



## Treatment cost savings from reducing obesity: Results from a Health and Ageing Model-System that simultaneously targets several chronic diseases

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## Background and Aims

**Chronic diseases in Australia (e.g. heart disease, cancer, diabetes)**

- affect around 80% of older Australians
- are the main causes of disability and premature death
- account for 70% of total health expenditures

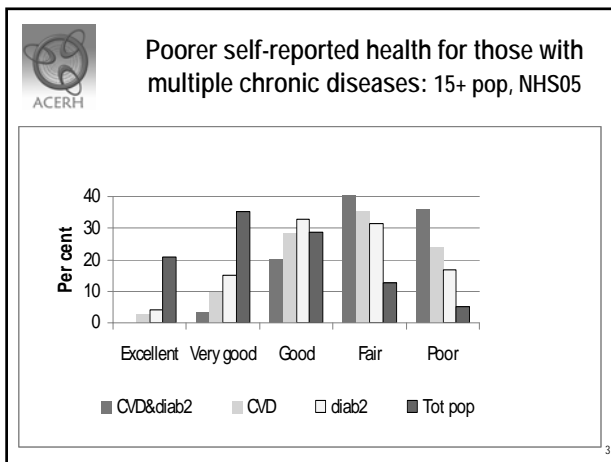

**The project**

- concerns chronic diseases, risk factors and comorbidities Australia-wide;
- produces a microsimulation Umbrella model, linked to several disease specific progression models;
- applies the model-system to study of prevention and treatment options

**Aims of Presentation**

- provide an overview of the prototype model-system
- simulate the economic impact of a 10% weight reduction in Australia's 2.5 million obese adults


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## Higher costs for those with multiple chronic diseases (DoHA 2000)

(NHPA – National Health Priority Area)	Average cost per person/yr
<b>Single NHPA</b>	
1 Cardiovascular disease	\$4,006
1 Diabetes	\$1,289
1 Cancer	\$2,478
1 Asthma	\$1,502
<b>Multiple NHPAs</b>	
2 Cardiovascular disease + diabetes (\$5,295)	\$6,283
2 Cancer + cardiovascular disease (\$6,484)	\$8,526
2 Diabetes and mental illness	\$2,738
3 Cancer, cardiovascular disease and mental illness	\$10,090
5 NHPA conditions	\$14,337

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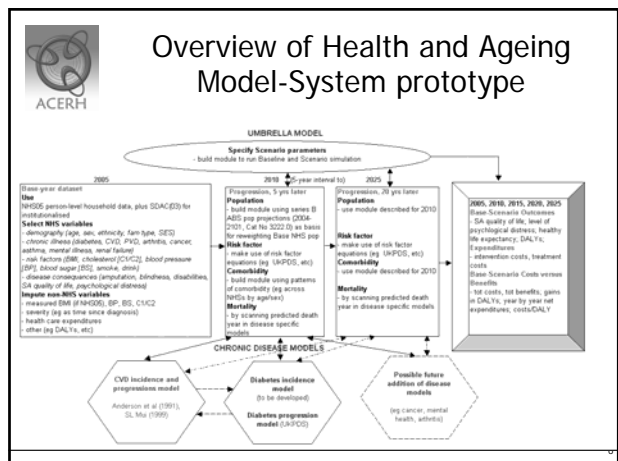



## Broad structure of Health and Ageing Model-System

The current prototype of the model-system:

- links disease-specific progression sub-models to an 'Umbrella' microsimulation model representing the Australian population
- considers type 2 diabetes, hospitalised cardiovascular events (CVD), and CVD events as a complication of diabetes (comorbidities)
- considers health risk factors: obesity and high blood sugar and cholesterol levels
- projects up to 20 years ahead and estimates costs and benefits of 'intervention scenarios' relative to 'no intervention'

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### Data sources

Key data sources:

- 2005 National Health Survey (NHS05) ABS unit record data used as basis for the Umbrella model's base-year population (and to indicate time-trends across NHSs)
- Australian Diabetes, Obesity and Lifestyle Study (AusDiab\_2000 and AusDiab\_2005) - International Diabetes Institute (2001, 2006), to estimate risk factor progressions and diabetes/CVD incidences
- health expenditure statistics by Clarke et al (2008), AIHW (2007, 2006d, 2005), and DoHA (2000).


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### Diabetes and CVD unit costs in Prototype (default)

	Cost per person per annum (Australian dollars, 1999-2000 prices)	
	Non-fatal	Fatal
Diabetes without complications	\$1,289*	
CVD events (at time of event):		
CHD (incl angina, heart failure)	\$13,000	\$10,000
Stroke	\$13,000	\$10,000
Diabetes with CVD	20% above the sum of the single-disease costs	
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### Preliminary validation of prototype (15+ pop)

	Prototype	Benchmark	Source of benchmark
<b>Baseline characteristics, 2005 (15+ year olds)</b>			
15+ population	15,761,000	16,287,000	ABS 2005
Diagnosed type 2 diabetes, with or without CVD (No)	579,249	581,000#	AIHW 2008a
- treatment costs (million, A\$ in 2000)	1,595	1,664#	AIHW 2005
CVD, without diabetes (No)	627,000	-	
- treatment costs (million, A\$ in 2000)	4,514	4,547#	AIHW 2005
# total population			


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### SCENARIO: 10% weight loss in obese Australians (defined as BMI > 30) 2005 to 2010

Height (m)	Weight (initial) (kg)	BMI (initial)	10% weight loss (kg)	BMI (final)
1.65	80	29	0.0	29
1.65	85	31	8.5	28
1.65	90	33	9.0	30
1.65	95	35	9.5	31

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### SCENARIO: 10% lower Body Mass Index, obese Australians\* 2005 to 2010

	Baseline: No Intervention	Scenario: 10% Lower BMI
<b>Persons** (Number)</b>		
Australians with diabetes only	951,706	894,480
difference Scenario-to- Baseline		- 57,226
Australians with diabetes+ CVD events	50,749	43,382
difference Scenario-to- Baseline		- 7,367
Australians with non-fatal CVD event only	285,222	277,016
difference Scenario-to- Baseline		- 8,206
<b>ALL PERSONS WITH DIABETES AND CVD</b>	<b>1,287,677</b>	<b>1,214,883</b>
difference Scenario-to- Baseline		- 72,794
<b>Expenditures (AUS\$ million)</b>		
Total expenditure _diabetes only	4,816	4,629
difference Scenario-to- Baseline		- 187
Total expenditure _diabetes_ non-fatal CVD event	1,128	981
difference Scenario-to- Baseline		- 147
Total expenditure _non-fatal CVD event only	5,767	5,594
difference Scenario-to- Baseline		- 173
Expenditure _fatal CVD events	1,317	1,317
difference Scenario-to- Baseline		0
<b>TOTAL CVD plus DIABETES COSTS</b>	<b>13,028</b>	<b>12,521</b>
difference Scenario-to- Baseline		- 507

\* Body Mass Index (BMI) of 30 or more

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### SCENARIO findings - continued

The \$507 million savings in treatment costs over 5 years were attributed as follows:

- 37% of the savings were due to 57,226 less new cases with diagnosed diabetes (without CVD)
- 34% to 8,206 less non-fatal hospital CVD events
- 29% to 7,362 less non-fatal CVD hospital events in persons with type 2 diabetes. We accounted for the CVD-diabetes comorbidity effect by increasing the combined 'single disease' treatment costs by 20% (as per DoHA 2000)

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## CONCLUSIONS

**Main outcome:**

a workable Prototype (which needs further validations)

**Scenario findings :**

illustrate the usefulness of the Prototype when estimating the impact obesity-related interventions (i.e. they delay or avoid the onset and person-level accumulation of debilitating chronic diseases)

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## CONCLUSIONS (cont.)

**Further research possibilities:**

-simultaneous consideration of other chronic diseases (eg arthritis, cancer)

-up-dating of the base-year data with the just released NHS 2007-08

-simulating other, and more complex, risk factor and diseases prevention scenarios

**Outcome by end 2010:**

a fully validated chronic disease model-system, with published policy- relevant applications

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## Further information

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## Methods

- constructed base-year population of Umbrella model from NHS05, imputing variables not in NHS05
- accounted for individuals' demographic, socioeconomic and health-risk-factor characteristics; their number of chronic diseases; quality of life; and health-related expenditures
- reweighted the base-year population to 2010, 2015 etc to match ABS population projections for these years (by age-sex)
- progressed (5-year intervals) persons' age, risk factors, diabetes and non-fatal CVD event states (stroke; coronary heart disease and myocardial infarction; coronary artery bypass graft surgery; and percutaneous transluminal coronary artery angioplasty)
- estimated risk factor and disease incidence/progression equations (using AusDiab *measured* data)
- used the above estimated probabilities, combined with the Monte Carlo method, to allocate new diabetes/CVD states to Prototype individuals
- aligned the Prototype outputs to external aggregate Australian benchmarks

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