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HEALTHCARE EXPENDITURE IN THE LAST YEAR OF LIFE

AN ACTUARIAL PERSPECTIVE

Research Objectives

- To highlight the key concepts and challenges.
- To investigate the relationship between the average last-year-of-life costs and the average costs in preceding years before death.
- To investigate the relationship between the healthcare costs of those beneficiaries dying and those surviving in a particular calendar year.
- To consider the relationships between last-year-of-life costs and age, categories of expenditure and predicted beneficiary resource use.

Why is this of interest?

- Potentially useful insights for benefit design and managed care
  - high-risk members, palliative care
- Relates to the important issue of rationing of healthcare
  - Limited medical resources being directed to health insurance beneficiaries in their last year of life (Scitovsky, 1994)
  - Difference between a retrospective study and prospective study
- Important for the pricing of risk
  - Understanding the relationship between age, risk categorisation and mortality

Data

- Data provided by an administrator, with insurers and beneficiaries de-identified
- Four-year period (2008-2011)
- 2 sets of data provided: summary data for the entire risk pool and detailed data for decedents
- 36,711 decedents in the sample

Clinical Groupers

- Data representing each decedent's Resource Utilisation Band (RUB) were also provided.
- An indication of a beneficiary's expected future healthcare utilisation and costs
- Values 0 to 5: the higher the value, the higher the predicted resource utilisation for the beneficiary.
- Determined using the (proprietary) Johns Hopkins Adjusted Clinical Groupings (ACGs) Case-Mix system
- Only provided for beneficiaries who have exposure > 6 months.

Methodology

Last year of life as compared to prior years

Analyse the relationship that exists between the years prior to death (not calendar years)

Age at death

Only decedents are considered

Comparison of decedent and survivor costs

Determine extent to which decedent costs vary from survivor costs within a particular calendar year

Age at 1 Jan

Both survivors and decedents are considered

Healthcare Costs in the Last Year of Life

Determine exposure period

Calculate aggregate exposure.

Calculate aggregate healthcare costs in each year prior to death.

Compare years by taking ratios.

This method is carried out for age at death, category of expenditure and RUB value.

Healthcare Costs in the Last Year of Life

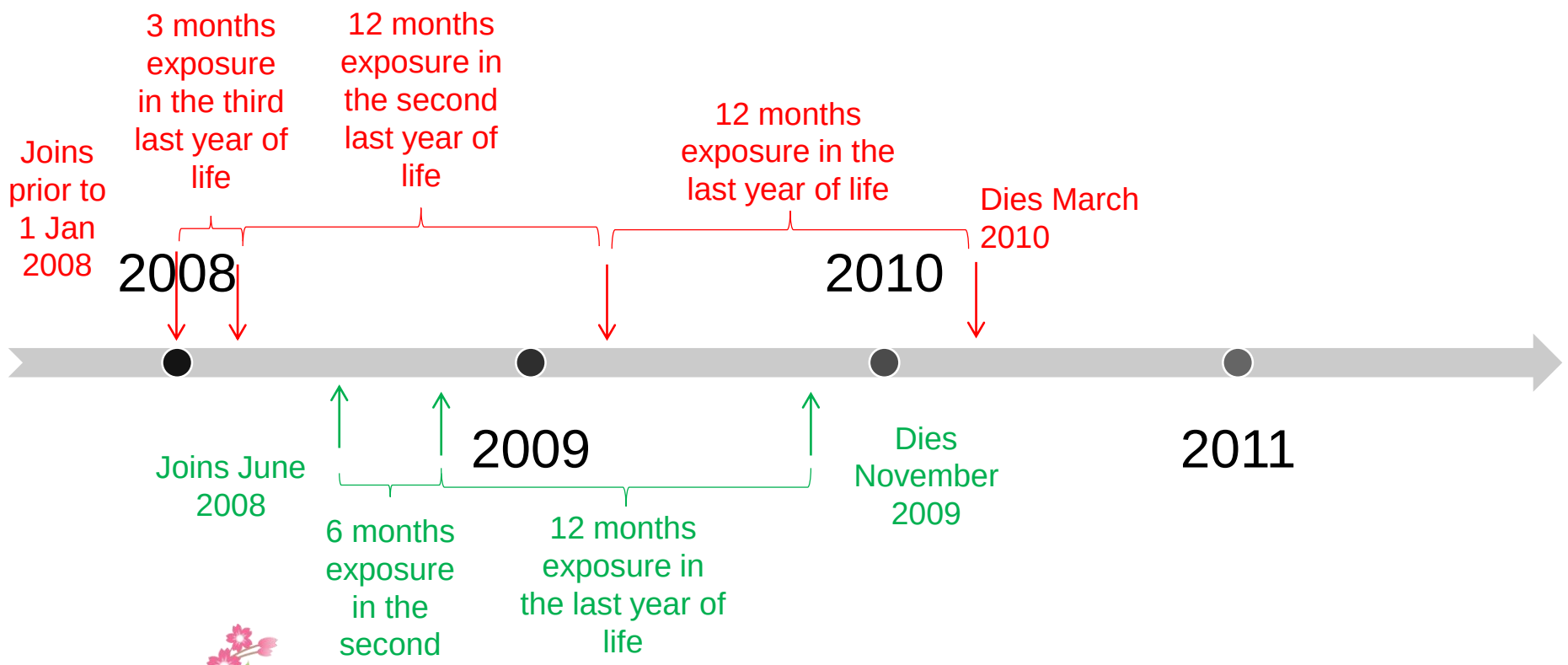
Determine exposure period

Ascertain the latest date on which each beneficiary discontinued their medical scheme cover – either on death or prior. Determine the date on which exposure began – later of 1 Jan 2008 and join date.

Healthcare Costs in the Last Year of Life

Calculate aggregate exposure. Divide exposure period into the respective years prior to death for each beneficiary. Computed using the end of the month of death. Aggregate exposure was calculated by summing all beneficiaries' exposure months falling within each respective year prior to death.

Example of Allocating Exposure



Note on Aggregate Exposure

- Calculated exposure is subject to overestimation of exposure period.
  - End of exposure is end of the month, irrespective of when the beneficiary died.
  - Start of exposure is assumed to be the start of the month. Vast majority of joining dates fall at the beginning of the month but there were some data points which had to be adjusted.
- Principle of correspondence:
  - Consistency between claims and exposure as claim amounts are summarised by treatment month

Healthcare Costs in the Last Year of Life

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This method is carried out for age at death, category of expenditure and RUB value.

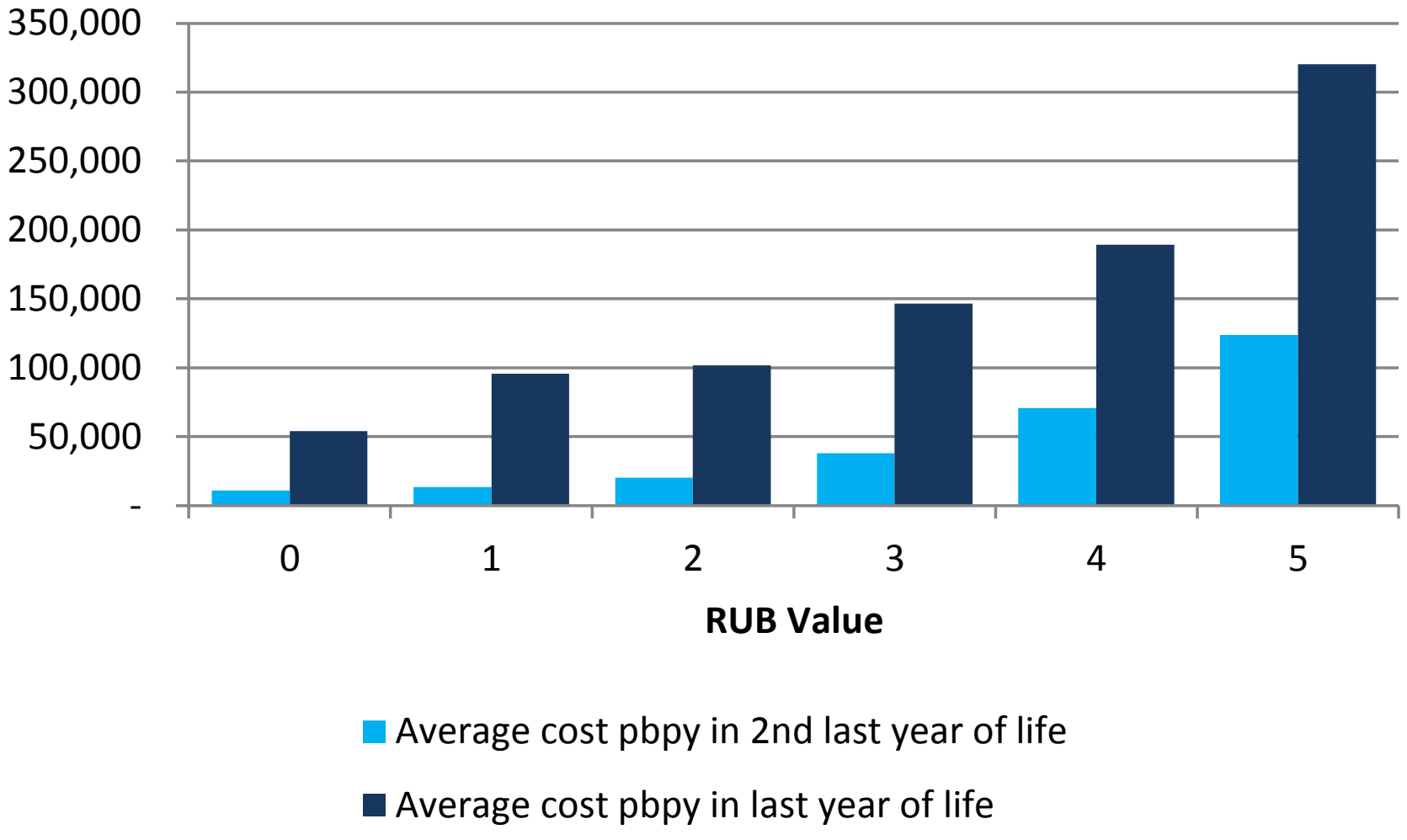
A note on inflation adjustment

- Important to obtain results in real terms (first of January 2011 prices)
- Choice of inflation factor important
  - Basket of goods
  - Consumer perspective vs. funder perspective

Average claimed amount for each year prior to death, as well as the ratio between the average claimed amounts in the successive years prior to death

	Year Prior to Death			
	1st	*2nd*	*3rd*	*4th*
Average Cost (in ZAR)	**187 388.06**	53 158.52	41 391.43	36 311.39
Ratio	**3.53**	1.29	1.14	

Notes: $p < 0.01$ for all t-tests of differences between average costs of successive years before death



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Comparison of decedent and survivor costs

Decedents' costs and exposure periods aggregated by summing all decedents' costs and exposures respectively, within each calendar year

In the same way, aggregate survivor costs and exposure are calculated.

Ratios are calculated to compare the average survivor and decedent costs within each calendar year.

This method is carried out for age at 1 Jan, category of expenditure and for PMB/non-PMB costs.

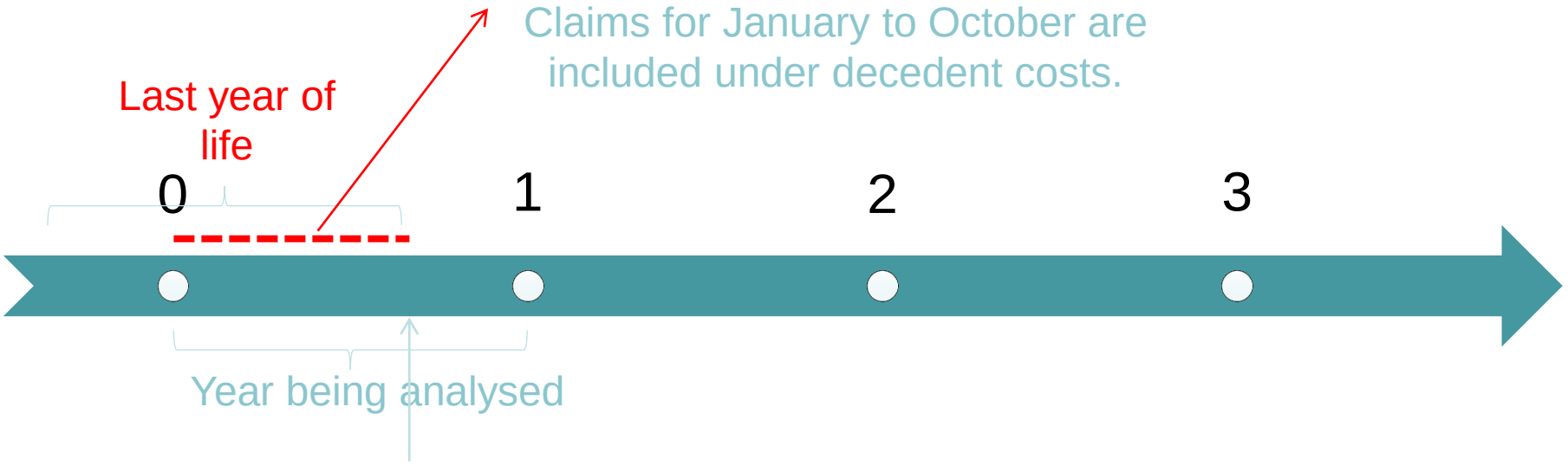
Comparison of Decedent and Survivor Costs

- The last year of life is as defined previously (i.e. overestimation of decedent exposure)
- There are three scenarios for allocating costs

Scenario 1	Scenario 2	Scenario 3
• Dies in the year being analysed	• Dies in the calendar year subsequent to the year being analysed	• Survives the calendar year being analysed and the subsequent year

Scenario 1

10 months of exposure, all assigned to decedent exposure.
No contribution to survivor exposure.
Claims for January to October are included under decedent costs.



Dies in October of the year being analysed

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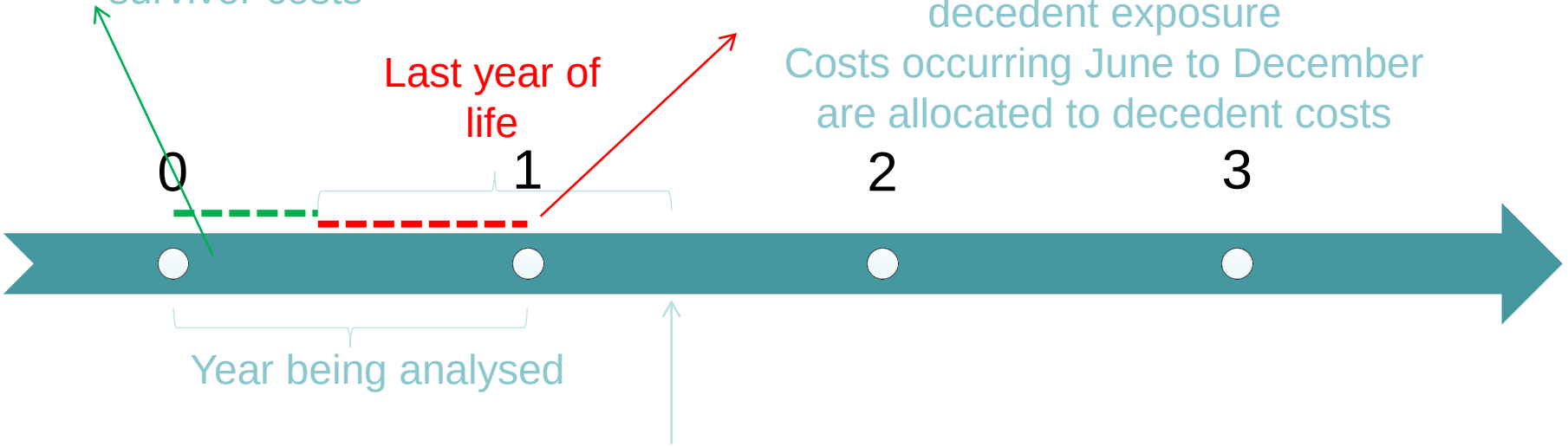
Scenario 2

5 months exposure allocated to survivor exposure.
Costs occurring in Jan to May are allocated to survivor costs



Dies in May in the calendar year subsequent to the year being analysed

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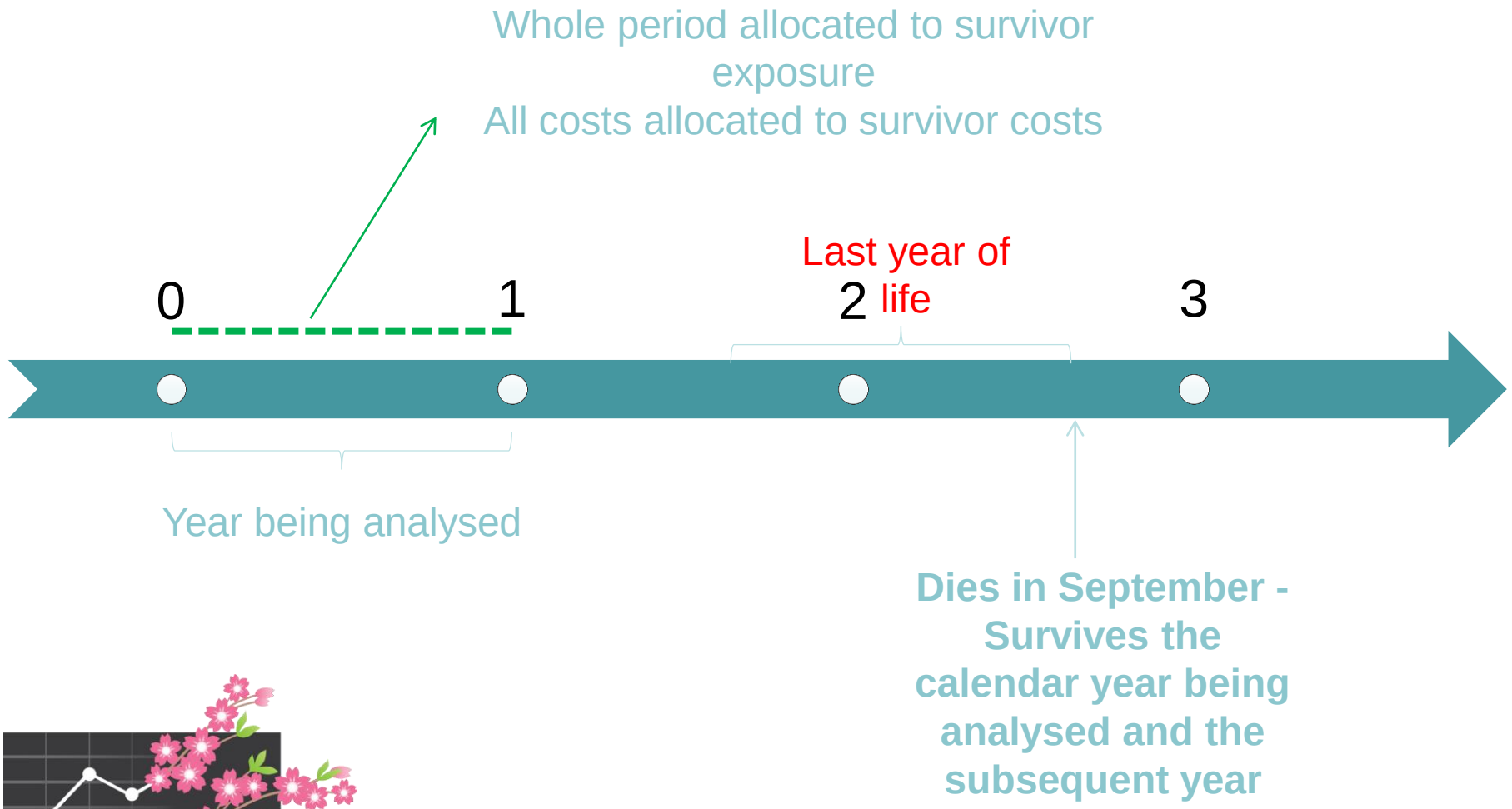
Scenario 3



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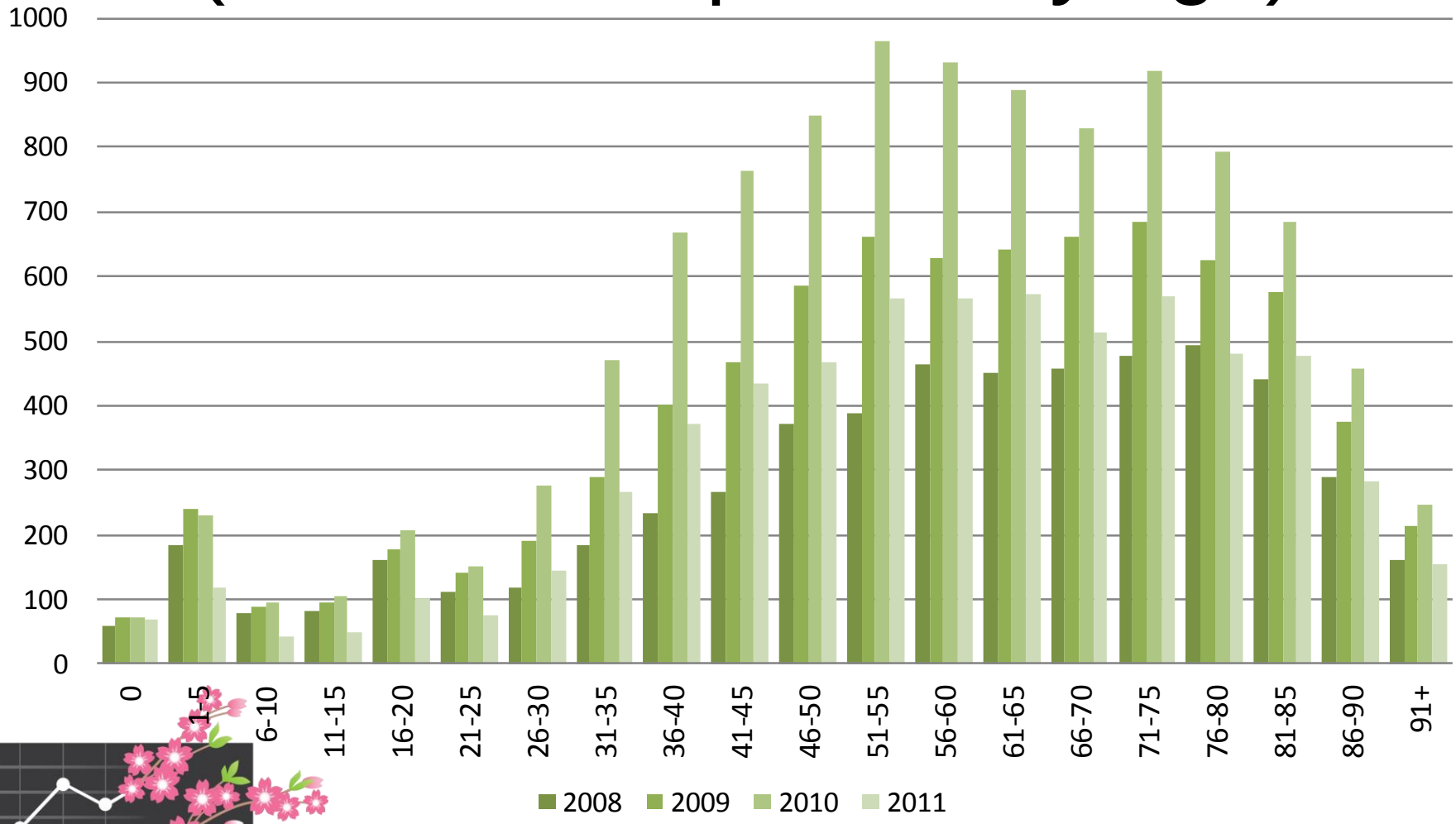
Incomplete Mortality (decedent exposure by age)



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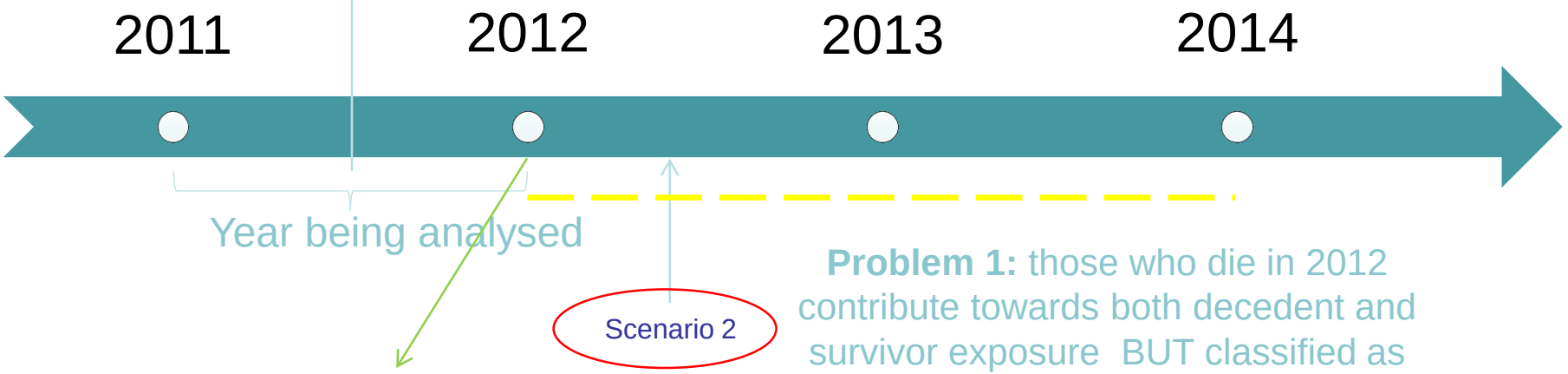
The challenge of incomplete mortality

Problem 2: Beneficiaries dying in 2011 are, on average, closer to death than that of beneficiaries dying in 2012. So aggregate decedent costs are substantially higher than for other calendar years.

RESULT: significant overestimation of average decedent costs in 2011.



Problem 1: those who die in 2012 contribute towards both decedent and survivor exposure BUT classified as survivors. Result: decrease in decedent exposure for 2011. Same applies for costs.

Assumption: everyone who survives to 31 December 2011 is classified as a survivor

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Risk Adjustment

- Survivor and decedent exposure distributions vary considerably
- In order to make the comparison of average survivor and decedent costs more meaningful, it is necessary to risk adjust the average costs by age and gender.
  - adjusting the averages in such a way that it is as if they are determined from a population with the same age and gender profile.

Analysis of Survivor and Decedent Costs

Year	2008	2009	2010	2011
Percentage	3.92%	5.23%	6.57%	5.39%
Risk-Adjusted Average Decedent Claim Amount (in ZAR)	120,890	149,189	157,760	213,856
Risk-Adjusted Average Survivor Claim Amount (in ZAR)	9,711	10,299	10,072	10,287
Ratio	12.45	14.49	15.66	20.79

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Conclusions: Methodology

- The principle of correspondence
- Appropriate inflation adjustment
- Risk adjustment to ensure comparability of survivors and decedents
- Adjusting for incomplete mortality data
- Statistical testing of results

Conclusions: Benefit Design

- Thinking about the “place of dying”
- Possible benefits from greater co-ordination of care for the frail and chronically ill
- Trends in last-year-of-life expenditure may be revealing in terms of technological advances (Stearns & Norton, 2004), for example, new cancer treatments