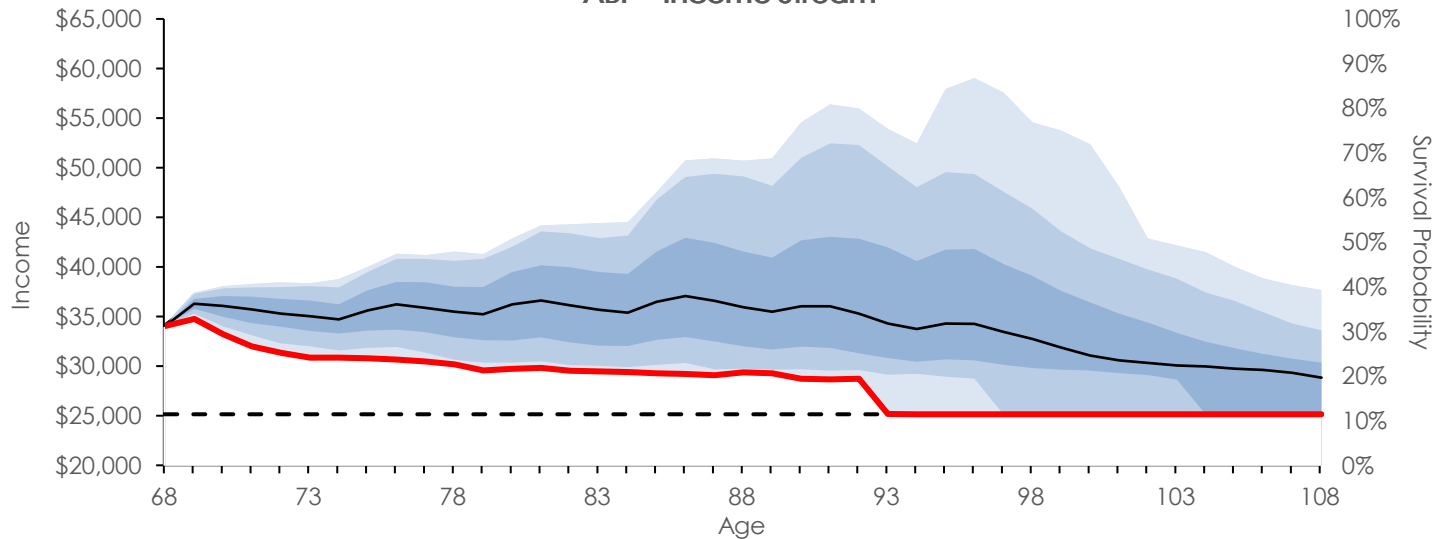
Developing suitable measures

- Measurement should be aligned to RIC trilemma.
- Mindful of actuarial technicalities (such as the use of deflators, mortality, absolute or relative, etc.)

Possible measurements for Trustees to consider	
Maximise Expected Retirement Income	Average pension multiple – using CPI deflator and allowing for life expectancy
	NPV of income payments – using both a CPI and risk free rate deflator and allowing for life expectancy
	Desired income attainability
	Total income as a % of cost of living minimum requirement
	Average income at different time horizons (ages 65-70, 70-75, 75-80 ...)
	Average income as a % of cost of living at different time horizons (ages 65-70, 70-75, 75-80 ...)
Manage Expected Risks to the Sustainability and Stability of Retirement Income	Likelihood age pension becomes a material portion of income – after age x likelihood age pension is greater than y% of income
	Likelihood retirement income is above half the standard costs of living – allowing for life expectancy
	Income volatility – both with and without setting positive deviations to 0 (e.g. Australian Government's Retirement Income Risk Measure)
	Chance income rises/falls by x%
	Frequency & severity of income shortfall below cost of living
Flexible Access to Expected Funds	Volatility of income at different time horizons (ages 65-70, 70-75, 75-80 ...)
	Expected amount of lump sum available for withdrawal at different ages (65, 70, 75, 80, 85 ...)
	X th percentile lump sum payment at different ages (65, 70, 75, 80, 85 ...)

Sample Graph – Account Based Pension

ABP - Income Stream



Key:

- Median Scenario
- Age Pension
- 1 in 5 Outcome
- 1 in 25 Outcome
- 1 in 100 Outcome

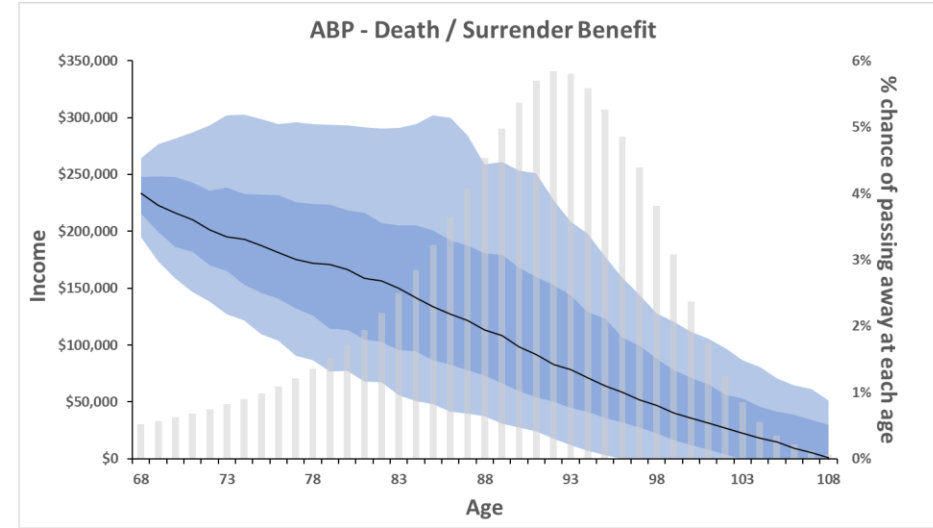
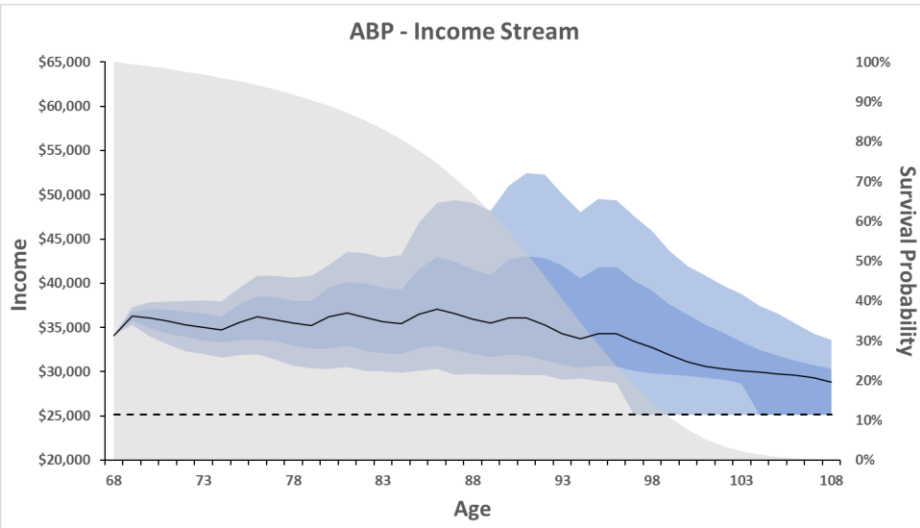
**Average Annual
Payment in Median
outcome=**
\$32.5k

**Average Annual
Payments in 1 in
100 Outcome =**
\$28k

Age Pension =
\$25k

Results are in 'real terms'

Sample Graph – Account Based Pension



Key:

- Median Scenario
- Age Pension
- 1 in 5 Outcome
- 1 in 25 Outcome
- Probability of Survival/Mortality

Results are in 'real terms'

Sample Measure – Single Value & Range of Outcomes

<u>Outcome</u>		<u>Balanced Portfolio</u>		<u>Cash Portfolio</u>		<u>Difference</u>	
		NPV with Age Pension	NPV without Age Pension	NPV with Age Pension	NPV without Age Pension	NPV with Age Pension	NPV without Age Pension
Upside	1 in 100	\$1,028,000	\$537,000	\$812,000	\$227,000	\$216,000	\$310,000
	1 in 25	\$992,000	\$434,000	\$798,000	\$213,000	\$194,000	\$221,000
	1 in 5	\$907,000	\$323,000	\$777,000	\$193,000	\$130,000	\$130,000
	Mean	\$837,000	\$257,000	\$759,000	\$174,000	\$78,000	\$83,000
	Median	\$827,000	\$242,000	\$758,000	\$173,000	\$69,000	\$69,000
Downside	1 in 5	\$765,000	\$180,000	\$741,000	\$156,000	\$24,000	\$24,000
	1 in 25	\$721,000	\$136,000	\$724,000	\$139,000	-\$3,000	-\$3,000
	1 in 100	\$700,000	\$115,000	\$715,000	\$130,000	-\$15,000	-\$15,000

ASFA Modest Level of Living = \$29,139 p.a. (NPV = \$664,000)

Results are in 'real terms' and
adjusted for mortality

Sample Measure – Outcome Snapshot by Age Band

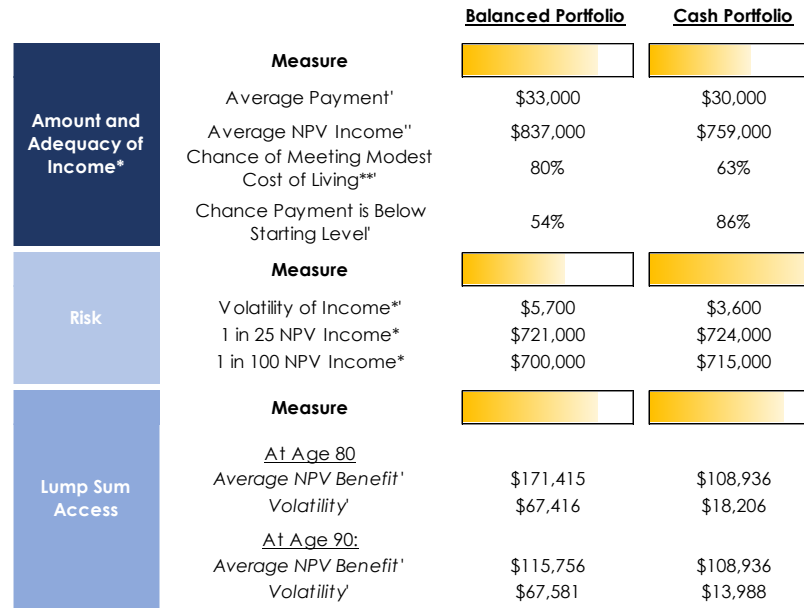
			<u>Balanced Portfolio</u>	<u>Cash Portfolio</u>
Initial Lump Sum			\$225,000	
Average Product Starting Payment			\$9,000	
Average Starting Payment (With Age Pension)			\$34,000	
Pension Multiple			33	30
Average Payment"			\$33,000	\$30,000
Modest Cost of Living* Multiple			114%	102%
Standard Deviation"			\$5,700	\$3,600
Adequacy against Cost of Living	Chance of Meeting Modest Cost of Living"	Overall	80%	63%
		68-80	100%	100%
		81-95	98%	97%
		96+	56%	18%
Risk	Chance Payment is Below Starting Level"	Overall	54%	86%
		68-80	21%	51%
		81-95	37%	96%
		96+	86%	100%
Level of Shortfall	Average Shortfall Relative to Modest Cost of Living"	Overall	12%	12%
		68-80	1%	0%
		81-95	7%	2%
		96+	12%	13%

*ASFA Modest Level of Living = \$29,139 p.a.

"Payments" adjusted in real terms

Sample Dashboard Ideas

A paper “Supporting Retirees in Retirement Income Planning” published by the Behavioral Economic team of the Australian Government (BETA) provides great ideas to create an intuitive dashboard. A sample design inspired by the paper is shown here:



*Inclusive of Age Pension

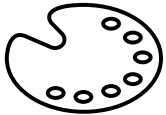
**ASFA Modest Level of Living = \$29,139 p.a.

^Benefit for Death and Surrender

'Payments adjusted in real terms

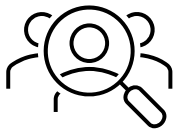
"Payments adjusted in real terms and adjusted for mortality

Designing Graphs and Measures – Learnings



This the an area when science meets art:

- Graphs to illustrate outcomes (**education**); measures to support analysis and decision (**evaluation**).
- **Aligned** to the RIC tripods of RIC to compare different products / strategies; Link measures to retiree's preferences and constraints for *a particular cohort*
- **Capture** the key dimensions: value, risk (volatility) or/and against benchmark across a 40-year horizon!
- **Link** to other supporting artefacts: life expectancy, age pension etc.
- Taking **care** in selecting threshold and benchmark
- **Interactive** – e.g. colours, sliders



Meaningful to trustees and also potentially the members. Different audience can digest based on what they need.

Summary



RIC and the member experience

Anthony Saliba

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Accumulation is “simple”

$$\begin{aligned} \textit{Money out} &= \textit{Money in} \\ &+ \textit{Investment returns} \\ &- \textit{Costs} \end{aligned}$$

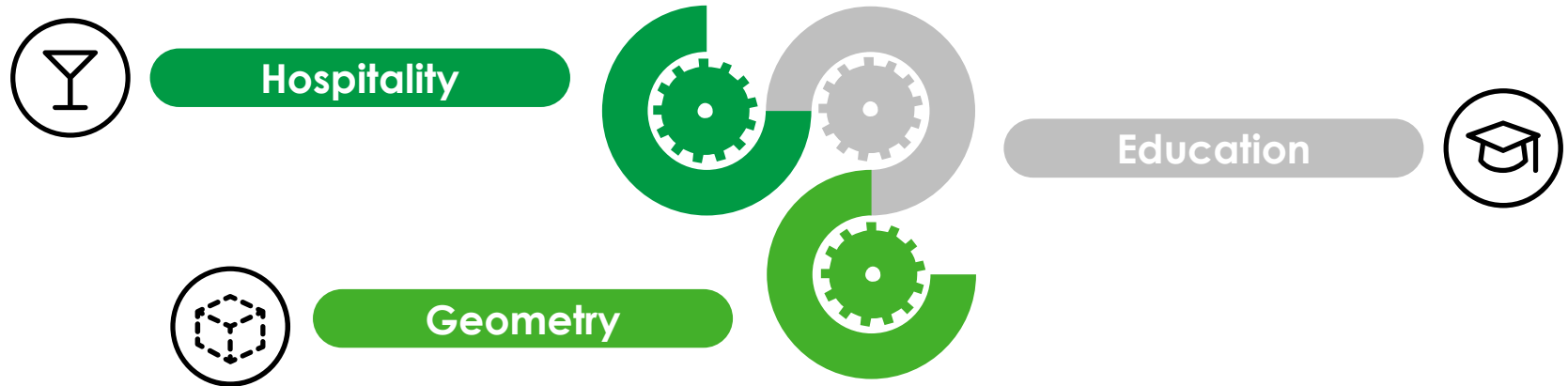
RIC objectives

1. Maximise expected retirement income
2. Manage any risks (including longevity risks, investment risks and inflation risks); and
3. Have flexible access to sufficient funds during retirement.

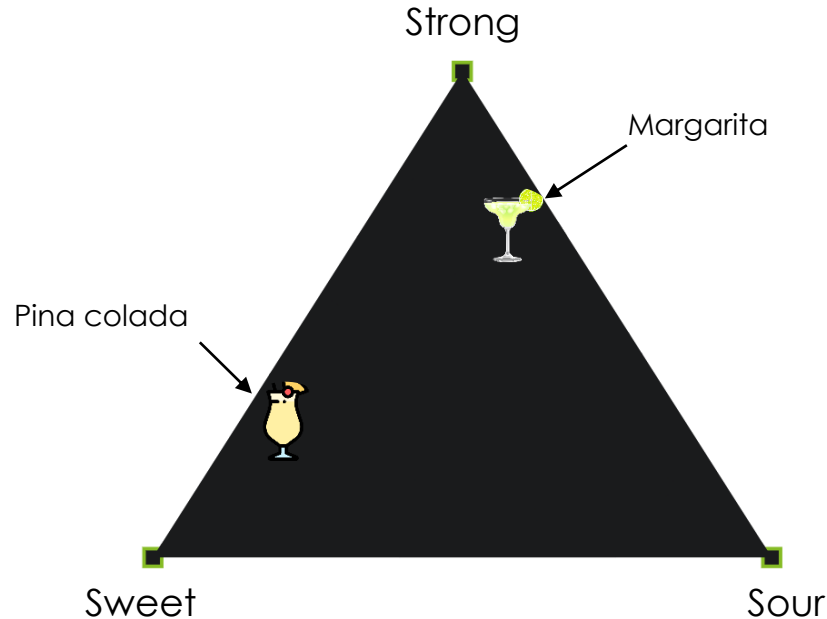
The Covenant acknowledges that there exist trade-offs between each of the objectives above, which presents superannuation funds and members with a ***retirement trilemma***.

This is not a new problem

Let us look to areas outside of financial services to help us communicate this retirement trilemma...



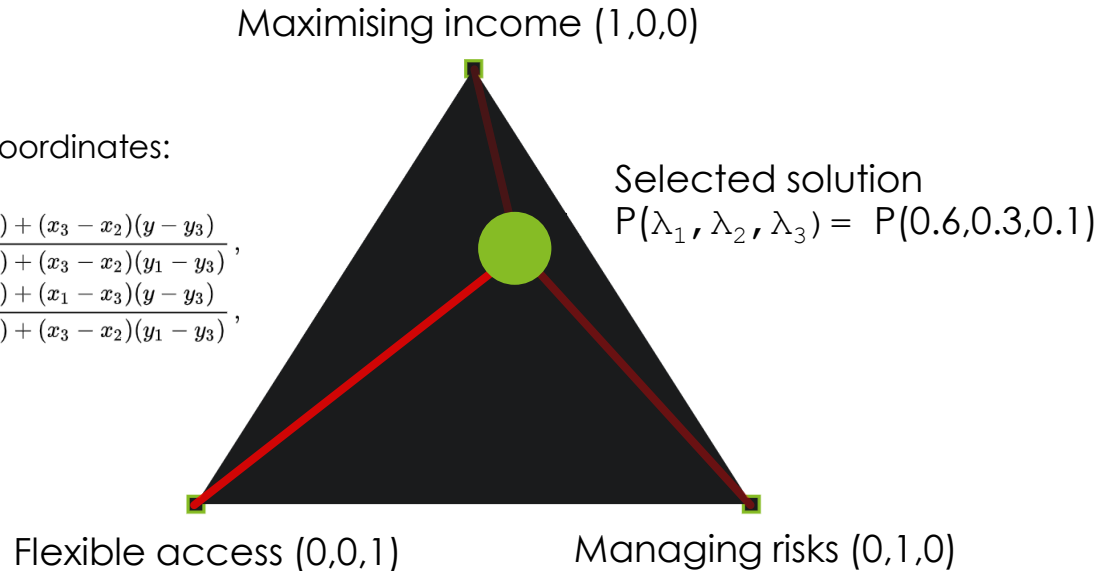
The cocktail trilemma



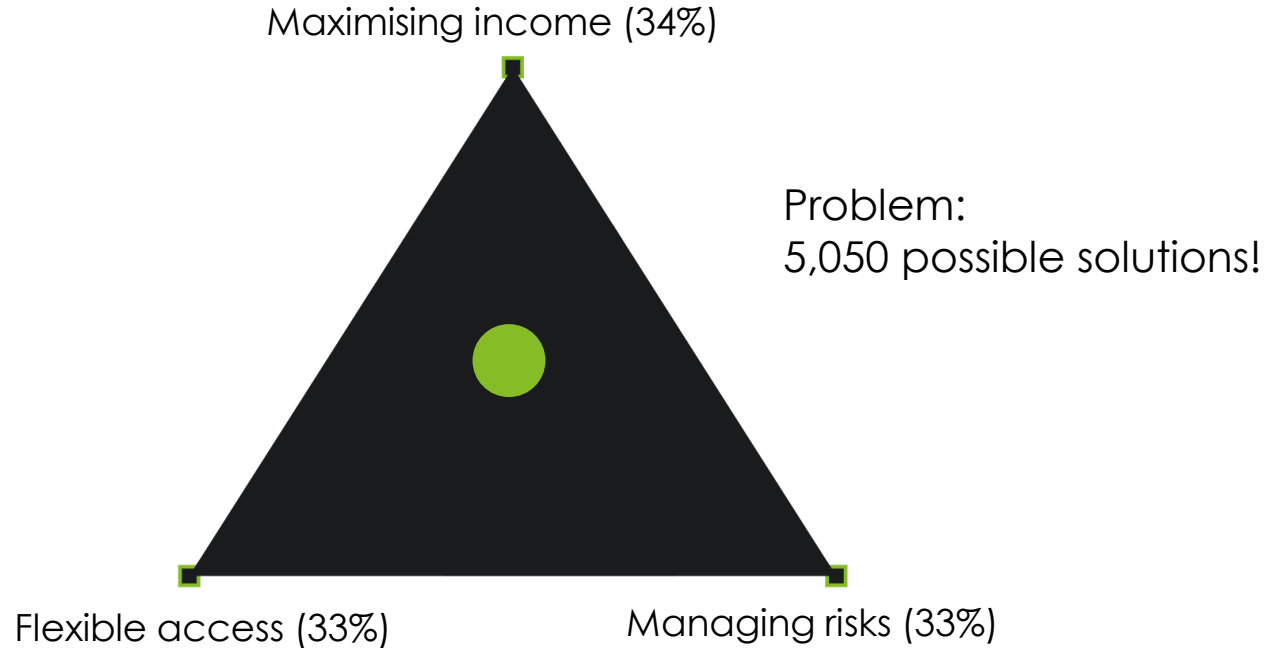
Barycentric coordinates

Converting from Cartesian to Barycentric coordinates:

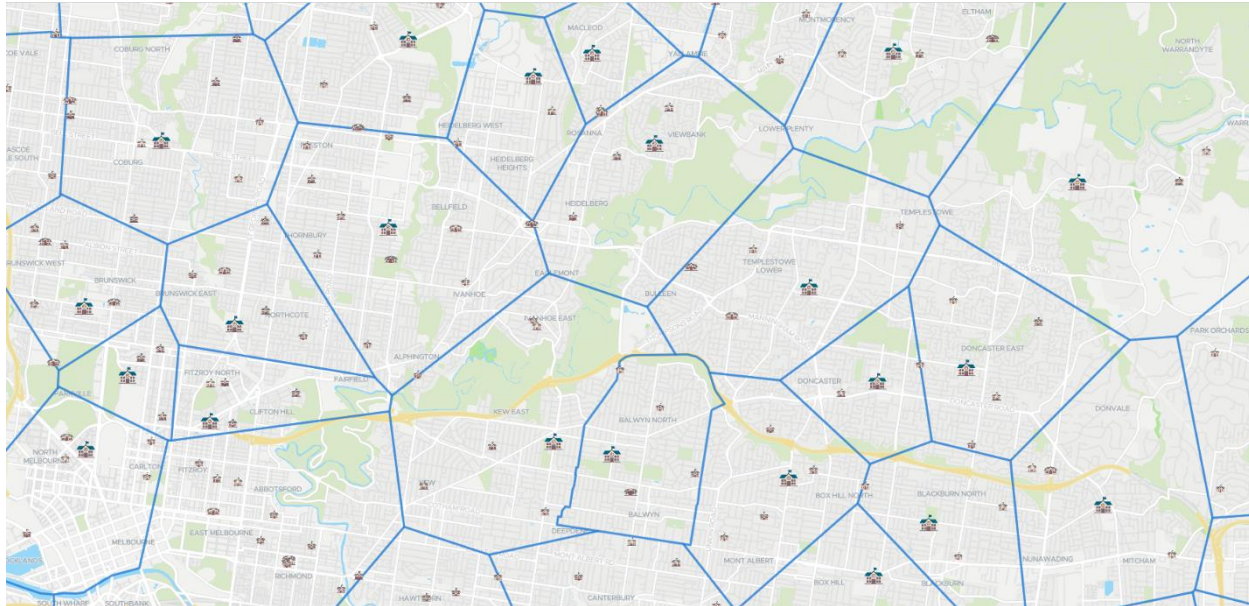
$$\lambda_1 = \frac{(y_2 - y_3)(x - x_3) + (x_3 - x_2)(y - y_3)}{\det(T)} = \frac{(y_2 - y_3)(x - x_3) + (x_3 - x_2)(y - y_3)}{(y_2 - y_3)(x_1 - x_3) + (x_3 - x_2)(y_1 - y_3)},$$
$$\lambda_2 = \frac{(y_3 - y_1)(x - x_3) + (x_1 - x_3)(y - y_3)}{\det(T)} = \frac{(y_3 - y_1)(x - x_3) + (x_1 - x_3)(y - y_3)}{(y_2 - y_3)(x_1 - x_3) + (x_3 - x_2)(y_1 - y_3)},$$
$$\lambda_3 = 1 - \lambda_1 - \lambda_2.$$



The retirement trilemma

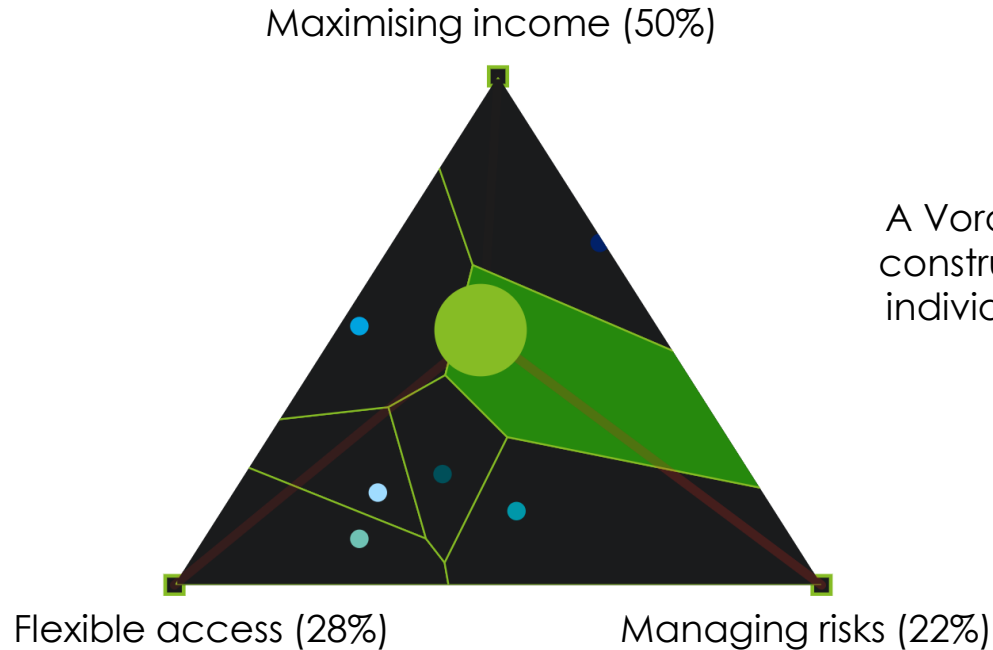


School catchment zones



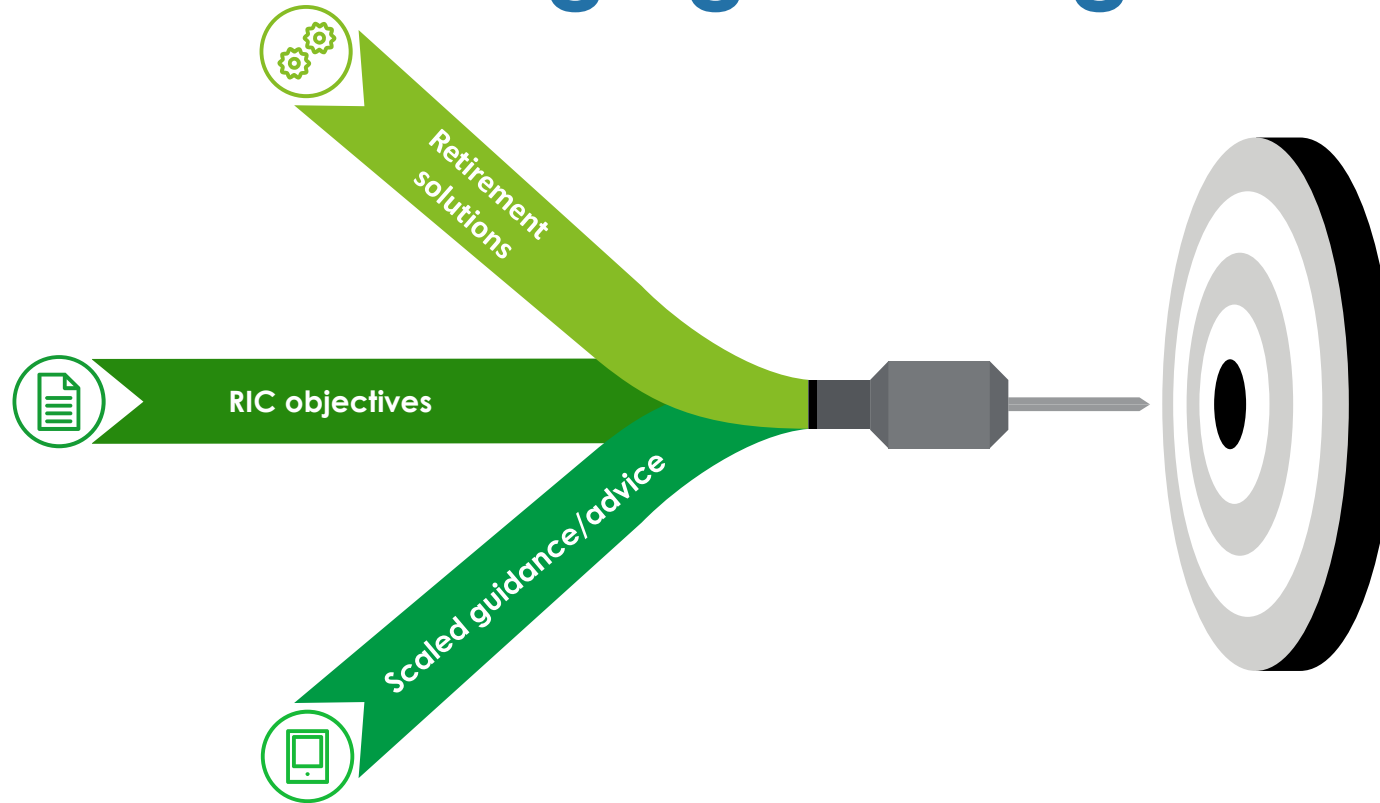
In Victoria, school
catchment zones are
set by dividing
districts into
[Voronoi polygons](#)

Seven unique solutions

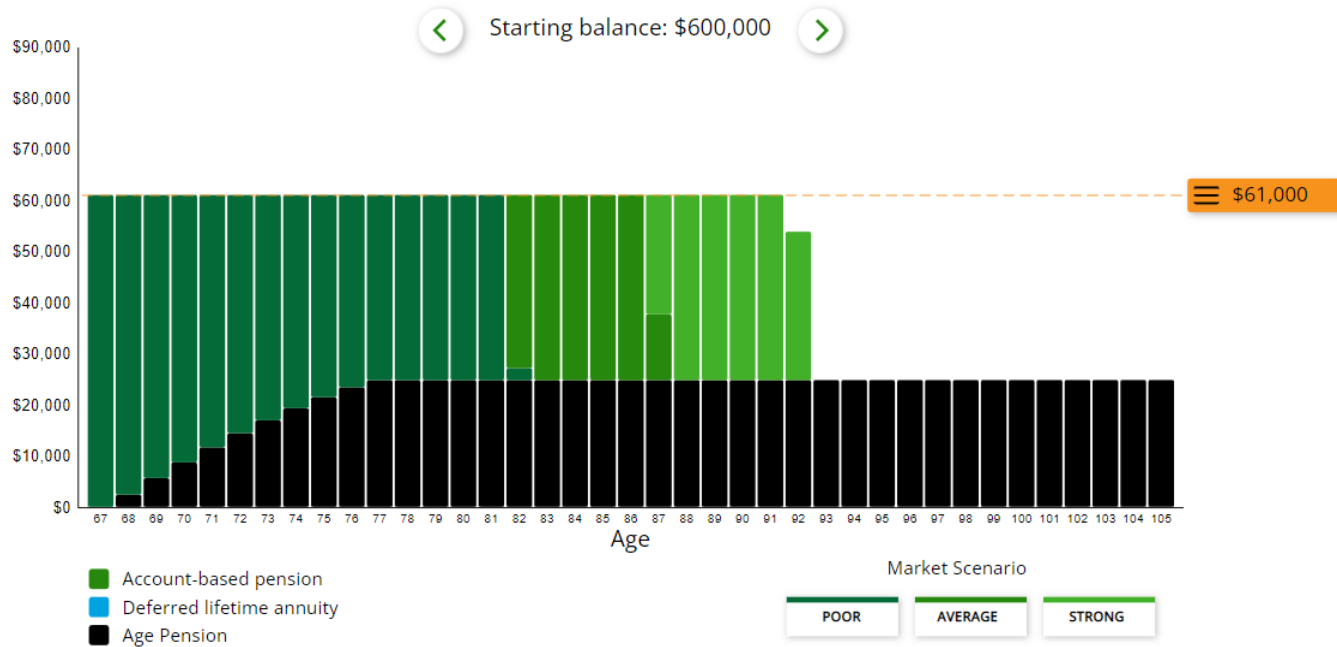


A Voronoi polygon is constructed for each individual retirement solution

Bringing it all together...



Let us see how the retirement trilemma triangle can be used in conjunction with retirement projections presented to members.



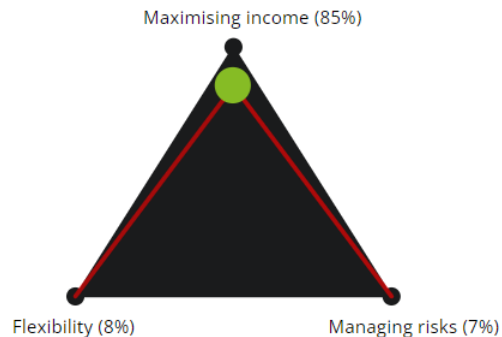
Initial product allocation

\$600,000

ACCOUNT-BASED PENSION

\$0

DEFERRED LIFETIME ANNUITY



Annuity income settings

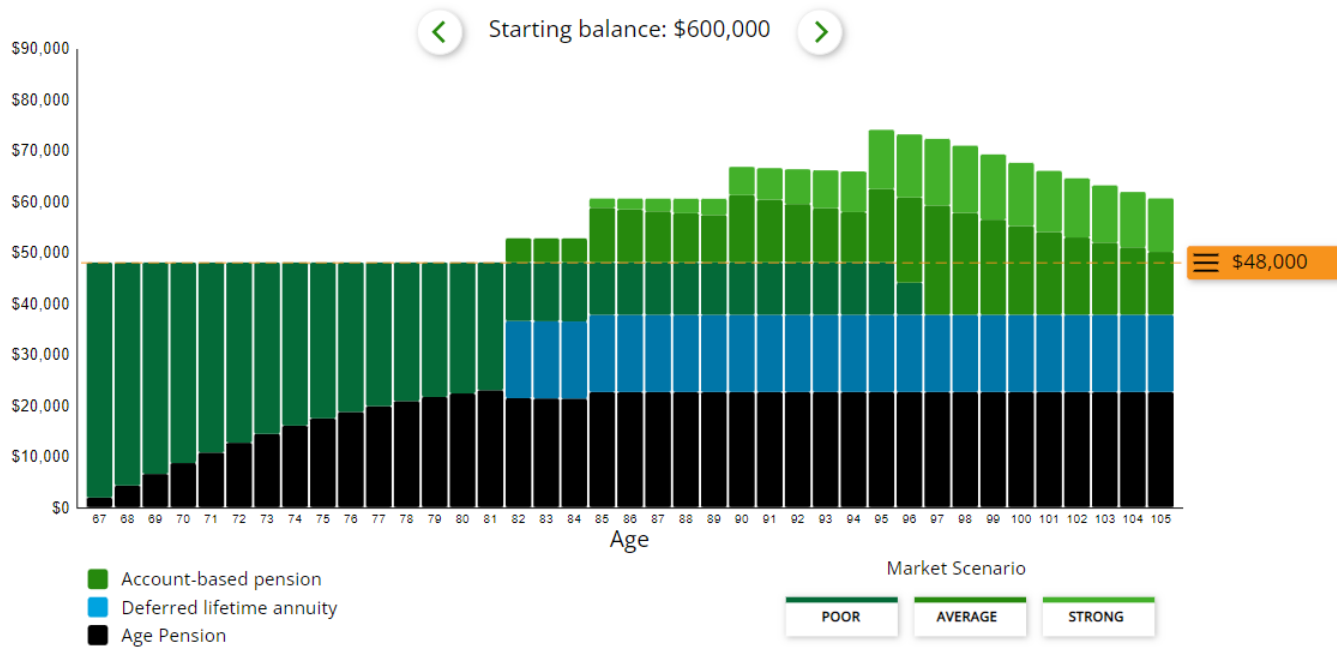
Initial allocation: 0% 0%

Deferral period: 0 years 0 years

☒ Age Pension

Account-based pension asset allocation





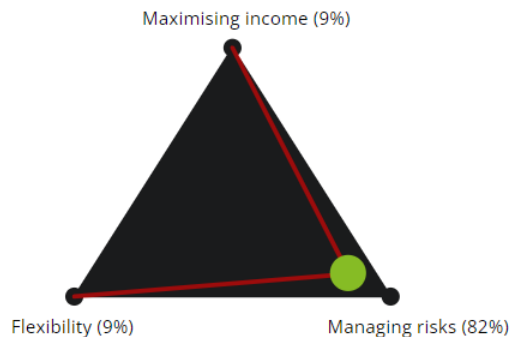
Initial product allocation

\$510,000

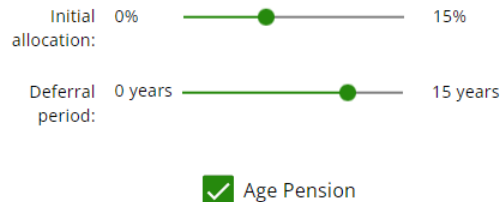
ACCOUNT-BASED PENSION

\$90,000

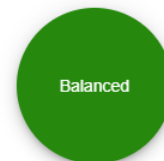
DEFERRED LIFETIME ANNUITY

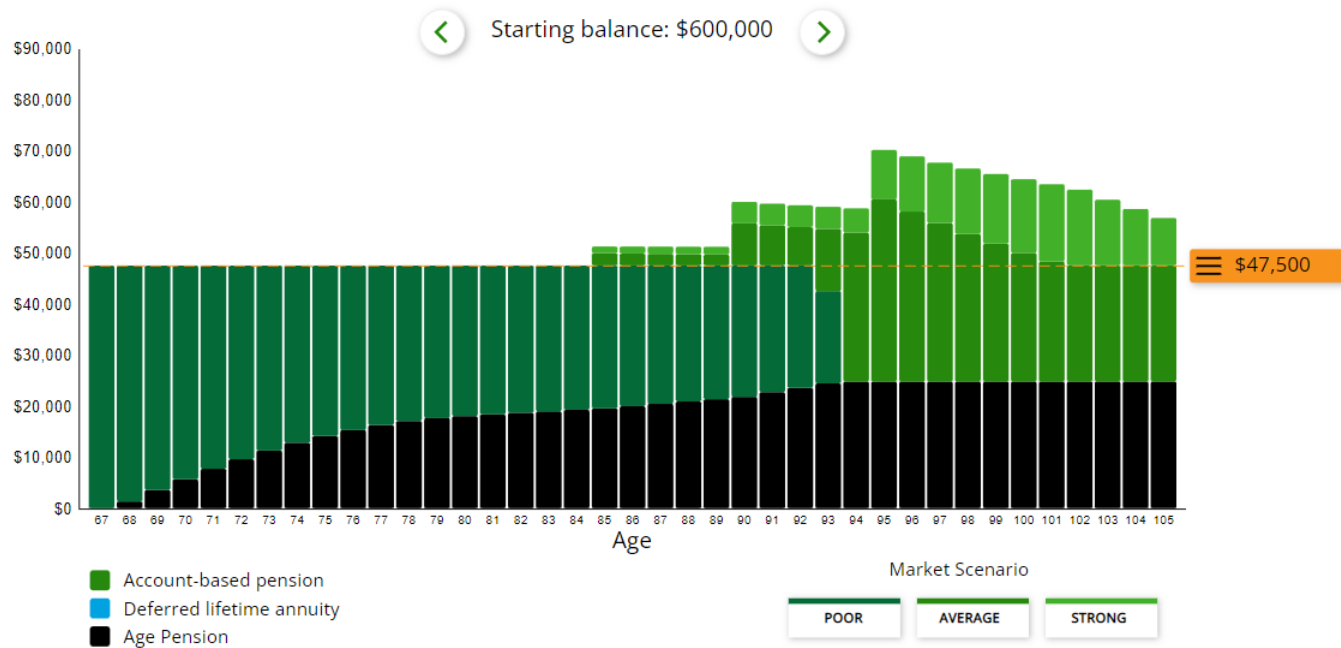


Annuity income settings



Account-based pension asset allocation





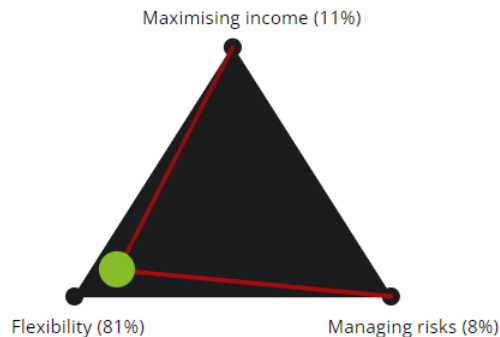
Initial product allocation

\$600,000

ACCOUNT-BASED PENSION

\$0

DEFERRED LIFETIME ANNUITY



Annuity income settings

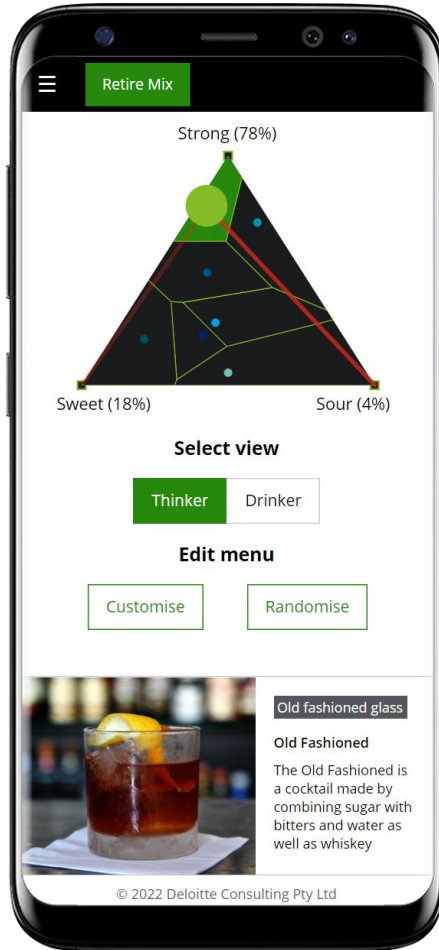
Initial allocation: 0% 0%

Deferral period: 0 years 0 years

☒ Age Pension

Account-based pension asset allocation





Try for yourself!

To see the interactive cocktail trilemma in action, be sure to check out:

retiremix.com

Questions?