



Simplifying complex pension calculations

Lars Jacobsen, September 26th, 2024



Outline

Case: Retirement

- ⚡ What is part of a retirement plan?
- ⚡ What calculations do we need?
- ⚡ What are the dependencies?
- ⚡ How can we simplify it, step 1?
- ⚡ How can we simplify it, step 2?
- ⚡ More ways of using this

Note: At retirement you need to show the participant how much money comes in, what are the expenses, and how does it look over the retirement period.



Some of the calculations



Note: There are a lot of calculations – and they are very complex.

1. What is the intensity that a person dies in age x ?

(based on the Makeham constants A, B and C)

$$\mu_1(x) = A_1 + 10^{B_1 + C_1 x}$$

2. What is the probability that a person dies in age x if he was alive at age x_0 ?

$$l_1(x_0; x) = \exp\left(-A_1 * (x - x_0) - \frac{(\mu_1(x) - \mu_1(x_0))}{\ln(10) * C_1}\right)$$

3. How big is the base quantity, then?

$$\bar{N}_1(x) = \int_x^{\infty} D_1(t) dt$$

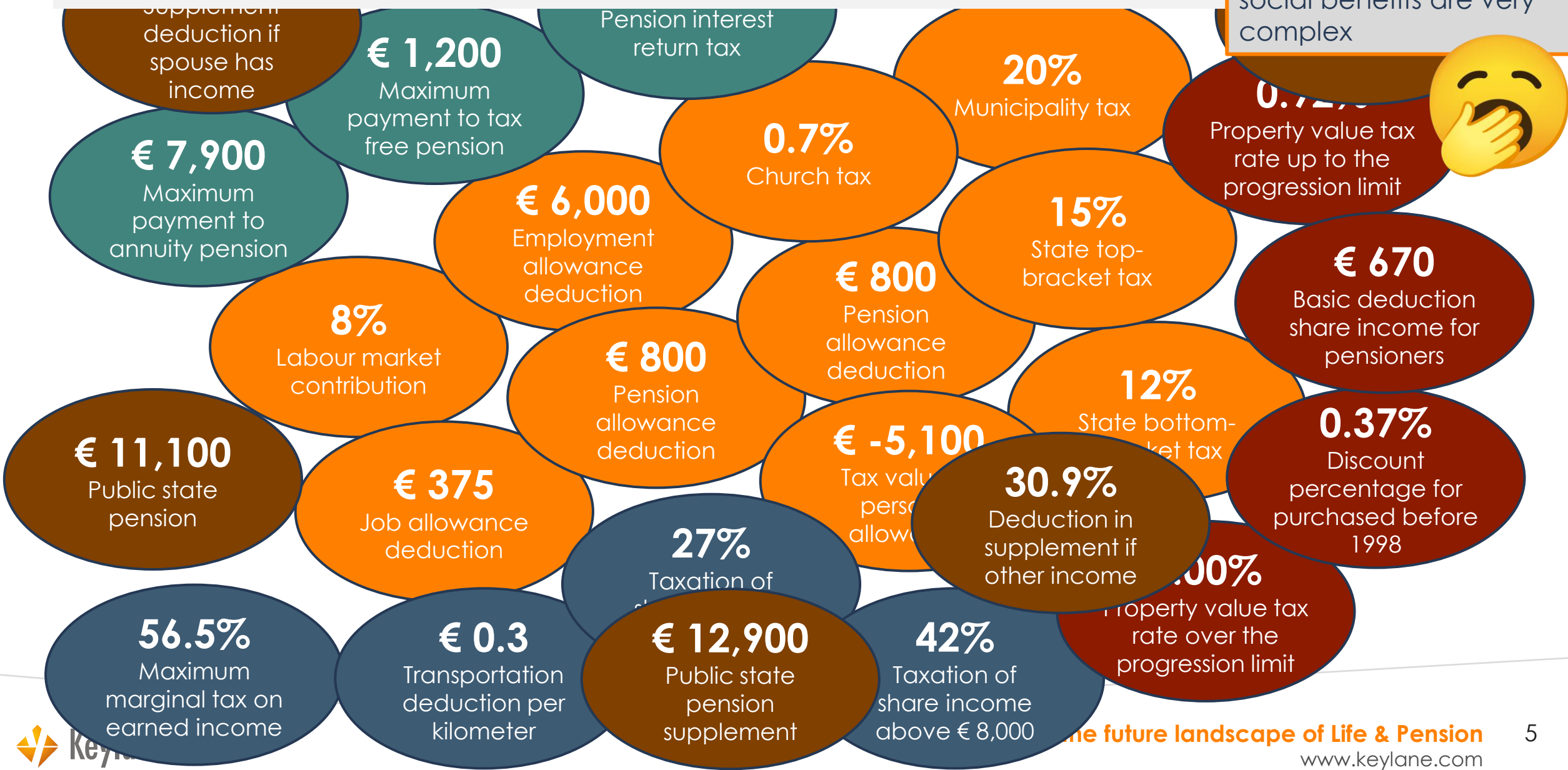
4. How big is the annuity if Person1 dies and Person2 continues?

(where α is the age difference and V is the reserve)

$$V * L^{-1}(x; \alpha) = V * \left(\frac{\bar{N}_2(x; \alpha)}{D_2(x; \alpha)} - \frac{\bar{N}_{1,2}(x; \alpha)}{D_{1,2}(x; \alpha)} \right)^{-1}$$

What should we take into account, then?

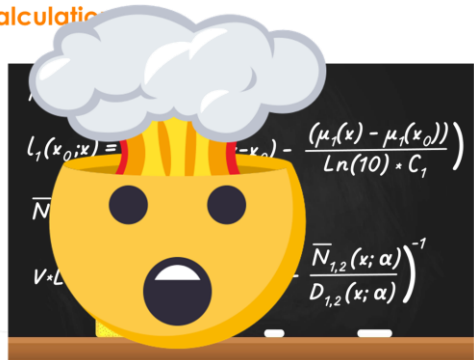
Note: The tax rules and how to estimate the social benefits are very complex



All this boils down to...

Some of the calculations

1. What is the intensity that a person dies in age x ?
(Based on the Makeham constants A, B and C)
2. What is the probability that a person dies in age x if he was alive at age x_0 ?
3. How big is the base quantity, then?
4. How big is the annuity if Person1 dies and Person2 continues?
(where d is the age difference and V is the reserve)

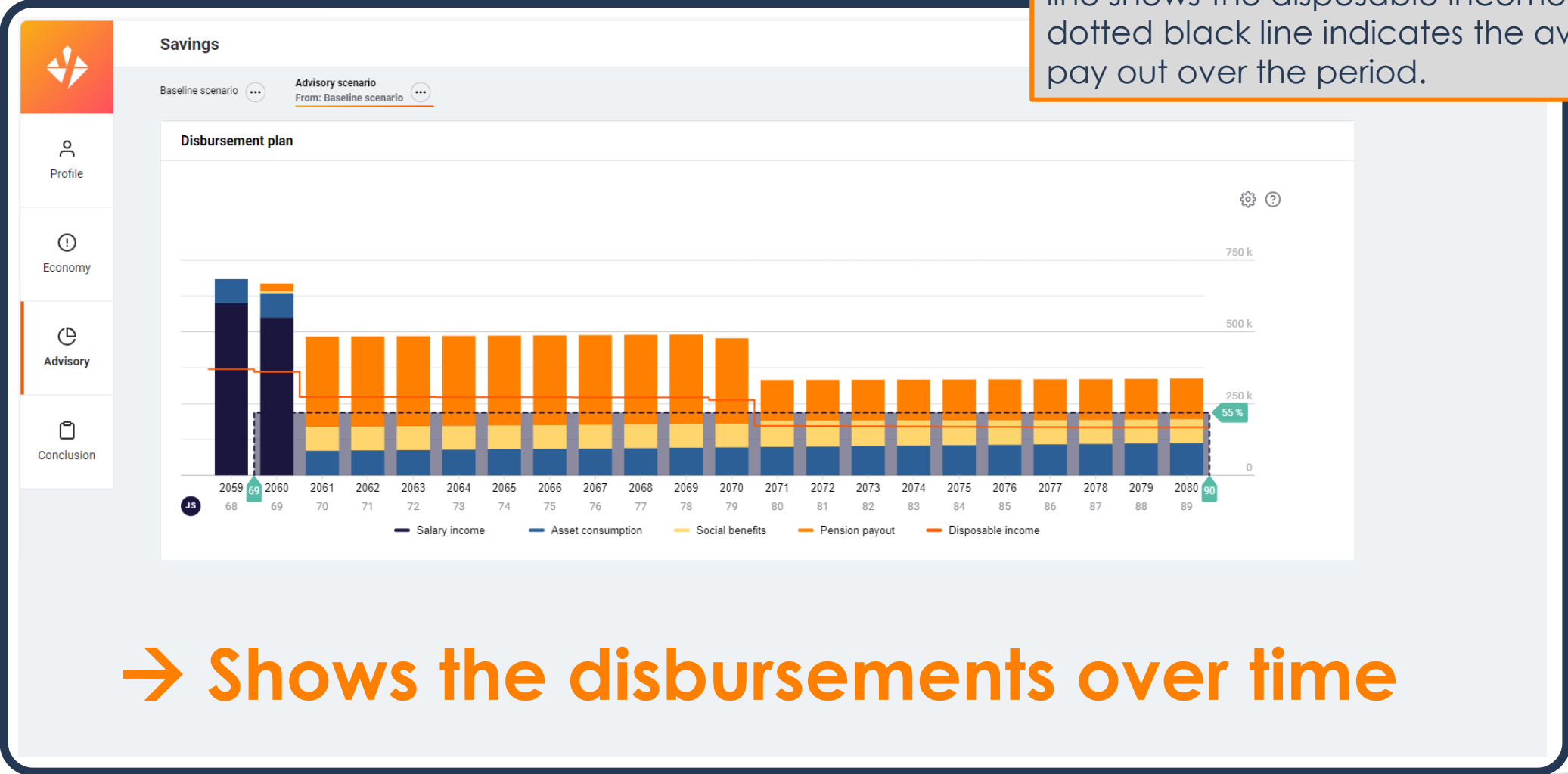


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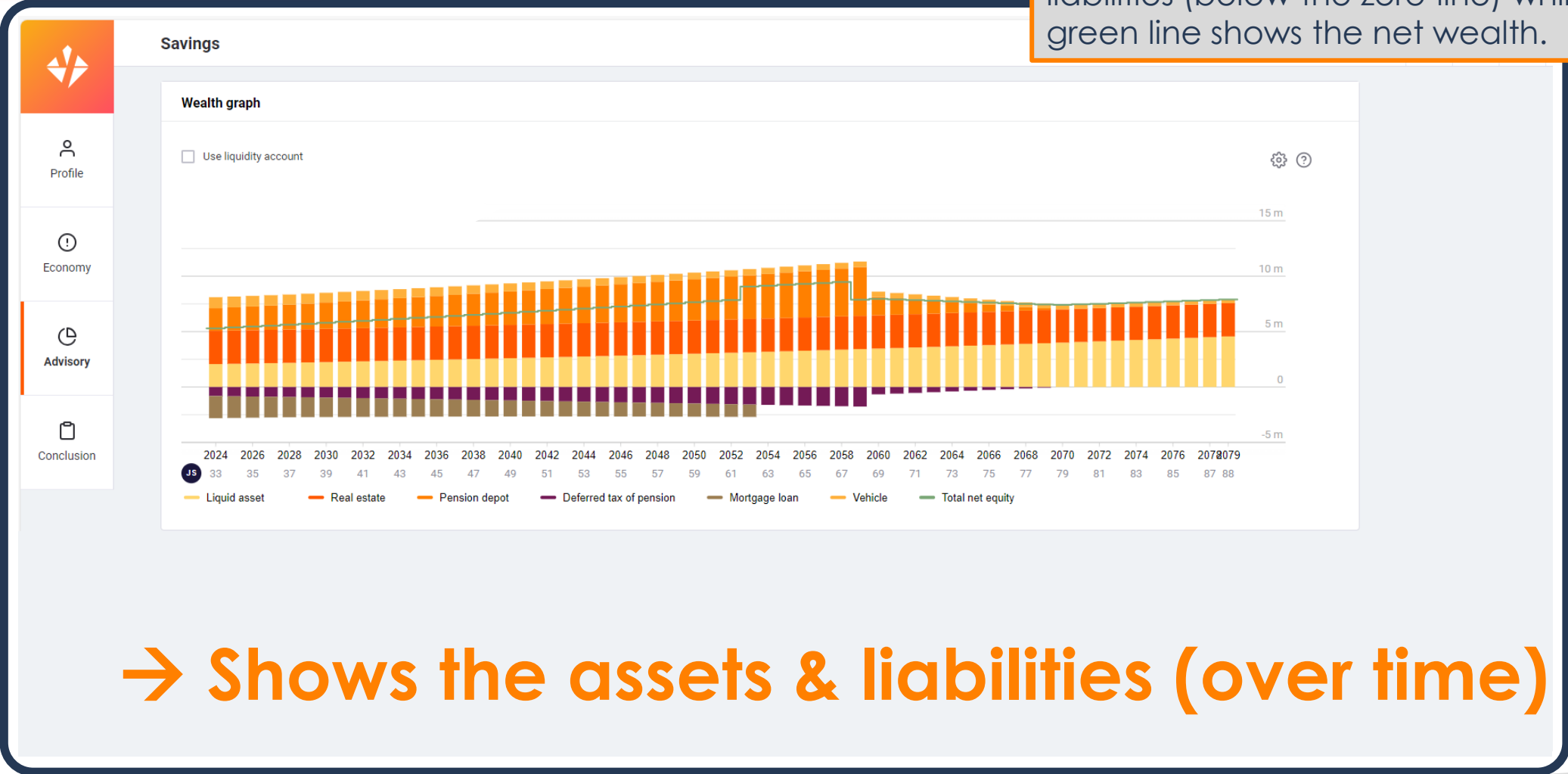
Note: Take all the complex calculations, all the complex tax rules and calculate over the entire retirement period.

Note: The bars shows the gross income in the different categories and the orange line shows the disposable income. The dotted black line indicates the average pay out over the period.

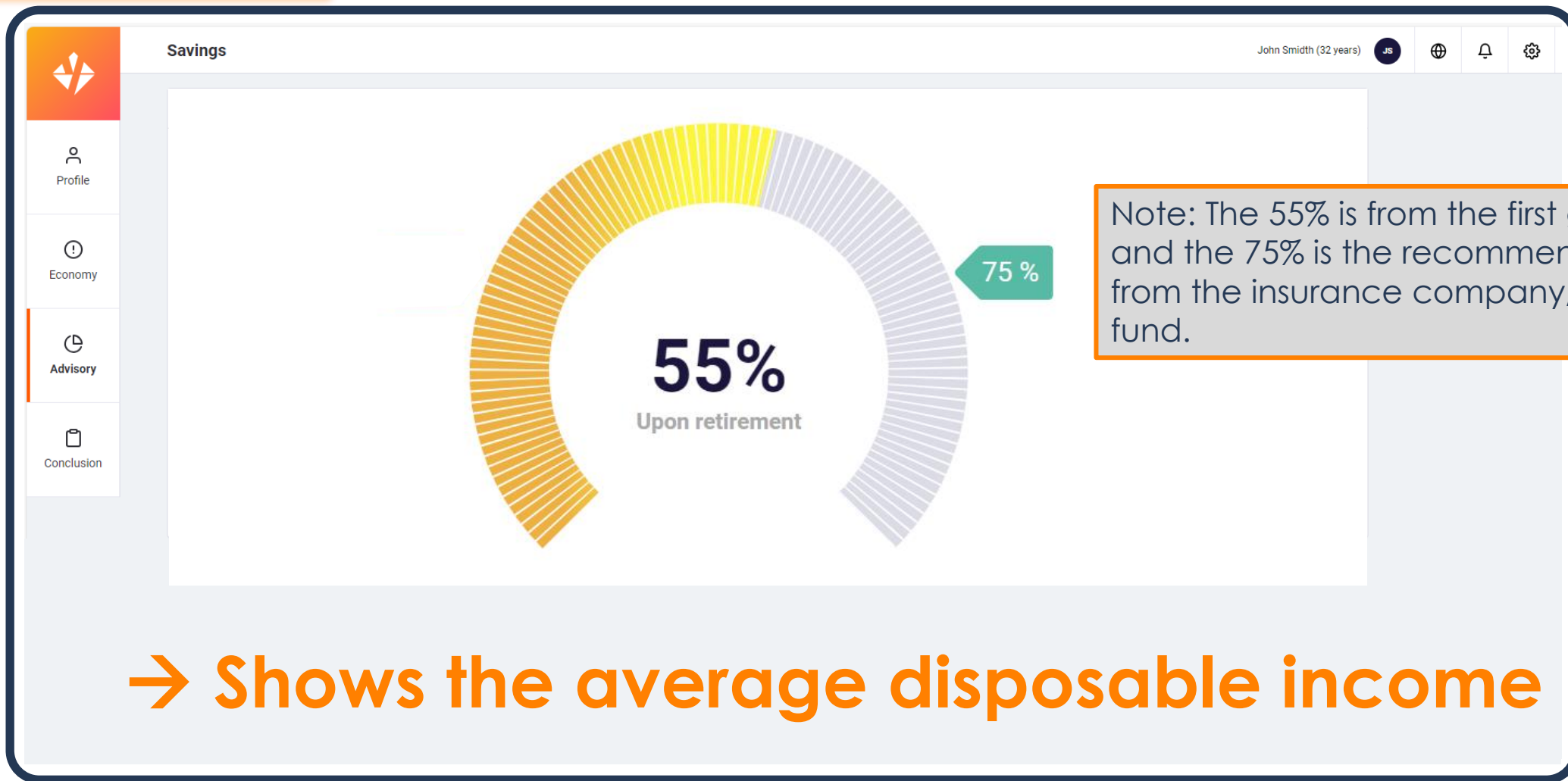


→ Shows the disbursements over time

Note: The bars shows the gross assets (above the zero-line) and the gross liabilities (below the zero-line) while the green line shows the net wealth.

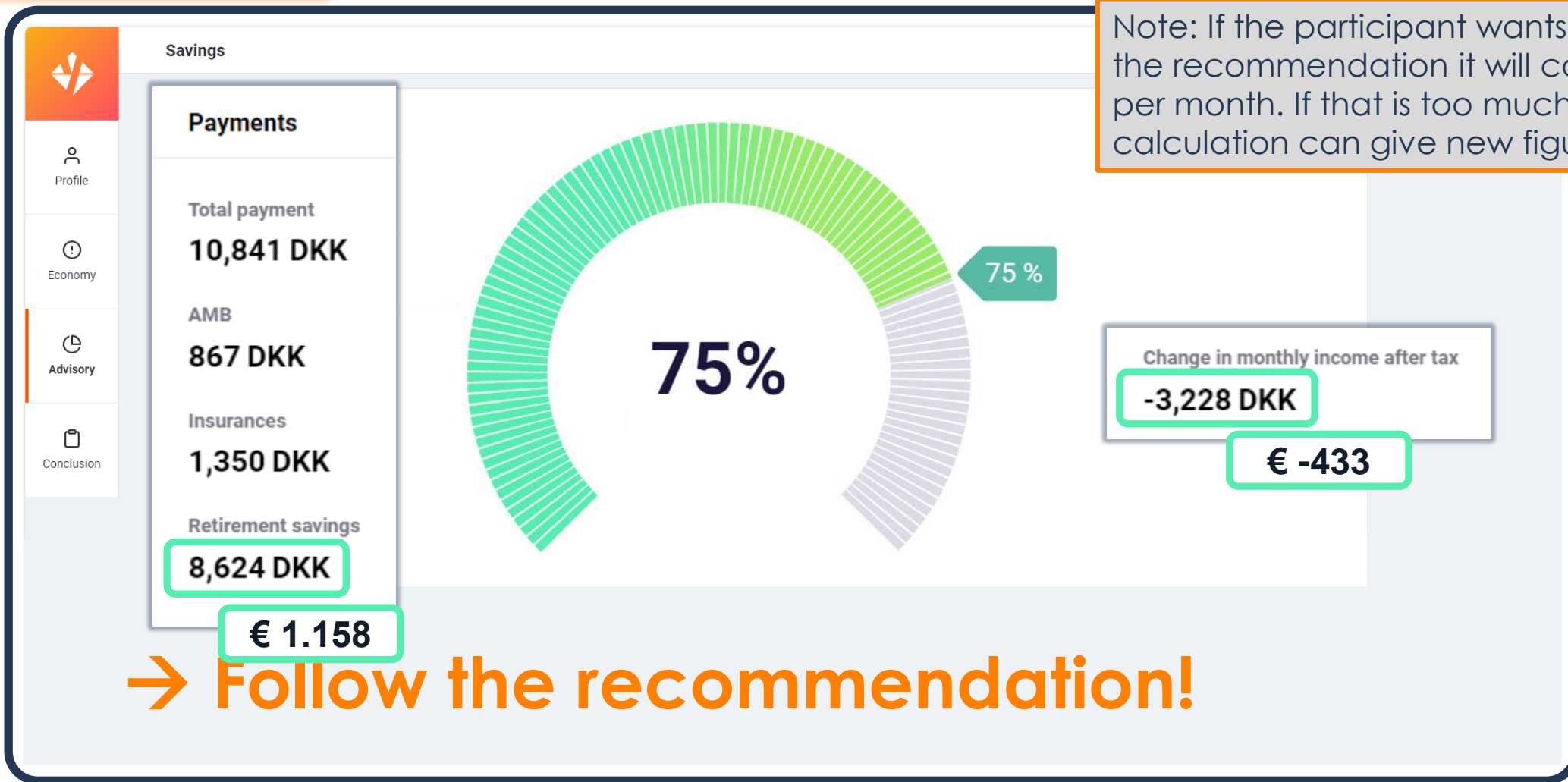


→ Shows the assets & liabilities (over time)



Case: Retirement – super simple

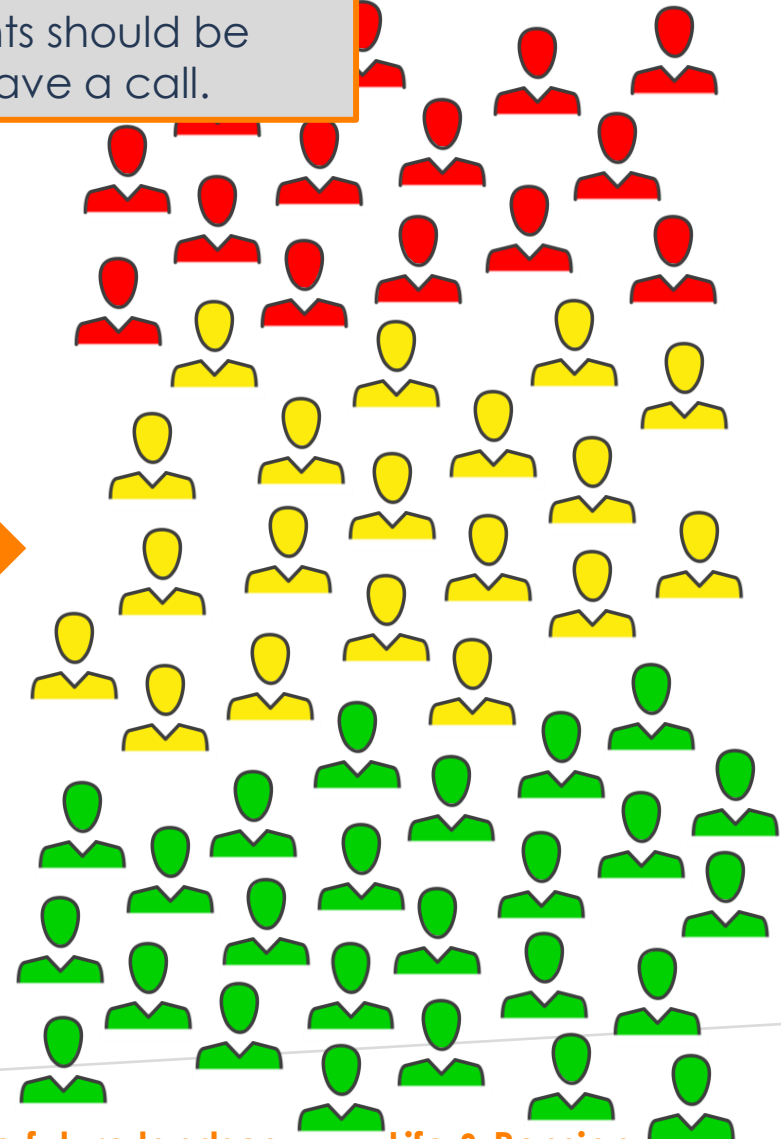
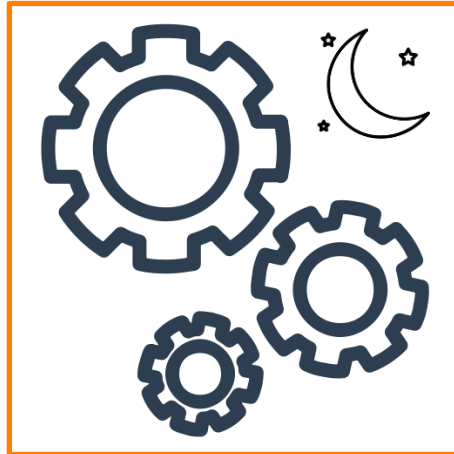
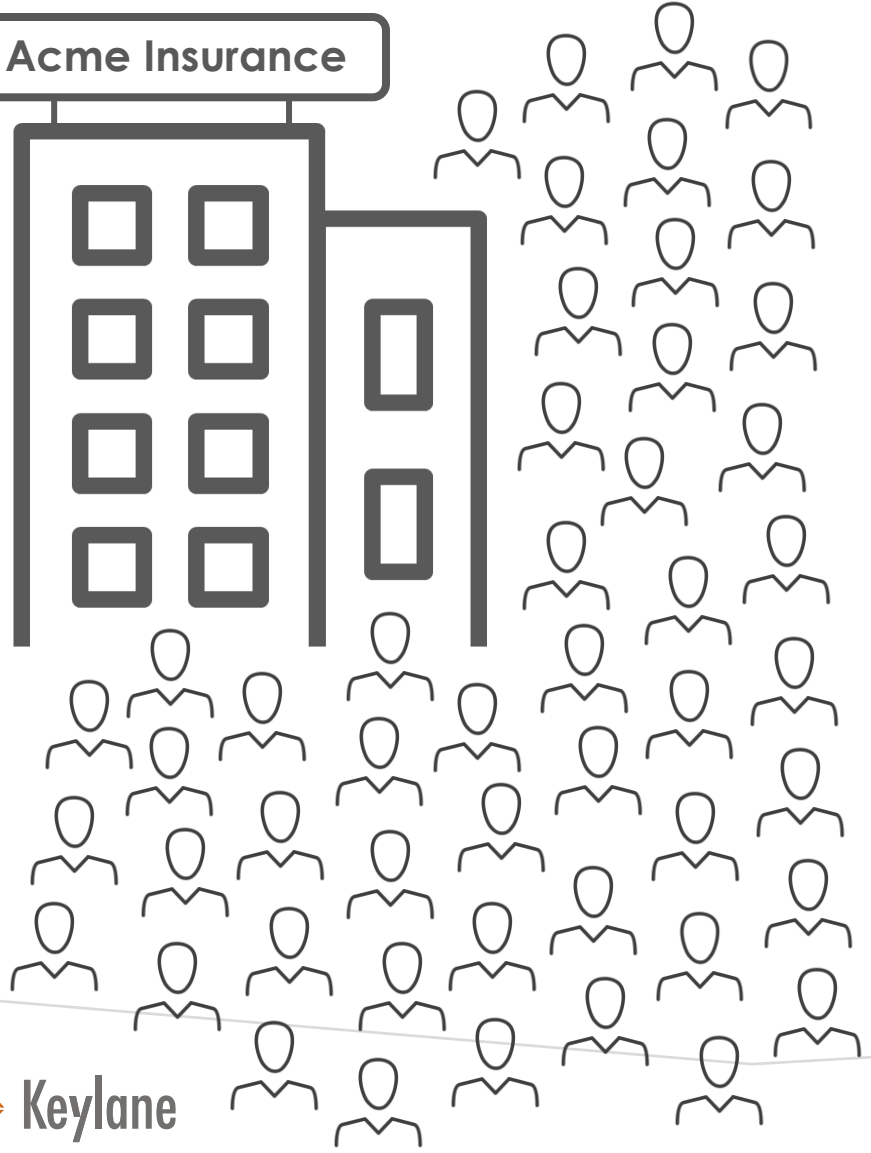
Note: If the participant wants to follow the recommendation it will cost 433 € per month. If that is too much, a new calculation can give new figures.



Help your participants...

Note: The insurance company or pension fund can use the calculation engine on the portfolio to indicate if some of the participants should be part of campaign or have a call.

Acme Insurance



Questions?

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