Injury Schemes Seminar
Balancing Outcomes
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Actuaries Institute

Mortality experience and projections for catastrophic injuries

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Why is this important?

- Life expectancy is a key driver of how much it will cost to pay for care
- The total cost of care is highly sensitive to mortality
- Especially important for schemes paying periodic benefits including NDIS
- Little available data
  - most studies' focus is on survival rates just after accident
  - few longitudinal studies for catastrophic injuries
  - accident compensation schemes are relatively new and none are fully "mature"

Two key aspects

1. Mortality Experience
2. Rates of improvement in mortality for people with catastrophic injuries

Important to look at both the number and liabilities of deaths to ensure you get the correct mix by cohort

Mortality Experience

Data used in our analysis

- TAC data: Motor vehicle accidents from 1980 to 2013
- ACC NZ data: Motor vehicle and other accidents from 1975 to 2013
- Across both schemes, issues with data capture limited the analysis to the past 6 years
- Population mortality Aust life tables 2009-11 and NZ life tables 2010-12

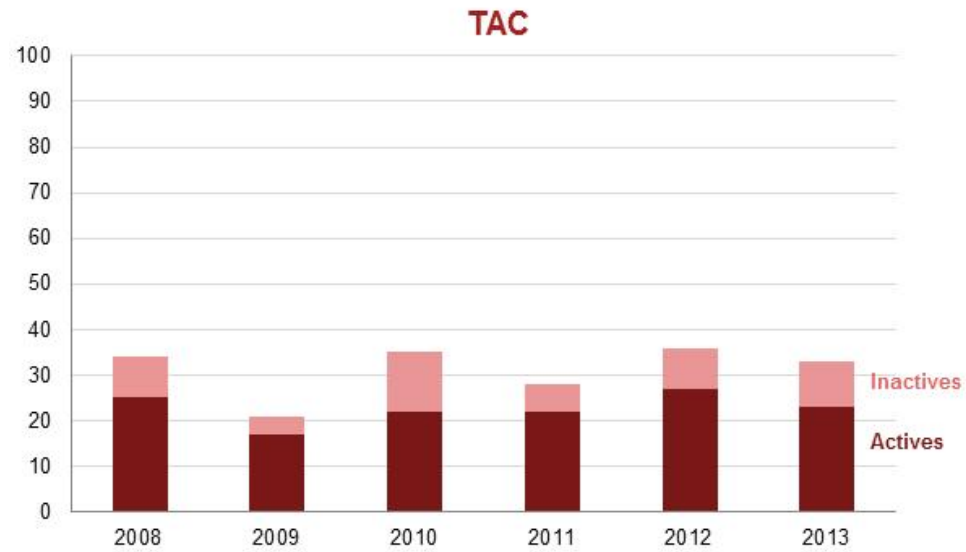
- Information analysed
  - Age
  - Injury
  - Duration from accident
  - Amount of care received

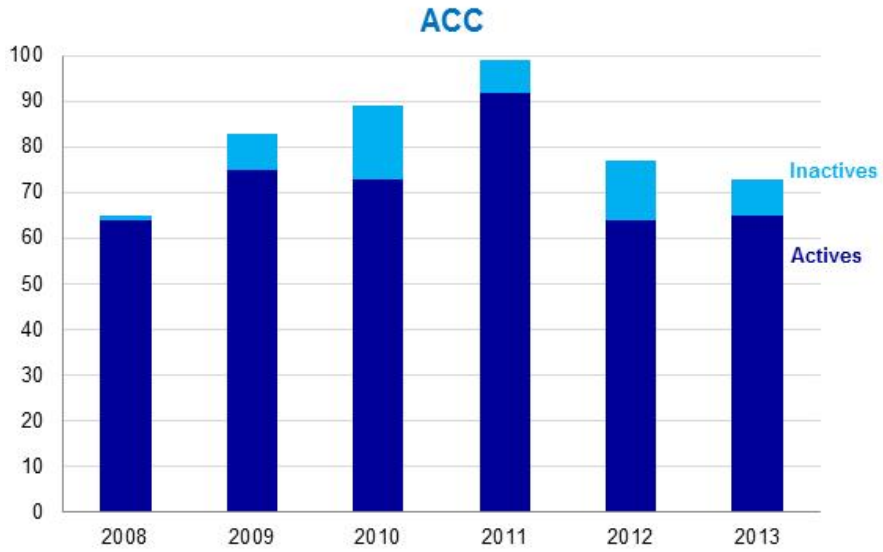
- Information which was not analysed
  - FIM
  - *Location of care (home or accommodation)*

What are catastrophic injuries

- Brain injuries
- Spinal cord injuries
- Multiple amputations
- Burns

Number of Deaths – by Service Year

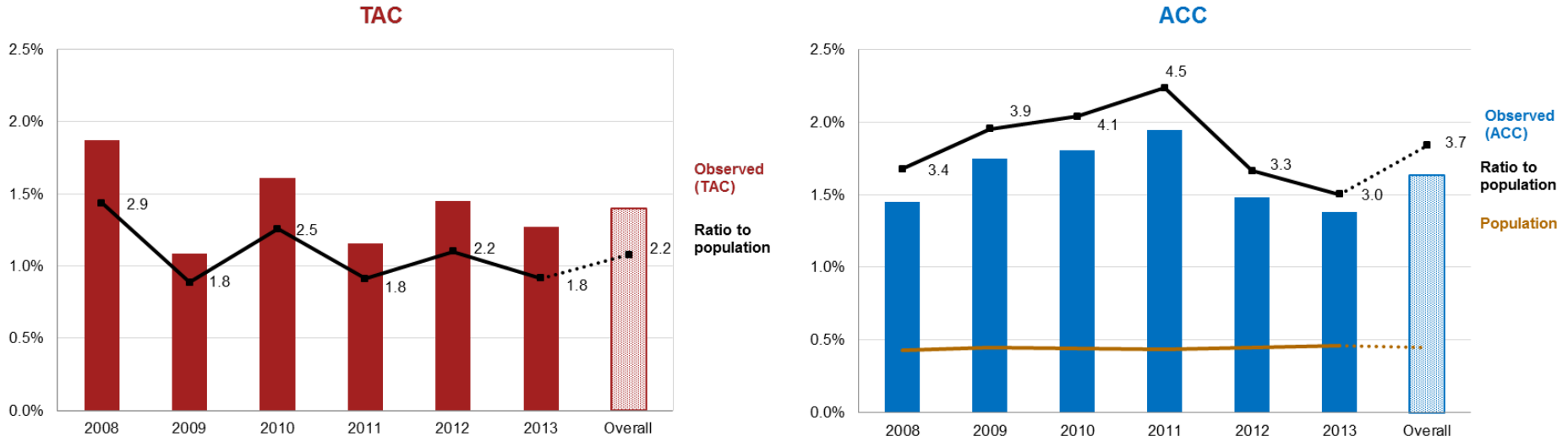




TAC averaged 31 deaths p.a.
(1.4% of claims)

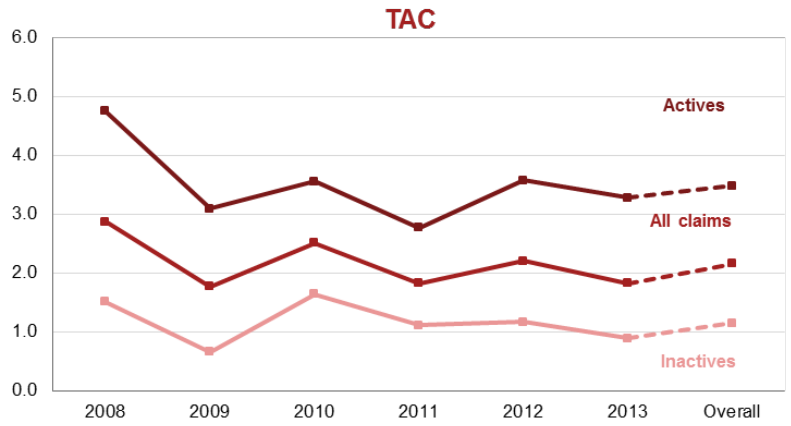
ACC averaged 81 deaths p.a.
(1.6% of claims)

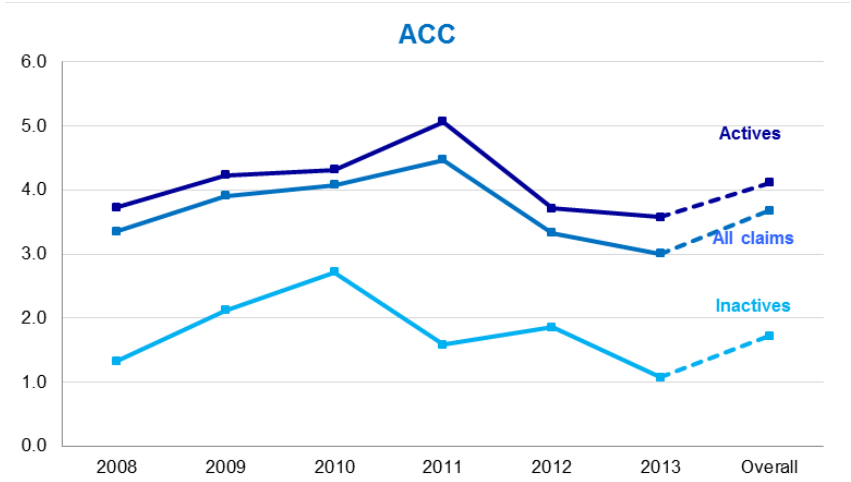
Mortality Rate – by Service Year



- **TAC has lower mortality than ACC relative to population** which is due to: injury, age and cultural mix
- The reduction in multipliers for ACC is due to more inactive claims being captured

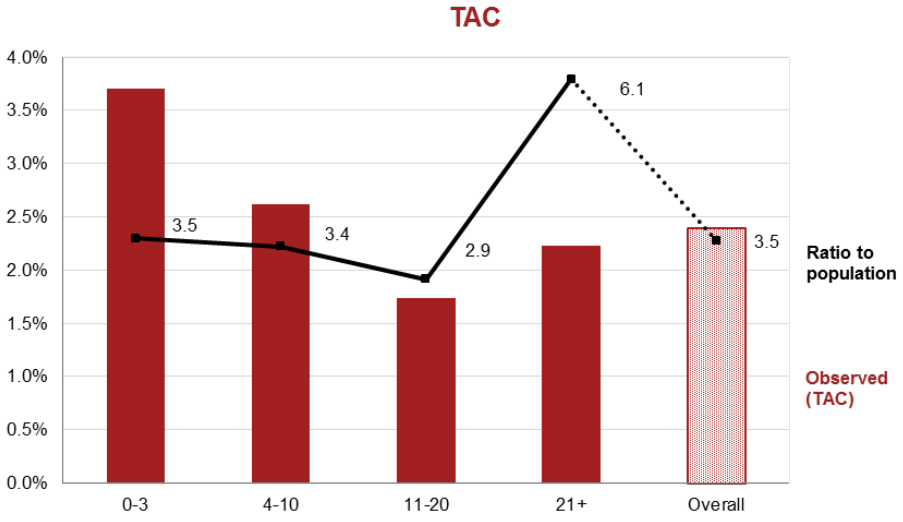
Mortality Multipliers – Active vs Inactive clients

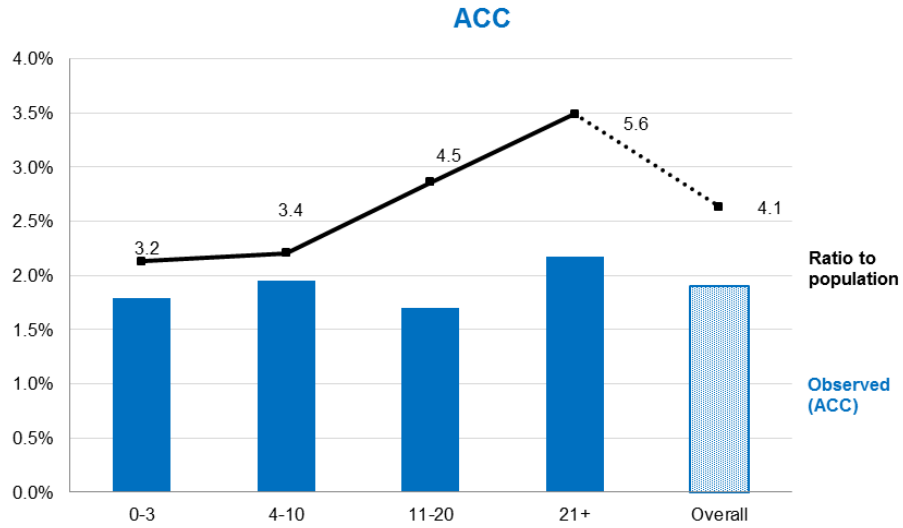




- **Mortality rates much higher for active clients** (i.e. receiving paid care)at 3 to 5 times population
- For inactive claims (i.e. not receiving paid care) mortality is close to population
- Smaller proportion clients are inactive for ACC as family provided care is paid for in NZ

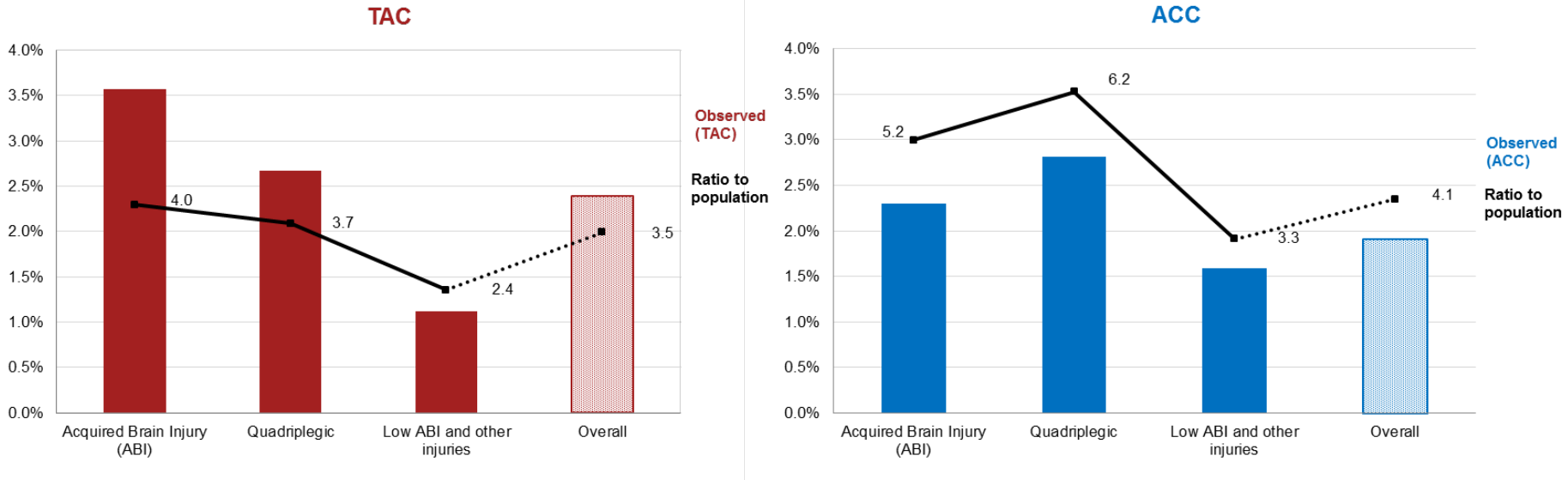
Mortality Rate – by Duration for active claims





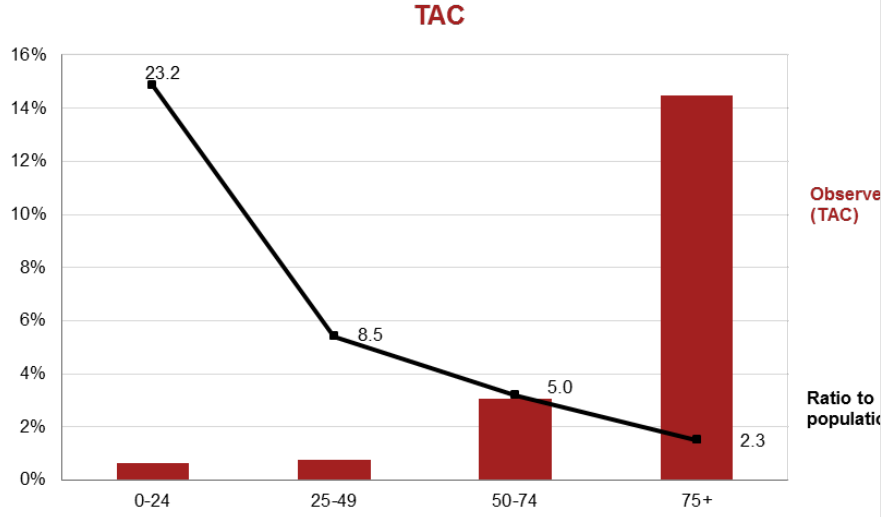
- Not a key driver of experience for TAC, but is a relationship for ACC
- For ACC this increasing ratio to population is attributable to people injured as a child rather than those injured aged 40+ as mortality rate is similar to other durations

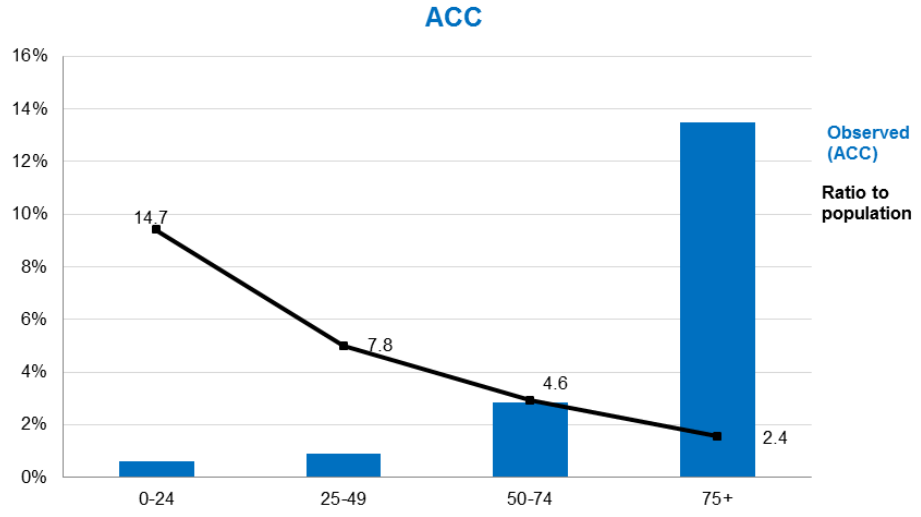
Mortality Rate – by Injury type for active clients



- Within each scheme, **experience is similar for ABI and Quadriplegic injuries**
- Lower mortality for less severe brain injuries
- ACC has higher ratios to population across all injuries

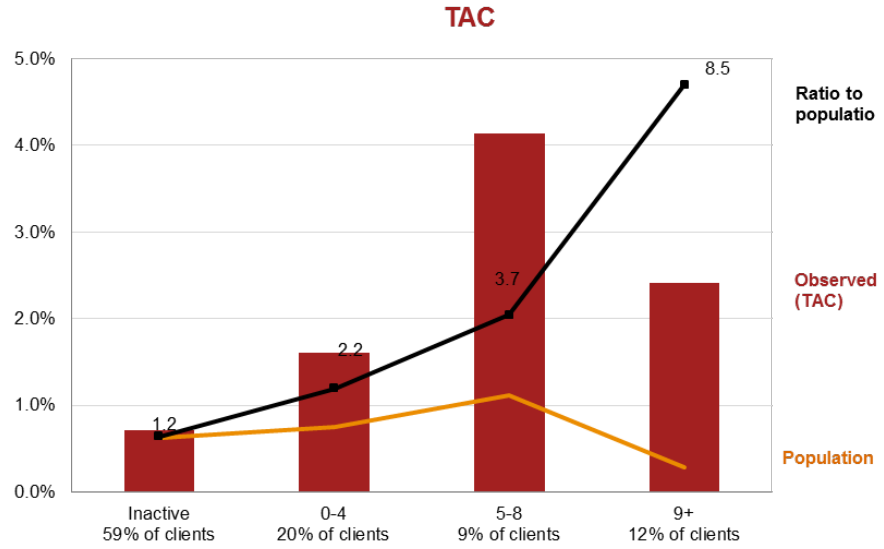
Mortality Rate – by Age for active clients

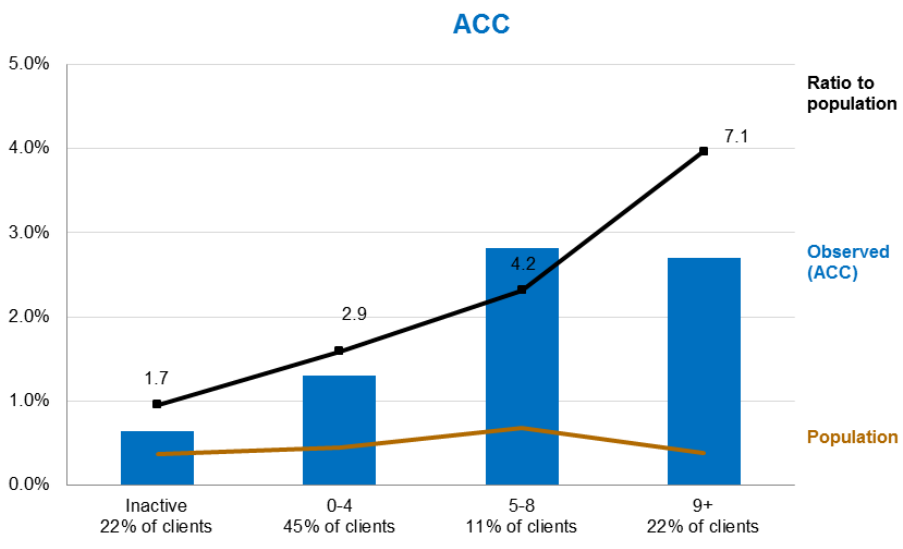




- **Experience is quite similar by age for TAC and ACC** with slight higher ratios for TAC

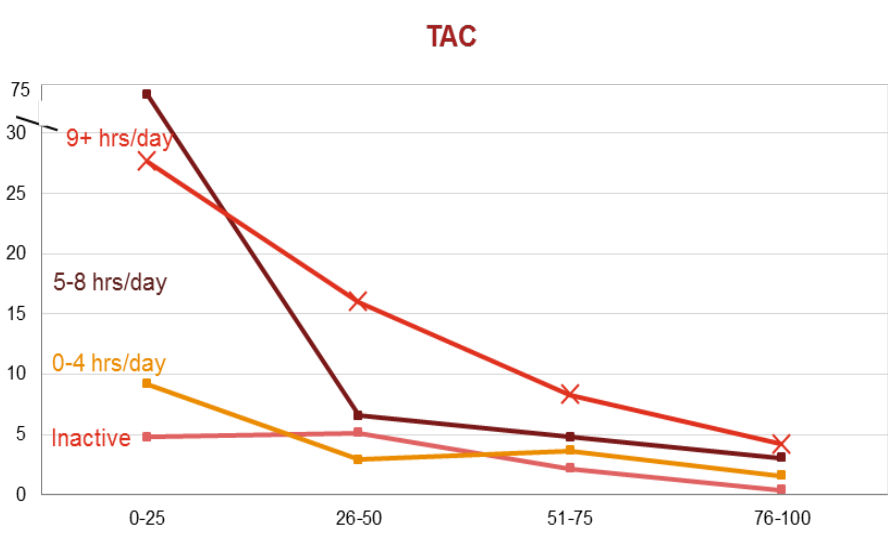
Mortality Rate – by hours of care per day

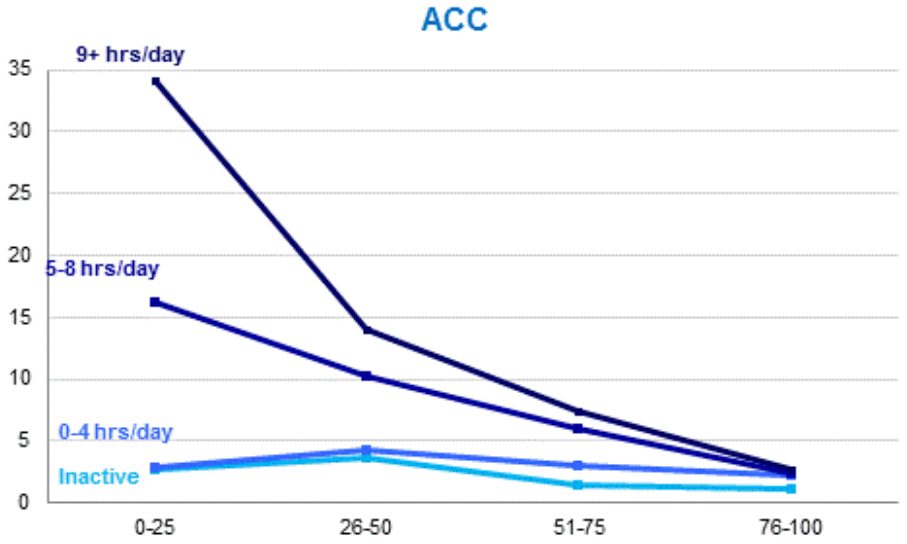




- Hours are an approximation only. Rates charged vary by type of service, location and provider
- Similar experience across both schemes. TAC has lower mortality at less than 4 hours of care a day but higher mortality when more than 9 hours of care a day
- High proportion of TAC clients with minor brain injuries are not receiving paid care

MSR – by Age and hours of paid care per day





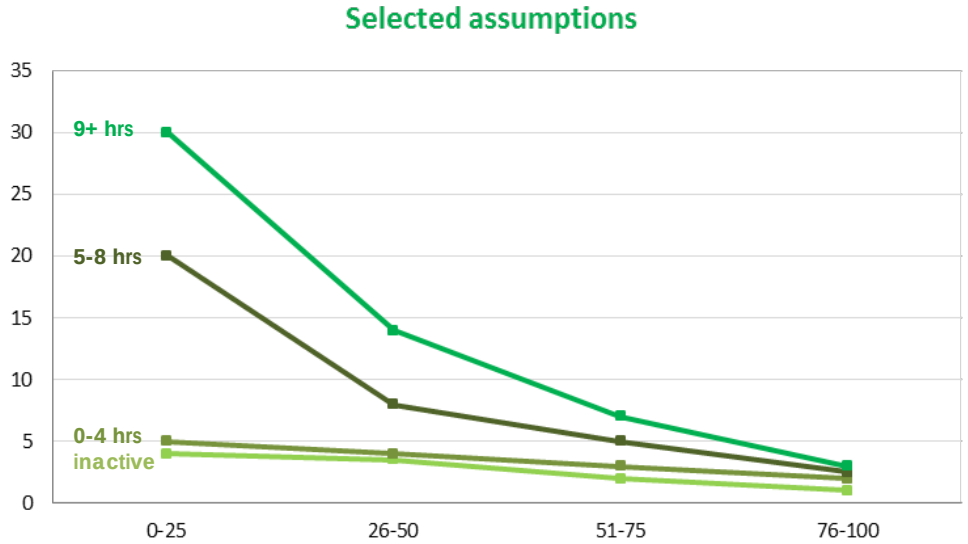
- **The more care one receives, the higher the mortality probability**
- Experience is relatively consistent by injury group
- For 9+ hours of care a day minimal difference between 9-16 hours and 17+ hours

Drivers of catastrophic injury by importance

Variable	Importance
Age	Very high
Amount of care provided	High
Injury	Low
Duration	Low
FIM	Unknown

- Amount of care provided is a proxy for health but is affected by scheme management, and social attitudes to the degree of paid care provided.
- Amount of care is not an ideal predictor as it is neither static nor 100% foreseeable (unlike age)

Estimated Mortality: Multipliers



Age	Amount of care			
	Inactive	0-4	5-8	9+
0-25	4.0	5.0	20.0	30.0
26-50	3.5	4.0	8.0	14.0
51-75	2.0	3.0	5.0	7.0
76-100	1.0	2.0	2.5	3.0

- Minimal differences between inactive clients or those receiving less than 4 hours of care
- Increases in care may reduce life expectancy and therefore potentially the liability
- Consider if this reasonable for small versus large changes in hours of care received

Scottish Experience Comparison

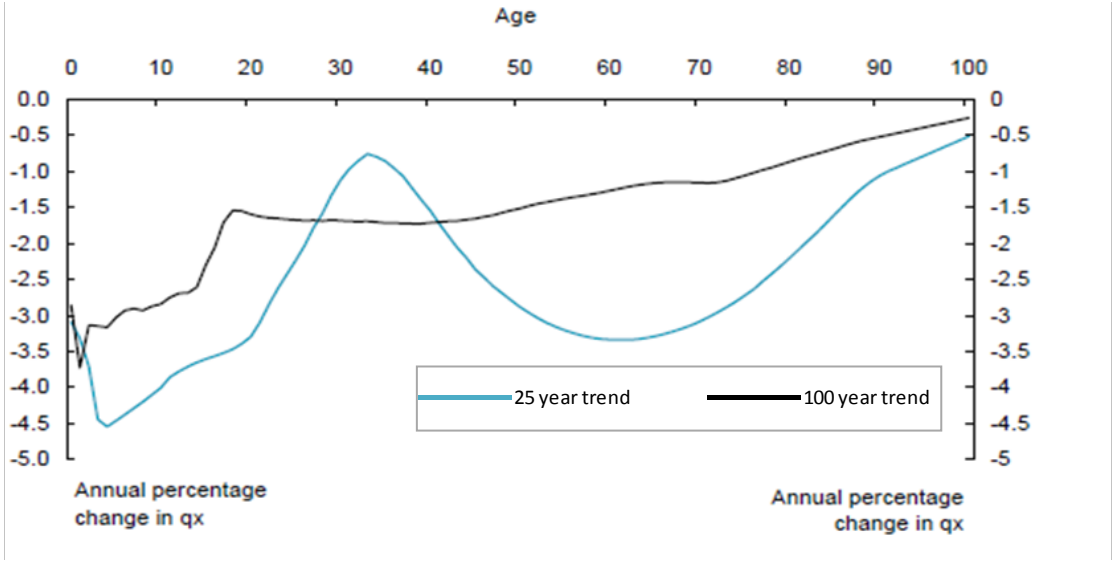
- Research by McMillan et al in 2011 focussed on brain injuries only.
- Difference in age mix for Scottish study so raw mortality is higher than TAC or ACC
- Ratio to population mortality is similar across all three jurisdictions

		Ages 0-54	Ages 55+
Mortality Rate	TAC	0.5%	3.2%
	ACC	0.7%	3.6%
	Scotland	1.7%	6.1%
Ratio to population	TAC	6.8	1.5
	ACC	7.5	2.8
	Scotland	8.0	1.6

Rates of improvement in mortality

Mortality improvement

- General population: mortality improving across all age bands
  - Past 25 years has larger improvement 1.5% -3.0% p.a. than previous 75 years 1.5% p.a.



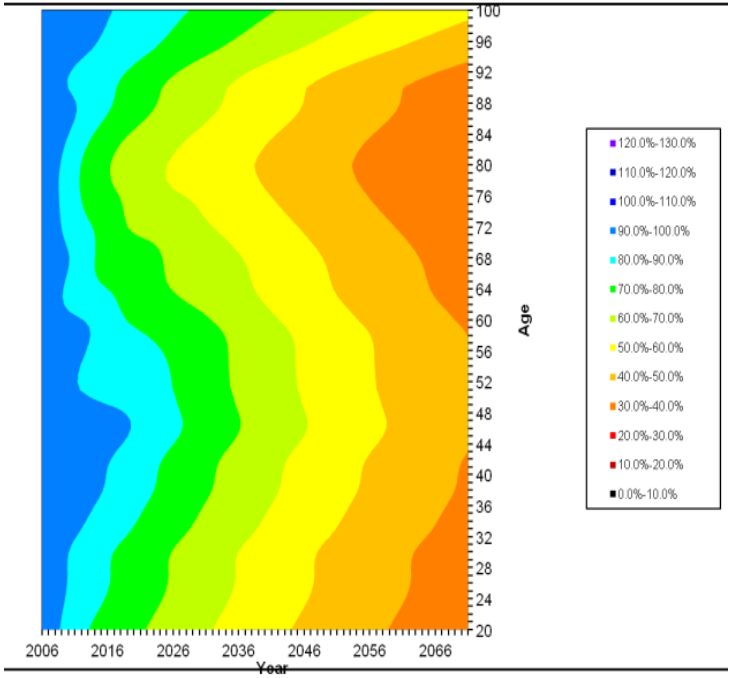
Source: Australian Life tables 2005-07

Continuous Mortality Investigation

- UK based group
- Published several iterations of estimated future mortality
- Focussed on population mortality only

- Reasons for improvement
  - Time affect (i.e. All age affected similarly)
  - Birth year (cohort) affect

- Rate of improvement is NOT direct function of age
  - Although Australian chart does seem to show a reducing rate of improvement as you get older



Mortality Improvement: catastrophic injuries

- Few longitudinal studies: Baguley et al and Shavelle et al both concluded that after survival, there is no observed long term mortality improvement if you have a serious brain injury

- Impact of initial treatments has changed dramatically so this could alter the findings of the study.

- Sources of mortality improvement
  - Age / health / accidents as per population ➔ Improvement same as population.
  - Related to injury and affected by medical treatment ➔ Uncertain rate of improvement
  - Stress on the body of living with an injury ➔ Minimal mortality improvement expected

Mortality Improvement: catastrophic injuries

- Limited evidence as to how to set a basis
  - Mortality improvement is likely to less than population (i.e. Widening gap in life expectancy) as would it require benefits from improved treatment for mortality as a result injury which to outweigh mortality attributable to the stress of living with a catastrophic injury
  - Given the uncertainty decided to only allow for a time affect (i.e. Same rate of improvement across all ages)
  - Likely range for improvements in mortality 0.5% p.a. to 2.0% p.a. for people with catastrophic injuries

Sensitivity of key assumptions

% change in liability for a 10% increase in MSR

Current Age	Amount of care				
	Inactive	0-4	5-8	9+	ALL
0-25	-2%	-2%	-2%	-3%	-3%
26-50	-4%	-3%	-3%	-4%	-4%
51-75	-6%	-6%	-5%	-5%	-5%
76-100	-12%	-9%	-9%	-10%	-10%
ALL	-4%	-4%	-4%	-4%	-4%

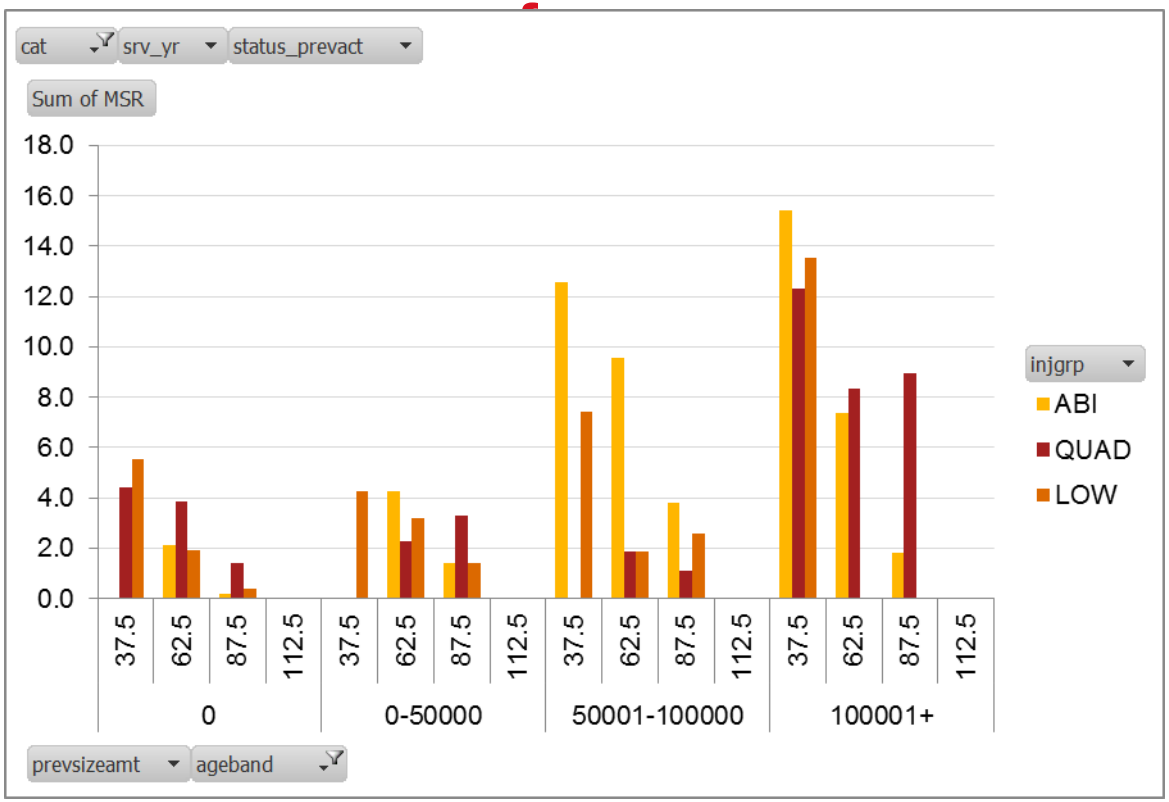
% change in liability for a 1% p.a. improvement in mortality

Current Age	Amount of care				
	Inactive	0-4	5-8	9+	ALL
0-25	13%	11%	10%	8%	10%
26-50	14%	11%	9%	7%	8%
51-75	14%	8%	7%	6%	7%
76-100	16%	5%	3%	3%	4%
ALL	14%	10%	9%	7%	8%

- Sensitivity of key assumptions
  - 10% deterioration in mortality reduces liabilities by approximately 4%
  - 1% p.a. improvement in mortality increases liabilities by approximately 8%.

Appendices

TAC Ratio to population – By Age, Injury and amount



ACC Ratio to population – By Age, Injury and amount of care