



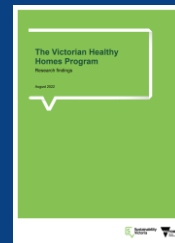
THE UNIVERSITY OF
MELBOURNE

Climate and Health Economic co-benefits Tool (CHET)

Integrating the WHO framework
for the quantification and economic valuation
of health outcomes originating from health and
non-health climate change mitigation and
adaptation action

**Using findings from the Victorian
Healthy Homes Program**

Becca Liu & Dr Kelvin Say



Source: Pan American Health Organization

Introduction

- **Health is closely linked to sustainable development**
 - Health is interconnected with nutrition, poverty, education, energy, infrastructure, and economic development.
 - It both contributes to and is impacted by socioeconomic development.
 - **Health should be integrated into policy and development decisions**
 - Climate policy assessments often overlook health impacts.
 - Including health in cost-benefit analysis can reveal previously ignored co-benefits and help determine the economic viability of climate investments.
 - **Systemic assessment is important but challenging**
 - It is difficult to distinguish health impacts caused directly by climate change from those driven by development pathways.
 - Uncertainty and strong interconnections across sectors make policy-making more complex.
- **A framework to link science, policy, and practice developed by the WHO**
- **A tool to interpret the framework is needed**



Purpose

- Reflects the real-world complexity more accurately.
- Integrates health economics with policy assessments.
- Promotes cross-sectoral coordination and highlights the central role of health in development.
- Delivers co-benefits such as reduced healthcare costs and improved public health.
- **Convey the WHO framework's complexity in a clear and understandable way for those without technical backgrounds.**

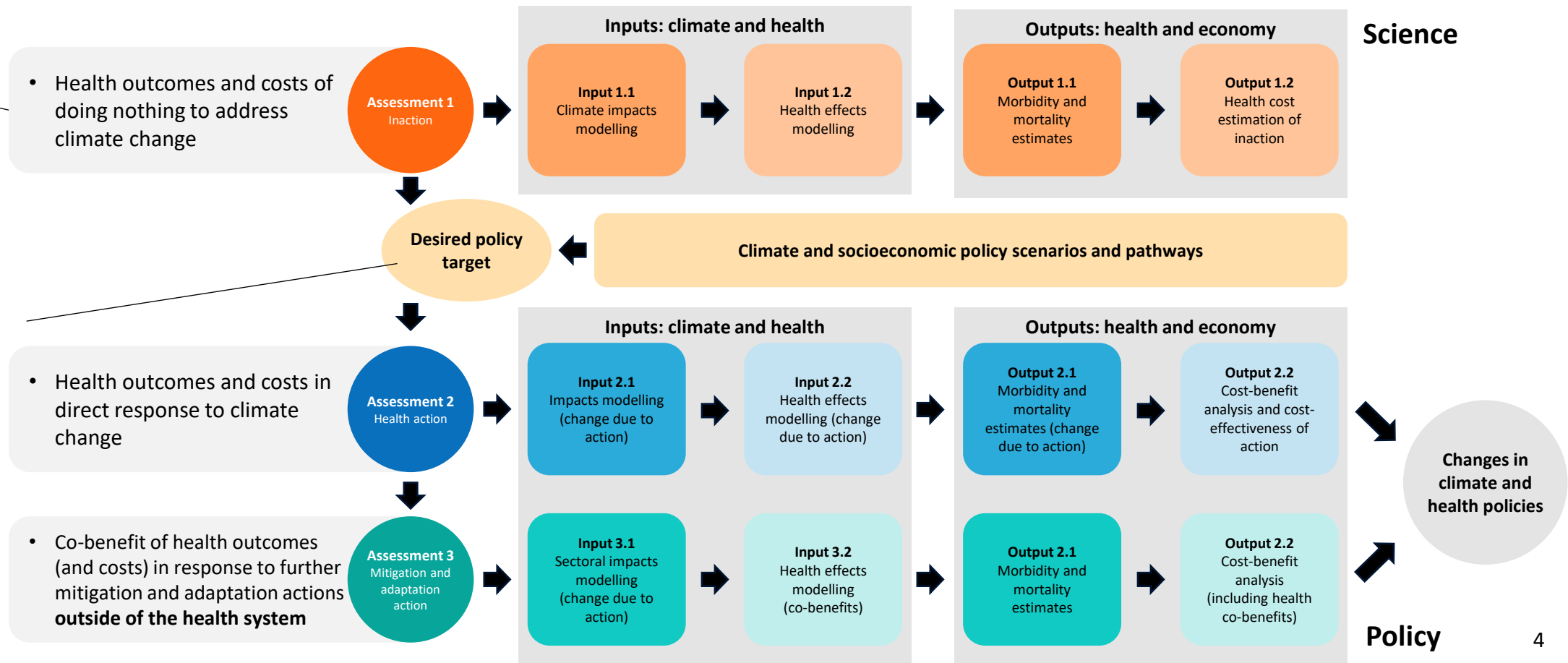


Setting the stage for knowledge integration: Linking climate science with policy

Fig. 2. Envisaged sequence of tasks in policy analysis for a comprehensive assessment of climate-related health costs and co-benefits generated by climate action

What is the future we are heading towards? **(baseline)**

What is the future we are committed to? **(intervention)**





Introducing the Climate and Health Economic co-benefits Tool (CHET)

- Purpose:**

Many policy actions have health and climate co-benefits that are not valued together. CHET combines health and climate outcomes for users to better understand how they can be quantitatively valued together.

- Analytical Scope:**

CHET utilises data entered by the user to calculate the Benefit Cost Ratio (BCR) by comparing the direct health economic response to climate change (Assessment 2) and mitigation/adaptation actions (Assessment 3) vs a climate inaction baseline (Assessment 1). The scope of the results and values are all provided by the user.

Note: CHET uses an Excel spreadsheet to represent the WHO framework. It requires the climate and health data resolution be consistent throughout the data entry process. For example, if the analysis is for an intervention across 1000 households over 10 years, the climate health impacts also need to be downscaled to 1000 households over 10 years. The BCR results then reflect the users' choice of resolution.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1					2. Health Action vs. 1. Inaction		3. Intervention vs. 2. Health Action		3. Intervention & 2. Health Action vs. 1. Inaction					
2				Improvement in Health Costs (\$m)	n/a		n/a		n/a					
3				Improvement in non-Health Costs (\$m)	n/a		n/a		n/a					
4				Costs of action (\$m)	n/a		n/a		n/a					
5				Benefit-Cost Ratio (BCR)	n/a		n/a		n/a					
6					Scope of the results									
7				[Title]	[Specify the scope of analysis]									
8				A framework for the quantification and economic valuation of health outcomes originating from health and non-health climate change mitigation and adaptation action	Cumulatively Valued Health Impacts (\$m)	Morbidity (cumulative, YLD)	Mortality (cumulative, YLL)	DALYs (cumulative)	Monetised DALYs (cumulative, \$m)	Cumulative Economic Impacts (\$m)	Direct cost to the healthcare system (cumulative, \$m)	Direct cost to the patient / family (cumulative, \$m)	Indirect health cost (cumulative, \$m)	Cost of investment into action(s) (cumulative, \$m)
9				1. Health outcomes under inaction towards climate change										
10				2. Health outcomes under health system action										
11				3. Health outcomes under further mitigation and adaptation action										

- Expected Data Inputs:**

The main economic inputs are the:

- Value of Statistical Life Year (VSLY)
- Mortality (years of life lost, YLL)
- Morbidity (years of healthy life lost due to disability, YLD)
- Direct cost to the healthcare service
- Direct cost to the patient / family
- Indirect health cost

under the circumstances of climate inaction (Assessment 1), health system action (Assessment 2), further mitigation and adaptation actions (Assessment 3).



Introducing the Climate and Health Economic co-benefits Tool (CHET)

- **CHET Outputs:**

The Benefit Cost Ratio (BCR) of the changes to the health system in response to climate change via a comparison of the benefits and costs of Assessment 2 vs Assessment 1

$$BCR = \frac{Total\ Benefits}{Total\ Costs}$$

The BCR of any additional policy interventions (climate mitigation/adaptation) with its associated health co-benefits via a comparison of the benefits and costs of Assessment 3 vs Assessment 2

- **Understanding CHET:**

The CHET spreadsheet collects the necessary information from one or more health and climate actions to determine the BCR.

- The BCR is a relative value (compared to the Assessment 1 baseline) as opposed to an absolute value.

This means the choice of the baseline heavily influences the CHET results.

The CHET spreadsheet:

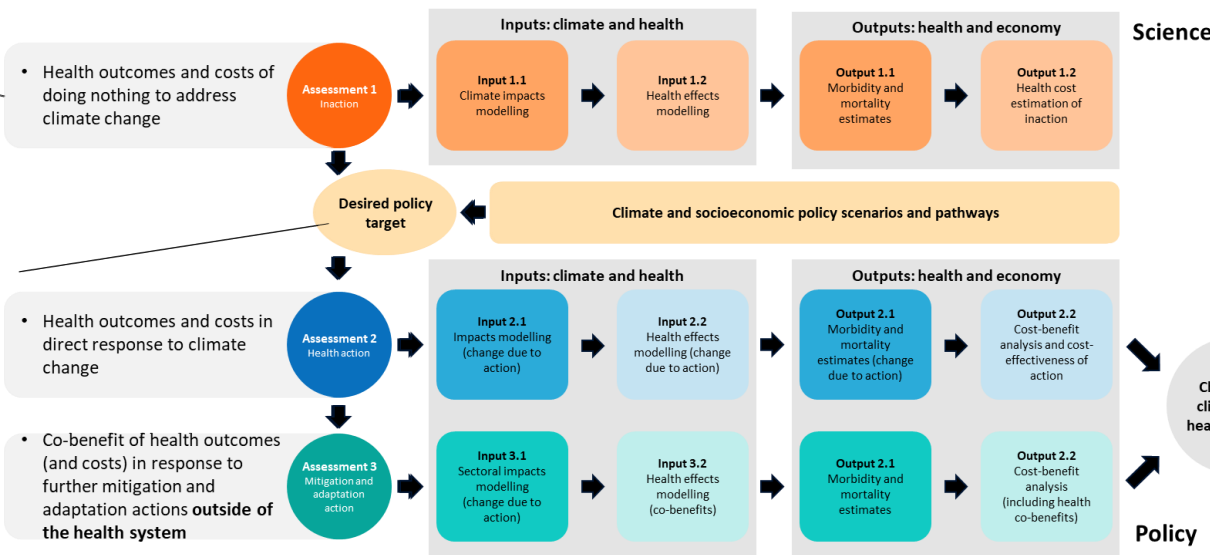
Group Level 1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1					2. Health Action vs. 1. Inaction		3. Intervention vs. 2. Health Action		3. Intervention & 2. Health Action vs. 1. Inaction					
2				Improvement in Health Costs (\$m)	n/a		n/a		n/a					
3				Improvement in non-Health Costs (\$m)	n/a		n/a		n/a					
4				Costs of action (\$m)	n/a		n/a		n/a					
5				Benefit-Cost Ratio (BCR)	n/a		n/a		n/a					
6					Scope of the results									
7				[Title]	[Specify the scope of analysis]									
8				A framework for the quantification and economic valuation of health outcomes originating from health and non-health climate change mitigation and adaptation action	Cumulatively Valued Health Impacts (\$m)	Morbidity (cumulative, YLD)	Mortality (cumulative, YLL)	DALYs (cumulative)	Monetised DALYs (cumulative, \$m)	Cumulative Economic Impacts (\$m)	Direct cost to the healthcare system (cumulative, \$m)	Direct cost to the patient / family (cumulative, \$m)	Indirect health cost (cumulative, \$m)	Cost of investment into action(s) (cumulative, \$m)
9				1. Health outcomes under inaction towards climate change										
18				2. Health outcomes under health system action										
30				3. Health outcomes under further mitigation and adaptation action										
42														

Overview of the user interface:

- Required data inputs are marked using a yellow background
- The BCR results are shown at the top
- Press the group levels to access increasing levels of detail

What is the future we are heading towards? (baseline)



The CHET spreadsheet:

Group Level 2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1					2. Health Action vs. 1. Inaction		3. Intervention vs. 2. Health Action		3. Intervention & 2. Health Action vs. 1. Inaction					
2				Improvement in Health Costs (\$m)	n/a		n/a		n/a					
3				Improvement in non-Health Costs (\$m)	n/a		n/a		n/a					
4				Costs of action (\$m)	n/a		n/a		n/a					
5				Benefit-Cost Ratio (BCR)	n/a		n/a		n/a					
6					Scope of the results									
7				[Title]	(Specify the scope of analysis)									
8				A framework for the quantification and economic valuation of health outcomes originating from health and non-health climate change mitigation and adaptation action	Cumulatively Valued Health Impacts (\$m)	Morbidity (cumulative, YLD)	Mortality (cumulative, YLL)	DALYs (cumulative)	Monetised DALYs (cumulative, \$m)	Cumulative Economic Impacts (\$m)	Direct cost to the healthcare system (cumulative, \$m)	Direct cost to the patient / family (cumulative, \$m)	Indirect health cost (cumulative, \$m)	Cost of investment into action(s) (cumulative, \$m)
9				1. Health outcomes under inaction towards climate change										
10				What's the estimated climate in the future?										
11				Health economic outcomes	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
12				2. Health outcomes under health system action										
13				What changes in health system and how much do they cost?										\$ -
14				How are climate factors changed?										
15				What are the other added benefits of these changes?										\$ -
16				What are the other added benefits of this intervention that cannot be monetised?										
17				Resulting health outcomes	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
18				3. Health outcomes under further mitigation and adaptation action										
19				What is the intervention and how much does it cost?										\$ -
20				How are climate factors changed?										
21				Further economic benefits not captured in the health costs?										\$ -
22				List any other benefits that cannot be monetised.										
23				Resulting health outcomes	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

Selecting group level 2 brings up:

- The context of actions for each assessment stage
- The health economic outcomes become visible

The CHET spreadsheet:

Group Level 3

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1					2. Health Action vs. 1. Inaction		3. Intervention vs. 2. Health Action		3. Intervention & 2. Health Action vs. 1. Inaction					
2				Improvement in Health Costs (\$m)	n/a		n/a		n/a					
3				Improvement in non-Health Costs (\$m)	n/a		n/a		n/a					
4				Costs of action (\$m)	n/a		n/a		n/a					
5				Benefit-Cost Ratio (BCR)	n/a		n/a		n/a					
6					Scope of the results									
7				[Title]	[Specify the scope of analysis]									
8				A framework for the quantification and economic valuation of health outcomes originating from health and non-health climate change mitigation and adaptation action	Cumulatively Valued Health Impacts (\$m)	Morbidity (cumulative, YLD)	Mortality (cumulative, YLL)	DALYs (cumulative)	Monetised DALYs (cumulative, \$m)	Cumulative Economic Impacts (\$m)	Direct cost to the healthcare system (cumulative, \$m)	Direct cost to the patient / family (cumulative, \$m)	Indirect health cost (cumulative, \$m)	Cost of investment into action(s) (cumulative, \$m)
9				1. Health outcomes under inaction towards climate change										
10				What's the estimated climate in the future?										
11				Health economic outcomes	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	
12				Health impact #1	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	
13				Health impact #2	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	
14				2. Health outcomes under health system action										
15				What changes in health system and how much do they cost?										\$ -
16				How are climate factors changed?										
17				What are the other added benefits of these changes?										\$ -
18				What are the other added benefits of this intervention that cannot be monetised?										
19				Resulting health outcomes	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	
20				Health impact #1	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	
21				Health impact #2	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	
22				3. Health outcomes under further mitigation and adaptation action										
23				What is the intervention and how much does it cost?										\$ -
24				How are climate factors changed?										
25				Further economic benefits not captured in the health costs?										\$ -
26				List any other benefits that cannot be monetised.										
27				Resulting health outcomes	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	
28				Health impact #1	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	
29				Health impact #2	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	

Selecting group level 3 brings up:

- An itemised list of health impacts that are consistent across all assessment levels
- These health impacts need to be independent of one another

The CHET spreadsheet:

Group Level 4

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1					2. Health Action vs. 1. Inaction	3. Intervention vs. 2. Health Action	3. Intervention & 2. Health Action vs. 1. Inaction							
2				Improvement in Health Costs (\$m)	n/a	n/a	n/a							
3				Improvement in non-Health Costs (\$m)	n/a	n/a	n/a							
4				Costs of action (\$m)	n/a	n/a	n/a							
5				Benefit-Cost Ratio (BCR)	n/a	n/a	n/a							
6					Scope of the results									
7				[Title]	[Specify the scope of analysis]									
8				A framework for the quantification and economic valuation of health outcomes originating from health and non-health climate change mitigation and adaptation action	Cumulatively Valued Health Impacts (\$m)	Morbidity (cumulative, YLD)	Mortality (cumulative, YLL)	DALYs (cumulative)	Monetised DALYs (cumulative, \$m)	Cumulative Economic Impacts (\$m)	Direct cost to the healthcare system (cumulative, \$m)	Direct cost to the patient / family (cumulative, \$m)	Indirect health cost (cumulative, \$m)	Cost of investment into action(s) (cumulative, \$m)
9				1. Health outcomes under inaction towards climate change										
10				What's the estimated climate in the future?										
11				Health economic outcomes	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
12				Health impact #1	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
13				unspecified		0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
14						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
15				Health impact #2	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
16				unspecified		0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
17						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
18				2. Health outcomes under health system action										
19				What changes in health system and how much do they cost?										\$ -
20				How are climate factors changed?										
21				What are the other added benefits of these changes?										\$ -
22				What are the other added benefits of this intervention that cannot be monetised?										
23				Resulting health outcomes	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
24				Health impact #1	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
25				unspecified		0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
26						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
27				Health impact #2	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
28				unspecified		0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
29						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
30				3. Health outcomes under further mitigation and adaptation action										
31				What is the intervention and how much does it cost?										\$ -
32				How are climate factors changed?										
33				Further economic benefits not captured in the health costs?										\$ -
34				List any other benefits that cannot be monetised.										
35				Resulting health outcomes	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
36				Health impact #1	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
37				unspecified		0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
38						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
39				Health impact #2	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
40				unspecified		0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
41						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
42						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

Selecting group level 4 brings up:

- The data entry options for each of the health impacts

Using CHET with the Victorian Healthy Homes Program

Background: Victorian Healthy Homes Program

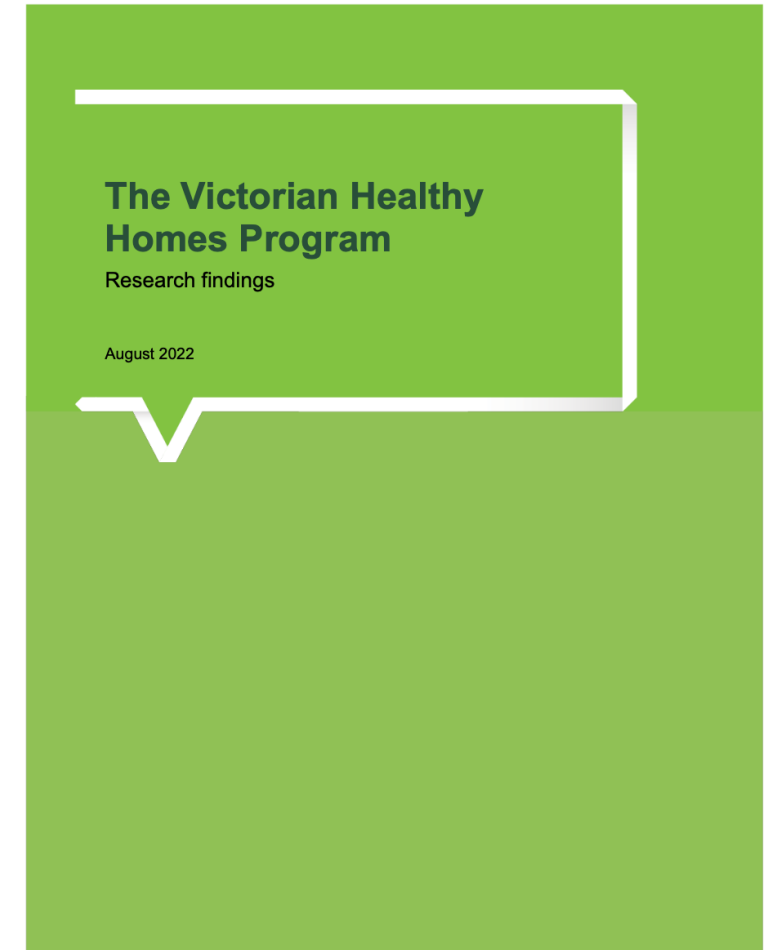
- **Study Design**

Randomised Controlled Trial (RCT)

- **Objective**

To evaluate the impact of home energy efficiency and thermal comfort upgrades on indoor temperature, energy use, health, and quality of life.

While not directly related to climate change, it is an adaptation action (i.e. Assessment 3).



Key findings of VHHP

- **Thermal Comfort:**
Indoor temperature rose by 0.33°C; cold exposure reduced by 43 mins/day. Participants felt noticeably warmer.
- **Energy Use:**
Gas use decreased; no change in electricity. No rebound effect, less reliance on heating devices.
- **Home Conditions:**
Less condensation reported in upgraded homes.
- **Health Benefits:**
Reduced breathlessness; improved mental health and social well-being; reduction in mortality
- **Economic Impact:**
\$887 saved per person in avoided healthcare costs over winter. Upgrades become cost-saving within 3 years, \$4,783 net savings over 10 years (with a 4% discount rate)

The Victorian Healthy Homes Program

Research findings

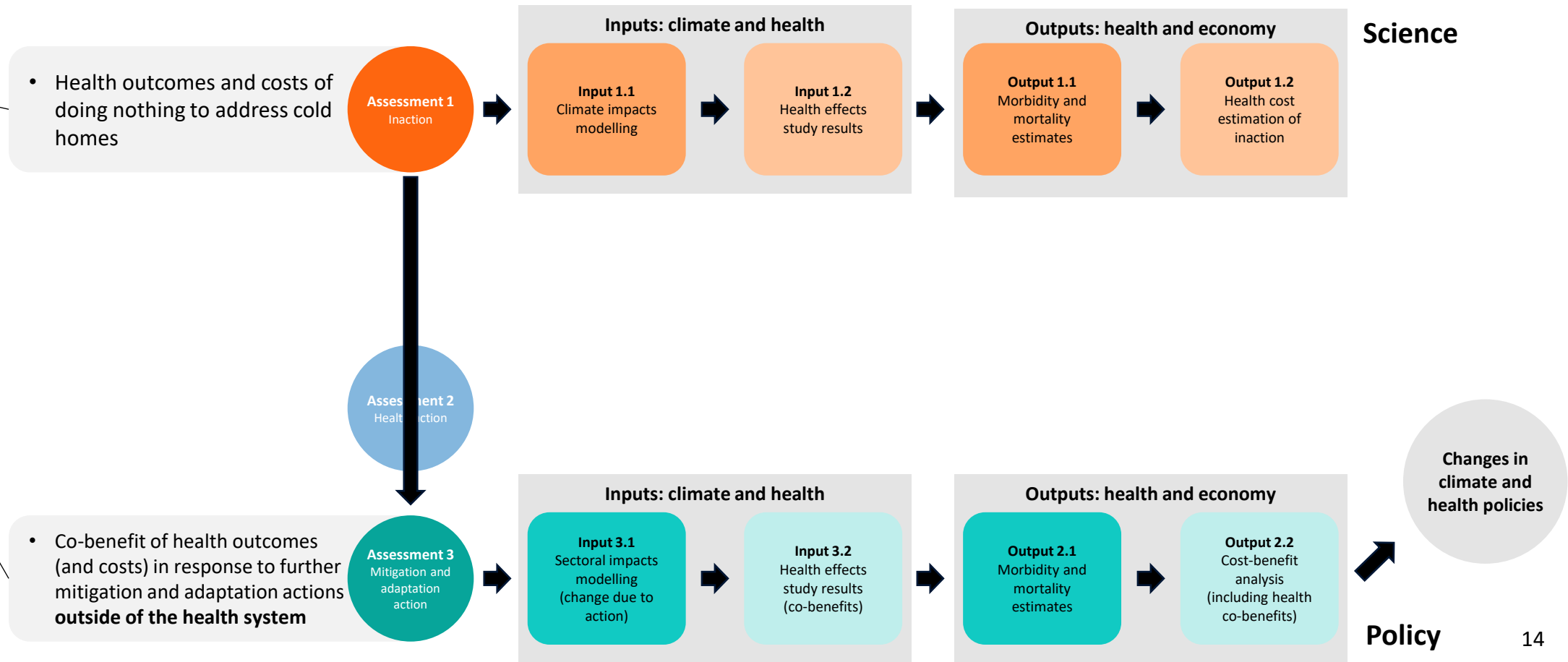
August 2022

VHHP using CHET:

Translating the results

What is the
future we are
heading
towards?
(**control**)

What is the
future we are
committed to?
(**intervention**)



VHHP using CHET:

Translating the results

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1					2. Health Action vs. 1. Inaction		3. Intervention vs. 2. Health Action		3. Intervention & 2. Health Action vs. 1. Inaction					
2				Improvement in Health Costs (\$m)	n/a		n/a		n/a					
3				Improvement in non-Health Costs (\$m)	n/a		n/a		n/a					
4				Costs of action (\$m)	n/a		n/a		n/a					
5				Benefit-Cost Ratio (BCR)	n/a		n/a		n/a					
6				Scope of the results										
7				[Title]	[Specify the scope of analysis]									
8				A framework for the quantification and economic valuation of health outcomes originating from health and non-health climate change mitigation and adaptation action	Cumulatively Valued Health Impacts (\$m)	Morbidity (cumulative, YLD)	Mortality (cumulative, YLL)	DALYs (cumulative)	Monetised DALYs (cumulative, \$m)	Cumulative Economic Impacts (\$m)	Direct cost to the healthcare system (cumulative, \$m)	Direct cost to the patient / family (cumulative, \$m)	Indirect health cost (cumulative, \$m)	Cost of investment into action(s) (cumulative, \$m)
9				1. Health outcomes under inaction towards climate change										
10				What's the estimated climate in the future?										
11				Health economic outcomes	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
12				Health impact #1	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
13				unspecified		0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
14						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
15				Health impact #2	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
16				unspecified		0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
17						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
18				2. Health outcomes under health system action										
19				3. Health outcomes under further mitigation and adaptation action										
20				What is the intervention and how much does it cost?										\$ -
21				How are climate factors changed?										
22				Further economic benefits not captured in the health costs?										\$ -
23				List any other benefits that cannot be monetised.										
24				Resulting health outcomes	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
25				Health impact #1	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
26				unspecified		0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
27						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
28				Health impact #2	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
29				unspecified		0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
30						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

Integrating the Victorian Healthy Homes data into CHET

- Assessment 2 is not required as it is a randomised control trial, and the **control** group is Assessment 1, and the **intervention** group is considered as Assessment 3
- Data entry is required across the yellow background fields

VHHP using CHET:

Translating the results

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1					2. Health Action vs. 1. Inaction	3. Intervention vs. 2. Health Action	3. Intervention & 2. Health Action vs. 1. Inaction							
2				Improvement in Health Costs (\$m)	n/a	n/a	n/a							
3				Improvement in non-Health Costs (\$m)	n/a	n/a	n/a							
4				Costs of action (\$m)	n/a	n/a	n/a							
5				Benefit-Cost Ratio (BCR)	n/a	n/a	n/a							
6					Scope of the results									
7				Case Study: Victorian Healthy Homes Program	1000 households, over 10 years with a mean age of 74.85 years and 1.33 persons/hh Note: The choice to apply a discount factor or not, is built into the cumulative value									
8				A framework for the quantification and economic valuation of health outcomes originating from health and non-health climate change mitigation and adaptation action	Cumulatively Valued Health Impacts (\$m)	Morbidity (cumulative, YLD)	Mortality (cumulative, YLL)	DALYs (cumulative)	Monetised DALYs (cumulative, \$m)	Cumulative Economic Impacts (\$m)	Direct cost to the healthcare system (cumulative, \$m)	Direct cost to the patient / family (cumulative, \$m)	Indirect health cost (cumulative, \$m)	Cost of investment into action(s) (cumulative, \$m)
9				1. Health outcomes under inaction towards climate change										
10				What's the estimated climate in the future?	No change, therefore assuming that the control group represents the current temperature/weather and associated health impacts without thermal comfort improvements									
11				Health economic outcomes	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
12				Health impact #1: Cold related	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
13				Consequence of cold homes		0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
14						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
15				Health impact #2	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
16				unspecified		0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
17						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
18				2. Health outcomes under health system action										
19				3. Health outcomes under further mitigation and adaptation action										
20				What is the intervention and how much does it cost?	Victorian Healthy Homes Program, delivered thermal comfort and energy efficiency upgrades to low-income Victorians with a health or social care need.									
21				How are climate factors changed?	Homes are being warmed to reduce to effect of cold days in the each household									
22				Further economic benefits not captured in the health costs?	Overall savings from reduced energy costs (\$85/household/winter) over 10 years and 1000 households									
23				List any other benefits that cannot be monetised.	From the VHHP report: Improved thermal comfort, Better mental health conditions, improved quality of life									
24				Resulting health outcomes	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
25				Health impact #1: Cold related	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
26				Consequence of cold homes		0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
27						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
28				Health impact #2	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
29				unspecified		0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
30						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

Providing context of the VHHP study

- Set the title
- Set the scope of the results
- Enter health impact #1 in relation to cold homes
- Enter details around the baseline/control in Assessment 1's context fields
- Enter details around the intervention in Assessment 3's context fields

Note: Health impact #2 remains unspecified, as it is unused

VHHP using CHET:

Translating the results

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1					2. Health Action vs. 1. Inaction		3. Intervention vs. 2. Health Action		3. Intervention & 2. Health Action vs. 1. Inaction					
2				Improvement in Health Costs (\$m)	n/a		n/a		n/a					
3				Improvement in non-Health Costs (\$m)	n/a		n/a		n/a					
4				Costs of action (\$m)	n/a		n/a		n/a					
5				Benefit-Cost Ratio (BCR)	n/a		n/a		n/a					
6					Scope of the results									
7				Case Study: Victorian Healthy Homes Program	1000 households, over 10 years with a mean age of 74.85 years and 1.33 persons/hh Note: The choice to apply a discount factor or not, is built into the cumulative value									
8				A framework for the quantification and economic valuation of health outcomes originating from health and non-health climate change mitigation and adaptation action	Cumulatively Valued Health Impacts (\$m)	Morbidity (cumulative, YLD)	Mortality (cumulative, YLL)	DALYs (cumulative)	Monetised DALYs (cumulative, \$m)	Cumulative Economic Impacts (\$m)	Direct cost to the healthcare system (cumulative, \$m)	Direct cost to the patient / family (cumulative, \$m)	Indirect health cost (cumulative, \$m)	Cost of investment into action(s) (cumulative, \$m)
9				1. Health outcomes under inaction towards climate change										
10				What's the estimated climate in the future?	No change, therefore assuming that the control group represents the current temperature/weather and associated health impacts without thermal comfort improvements									
11				Health economic outcomes	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
12				Health impact #1: Cold related	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
13				Consequence of cold homes		0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
14						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
15				Health impact #2	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
16				unspecified		0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
17						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
18				2. Health outcomes under health system action										
19				3. Health outcomes under further mitigation and adaptation action										
20				What is the intervention and how much does it cost?	Victorian Healthy Homes Program, delivered thermal comfort and energy efficiency upgrades to low-income Victorians with a health or social care need.									
21				How are climate factors changed?	Homes are being warmed to reduce to effect of cold days in the each household									
22				Further economic benefits not captured in the health costs?	Overall savings from reduced energy costs (\$85/household/winter) over 10 years and 1000 households									
23				List any other benefits that cannot be monetised.	From the VHHP report: Improved thermal comfort, Better mental health conditions, improved quality of life									
24				Resulting health outcomes	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
25				Health impact #1: Cold related	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
26				Consequence of cold homes		0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
27						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
28				Health impact #2	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
29				unspecified		0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
30						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

Fill in the economic valuation fields

- Enter an appropriate "value of statistical life year"
 - Consider using cell *notes* to record data sources
- Enter the cost of the VHHP trial using data from the VHHP report,

When considering the cost of expanding this program, a more accurate representation of the costs can be obtained by projecting forward administration costs in the expansion phase, then considering upgrade costs. In the expansion phase, average AEF cost per household was \$1773 and average SV cost per household was \$913, bringing the total administration cost to \$2686 per household. After adding the average upgrade cost of \$2809, the cost of expanding this program is **\$5496 per household**. This is the value used in cost effectiveness analyses.

Cost of expanding this program is \$5496 per household multiplied by 1000 households
- Additional cost savings were achieved from avoided energy costs

Cost-benefit analysis | Average upgrade cost was \$2809. Savings over the single 3-month winter period were \$887 in healthcare and **\$85 in energy**. In cost-benefit analysis, extrapolating outcomes over 10 years using a 4% discount rate, the upgrade was cost-saving within 3 years. When benefits are assessed against full program cost (upgrade costs plus administration costs), the payback period was less than 7 years.

$$\$85 \times 1000 \times 10 = \$0.85 \text{ m}$$

VHHP using CHET:

Translating the results

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1					2. Health Action vs. 1. Inaction	3. Intervention vs. 2. Health Action	3. Intervention & 2. Health Action vs. 1. Inaction							
2				Improvement in Health Costs (\$m)	n/a	n/a	11.83							
3				Improvement in non-Health Costs (\$m)	n/a	n/a	0.85							
4				Costs of action (\$m)	n/a	n/a	5.50							
5				Benefit-Cost Ratio (BCR)	n/a	n/a	2.30							
6														
7				Case Study: Victorian Healthy Homes Program	Scope of the results 1000 households, over 10 years with a mean age of 74.85 years and 1.33 persons/hh <i>Note: The choice to apply a discount factor or not, is built into the cumulative value</i>									
8				A framework for the quantification and economic valuation of health outcomes originating from health and non-health climate change mitigation and adaptation action	Cumulatively Valued Health Impacts (\$m)	Morbidity (cumulative, YLD)	Mortality (cumulative, YLL)	DALYs (cumulative)	Monetised DALYs (cumulative, \$m)	Cumulative Economic Impacts (\$m)	Direct cost to the healthcare system (cumulative, \$m)	Direct cost to the patient / family (cumulative, \$m)	Indirect health cost (cumulative, \$m)	Cost of investment into action(s) (cumulative, \$m)
9				1. Health outcomes under inaction towards climate change										
10				What's the estimated climate in the future?	No change, therefore assuming that the control group represents the current temperature/weather and associated health impacts without thermal comfort improvements									
11				Health economic outcomes	\$ -	0.0	0.0	0.0	\$ -	\$ 55.63	\$ 55.63	\$ -	\$ -	
12				Health impact #1: Cold related	\$ -	0.0	0.0	0.0	\$ -	\$ 55.63	\$ 55.63	\$ -	\$ -	
13				Consequence of cold homes		0.0	0.0	0.0	\$ -	\$ 55.63	\$ 55.63	\$ -	\$ -	
14						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	
15				Health impact #2	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	
16				unspecified		0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	
17						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	
18				2. Health outcomes under health system action										
19				3. Health outcomes under further mitigation and adaptation action										
20				What is the intervention and how much does it cost?	Victorian Healthy Homes Program, delivered thermal comfort and energy efficiency upgrades to low-income Victorians with a health or social care need.									
21				How are climate factors changed?	Homes are being warmed to reduce to effect of cold days in the each household									
22				Further economic benefits not captured in the health costs?	Overall savings from reduced energy costs (\$85/household/winter) over 10 years and 1000 households									
23				List any other benefits that cannot be monetised.	From the VHHP report: Improved thermal comfort, Better mental health conditions, improved quality of life									
24				Resulting health outcomes	\$ -	0.0	0.0	0.0	\$ -	\$ 43.80	\$ 43.80	\$ -	\$ -	
25				Health impact #1: Cold related	\$ -	0.0	0.0	0.0	\$ -	\$ 43.80	\$ 43.80	\$ -	\$ -	
26				Consequence of cold homes		0.0	0.0	0.0	\$ -	\$ 43.80	\$ 43.80	\$ -	\$ -	
27						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	
28				Health impact #2	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	
29				unspecified		0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	
30						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	

Fill in the avoided costs to the health care system

- Given the cost savings of \$887 per person per year, it has to be set against a baseline and applied across 1000 households

improved quality of life, particularly its mental health and social care aspects. Health benefits of the upgrade were reflected in cost savings, with \$887 per person saved in the healthcare system over the winter period. Cost-benefit analysis indicated that the upgrade would be cost-saving within 3 years –

- The average number of persons per household is 1.33
- Assuming a health care cost of \$4,172 per person per year as the baseline, the consequent of cold homes to the scope is:
 $\$4,172 \times 1.33 \times 1000 \times 10 = \55.63 m
- Similarly, the health care cost of the VHHP intervention with an avoided cost of \$887 is:
 $(\$4,172 - \$887) \times 1.33 \times 1000 \times 10 = \43.8 m

VHHP using CHET:

Translating the results for mortality

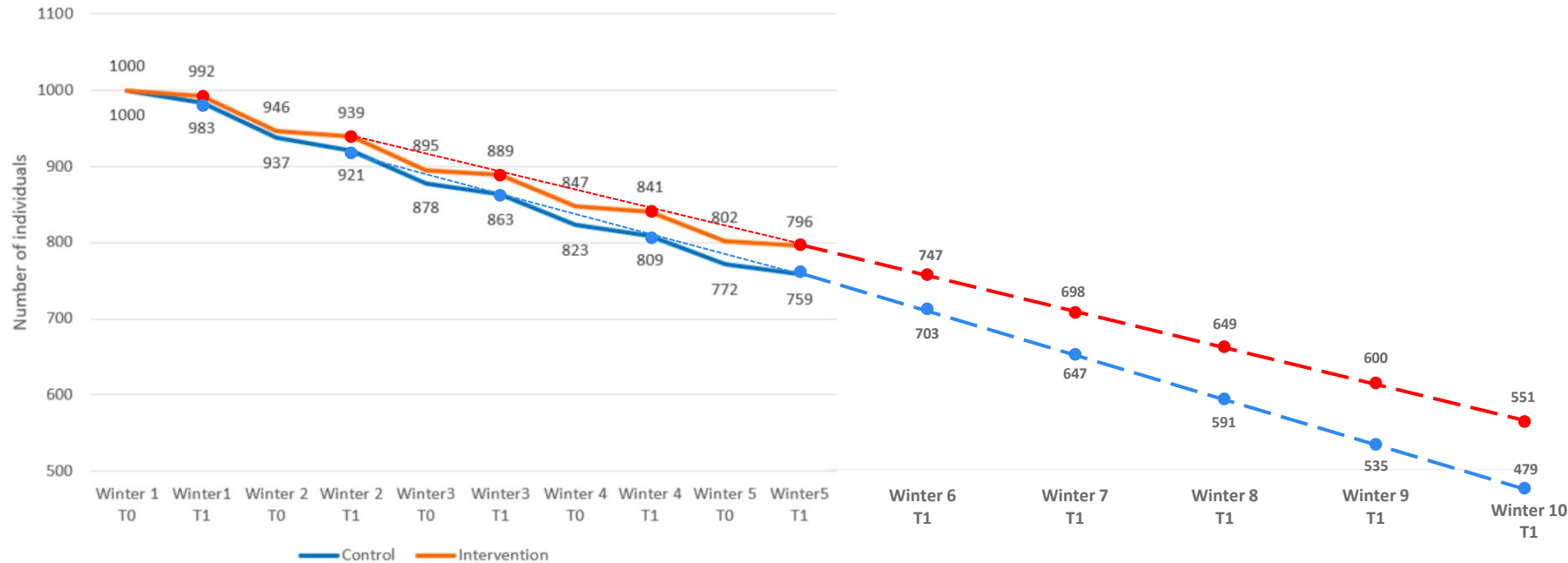


Figure 44. Death rates modelled over 5 winters using a starting sample of 1000 per group and sample death rates.

Standard Life Expectancy	Female	89.15	Average life expectancy								
	Male	87.25	88.2 years								
Winter	1	2	3	4	5	6	7	8	9	10	
Average age across 1000 individuals	74.85	75.85	76.85	77.85	78.85	79.85	80.85	81.85	82.85	83.85	
Number of individuals (intervention)	992	939	889	841	796	747	698	649	600	551	
Number of deaths (intervention)	8	53	50	48	45	49	49	49	49	49	
YLL per winter (intervention)	106.8	654.55	567.5	496.8	420.75	409.15	360.15	311.15	262.15	213.15	
Number of individuals (control)	983	921	863	809	759	703	647	591	535	479	
Number of deaths (control)	17	62	58	54	50	56	56	56	56	56	
YLL per winter (control)	226.95	765.7	658.3	558.9	467.5	467.6	411.6	355.6	299.6	243.6	

Assessment 3

49 deaths per year/1000 individuals
3802.15 YLL/1000 individuals
5069.521 YLL/1000 households

Assessment 1

56 deaths per year/1000 individuals
4455.35 YLL/1000 individuals
5940.452 YLL/1000 households

Accounting for changes in mortality (YLL) over 10 years

- The data collected only covers the first 5 years
- Using the average over winters 2 to 5, the trend is continued until winter 10
- Due to the absence of gender in the death rates, an average between male and female is used,
 - Average male and female lifespan is 88.2 years old
 - In year 1, the average age was 74.85 years
 - This data is used to calculate the years of life lost (YLL) between the control and intervention scenarios (see tab in spreadsheet example)

VHHP using CHET:

Translating the results

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1					2. Health Action vs. 1. Inaction	3. Intervention vs. 2. Health Action	3. Intervention & 2. Health Action vs. 1. Inaction							
2				Improvement in Health Costs (\$m)	n/a	n/a	225.20							
3				Improvement in non-Health Costs (\$m)	n/a	n/a	0.85							
4				Costs of action (\$m)	n/a	n/a	5.50							
5				Benefit-Cost Ratio (BCR)	n/a	n/a	41.10							
6														
7				Case Study: Victorian Healthy Homes Program	Scope of the results									
8				A framework for the quantification and economic valuation of health outcomes originating from health and non-health climate change mitigation and adaptation action	1000 households, over 10 years with a mean age of 74.85 years and 1.33 persons/hh Note: The choice to apply a discount factor or not, is built into the cumulative value									
9				1. Health outcomes under inaction towards climate change	Cumulatively Valued Health Impacts (\$m)	Morbidity (cumulative, YLD)	Mortality (cumulative, YLL)	DALYs (cumulative)	Monetised DALYs (cumulative, \$m)	Cumulative Economic Impacts (\$m)	Direct cost to the healthcare system (cumulative, \$m)	Direct cost to the patient / family (cumulative, \$m)	Indirect health cost (cumulative, \$m)	Cost of investment into action(s) (cumulative, \$m)
10				What's the estimated climate in the future?	No change, therefore assuming that the control group represents the current temperature/weather and associated health impacts without thermal comfort improvements									
11				Health economic outcomes	\$ 1,455.41	0.0	5940.5	5940.5	\$ 1,455.41	\$ 55.63	\$ 55.63	\$ -	\$ -	\$ -
12				Health impact #1: Cold related	\$ 1,455.41	0.0	5940.5	5940.5	\$ 1,455.41	\$ 55.63	\$ 55.63	\$ -	\$ -	\$ -
13				Consequence of cold homes		0.0	5940.5	5940.5	\$ 1,455.41	\$ 55.63	\$ 55.63	\$ -	\$ -	\$ -
14						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
15				Health impact #2	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
16				unspecified		0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
17						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
18				2. Health outcomes under health system action										
19				3. Health outcomes under further mitigation and adaptation action										
20				What is the intervention and how much does it cost?	Victorian Healthy Homes Program, delivered thermal comfort and energy efficiency upgrades to low-income Victorians with a health or social care need.									
21				How are climate factors changed?	Homes are being warmed to reduce to effect of cold days in the each household									
22				Further economic benefits not captured in the health costs?	Overall savings from reduced energy costs (\$85/household/winter) over 10 years and 1000 households									
23				List any other benefits that cannot be monetised.	From the VHHP report: Improved thermal comfort, Better mental health conditions, improved quality of life									
24				Resulting health outcomes	\$ 1,242.03	0.0	5069.5	5069.5	\$ 1,242.03	\$ 43.80	\$ 43.80	\$ -	\$ -	\$ -
25				Health impact #1: Cold related	\$ 1,242.03	0.0	5069.5	5069.5	\$ 1,242.03	\$ 43.80	\$ 43.80	\$ -	\$ -	\$ -
26				Consequence of cold homes		0.0	5069.5	5069.5	\$ 1,242.03	\$ 43.80	\$ 43.80	\$ -	\$ -	\$ -
27						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
28				Health impact #2	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
29				unspecified		0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
30						0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

Accounting for changes in mortality (YLL) over 10 years

- Entering the mortality values completes the VHHP analysis
- **Note:** In this example, the economic terms have not been discounted
- The improvement in health costs is \$225.21m, driven by improved lifespans and reduction in required health services
- The program costs \$5.5m for 1000 households
- The BCR of the VHHP intervention is 41.1 (using the additional economic benefit of \$0.85m from avoided energy costs)

Using CHET with a climate pathway and VHHP

An example to incorporate VHHP into a climate pathway comparison

There is an absence of readily available, health-oriented climate projections for different regional scales.

For example, how do 1000 households with a mean age of 74.85 years interact with the health system between 2026 and 2035 in a world heading towards 3-degrees of warming?

In the following example we use **synthetic** data. The assumptions are,

- Assessment 1: The path towards a 3-degree world is the **baseline**
 - Slightly reduces the effect of cold homes (from the VHHP study)
 - Introduces heat stress as second health impact.
- Assessment 2: The path towards a 2-degree world is the **desired policy target**
 - Reduces the level of heat stress
 - Has the same effect of cold homes (from the VHHP study)

Climate + VHHP using CHET:

Projecting the results between 2026 and 2035

What is the future we are heading towards? (baseline)

3 degree warmer world

- Health outcomes and costs of doing nothing to address cold homes

Less cold homes

Heat stress

Assessment 1
Inaction

Inputs: climate and health

Input 1.1
Climate impacts modelling

Input 1.2
Health effects study results

Outputs: health and economy

Output 1.1
Morbidity and mortality estimates

Output 1.2
Health cost estimation of inaction

Science

How does the health system react? (health action)

2 degree warmer world

- Health outcomes and costs in direct response to climate change

Cold homes

Lower heat stress

Assessment 2
Health action

Inputs: climate and health

Input 2.1
Impacts modelling (change due to action)

Input 2.2
Health effects modelling (change due to action)

Outputs: health and economy

Output 2.1
Morbidity and mortality estimates (change due to action)

Output 2.2
Cost-benefit analysis and cost-effectiveness of action

Changes in climate and health policies

Policy

What is the additional impact of VHHP? (further action)

- Co-benefit of health outcomes (and costs) in response to further mitigation and adaptation actions outside of the health system

Warmer homes

Lower heat stress

Assessment 3
Mitigation and adaptation action

Inputs: climate and health

Input 3.1
Sectoral impacts modelling (change due to action)

Input 3.2
Health effects modelling (co-benefits)

Outputs: health and economy

Output 2.1
Morbidity and mortality estimates

Output 2.2
Cost-benefit analysis (including health co-benefits)

Climate + VHHP using CHET:

Projecting the results between 2026 and 2035

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1														
2				Improvement in Health Costs (\$m)	n/a	n/a	n/a	n/a	225.20					
3				Improvement in non-Health Costs (\$m)	n/a	n/a	n/a	n/a	0.90					
4				Costs of action (\$m)	n/a	n/a	n/a	n/a	6.00					
5				Benefit-Cost Ratio (BCR)	n/a	n/a	n/a	n/a	37.71					
6														
7				Case Study: Victorian Healthy Homes Program amid a Warming Climate	Scope of the results 1000 households, over 10 years with a mean age of 74.85 years and 1.33 persons/hh between 2026 and 2035 Note: The choice to apply a discount factor or not, is built into the cumulative value									
8				A framework for the quantification and economic valuation of health outcomes originating from health and non-health climate change mitigation and adaptation action	Cumulatively Valued Health Impacts (\$m)	Morbidity (cumulative, YLD)	Mortality (cumulative, YLL)	DALYs (cumulative)	Monetised DALYs (cumulative, \$m)	Cumulative Economic Impacts (\$m)	Direct cost to the healthcare system (cumulative, \$m)	Direct cost to the patient / family (cumulative, \$m)	Indirect health cost (cumulative, \$m)	Cost of investment into action(s) (cumulative, \$m)
9				1. Health outcomes under inaction towards climate change										
10				What's the estimated climate in the future?	Assumption: Globally, the climate is heading towards 3 degrees of warming. This is an estimated impact on the health system for these 1000 households over 10 years (e.g. 2026-2035). The cold weather experienced is less severe, however heat stress is now a growing concern.									
11				Health economic outcomes	\$ 1,455.41	0.0	5940.5	5940.5	\$ 1,455.41	\$ 55.63	\$ 55.63	\$ -	\$ -	\$ -
12				Health impact #1: Cold related	\$ 1,455.41	0.0	5940.5	5940.5	\$ 1,455.41	\$ 55.63	\$ 55.63	\$ -	\$ -	\$ -
13				Health impact #2: Heat related	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
14														
15				2. Health outcomes under health system action										
16				What changes in health system and how much do they cost?	Hospitals are reconfigured to deliver health care services in a 2 degrees warmer world (for 1000 households between 2026-2035)									
17														\$ 0.50
18				How are climate factors changed?	Australia plays it part to achieve 2 degrees of global warming, this is the estimated impact on the health system for these 1000 households between 2026-2035.									
19														
20				What are the other added benefits of these changes?	Efficiency improvements in central heating over 10 years									
21														\$ 0.05
22				What are the other added benefits of this intervention that cannot be monetised?	None identified at this time									
23				Resulting health outcomes	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
24				Health impact #1: Cold related	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
25				Health impact #2: Heat related	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
26														
27				3. Health outcomes under further mitigation and adaptation action										
28				What is the intervention and how much does it cost?	Victorian Healthy Homes Program, delivered thermal comfort and energy efficiency upgrades to low-income Victorians with a health or social care need.									
29														\$ 5.50
30				How are climate factors changed?	Homes are being warmed to reduce to effect of cold days in the each household									
31														
32				Further economic benefits not captured in the health costs?	Overall savings from reduced energy costs (\$85/household/winter) over 10 years and 1000 households									
33														\$ 0.85
34				List any other benefits that cannot be monetised.	From the VHHP report: Improved thermal comfort, Better mental health conditions, improved quality of life									
35				Resulting health outcomes	\$ 1,242.03	0.0	5069.5	5069.5	\$ 1,242.03	\$ 43.80	\$ 43.80	\$ -	\$ -	\$ -
36				Health impact #1: Cold related	\$ 1,242.03	0.0	5069.5	5069.5	\$ 1,242.03	\$ 43.80	\$ 43.80	\$ -	\$ -	\$ -
37				Health impact #2: Heat related	\$ -	0.0	0.0	0.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
38														
39														
40														
41														
42														

Converting the VHHP data

- Change the title and the scope
- Set 'heat related' as the second (independent) health impact
- Add in further context for Assessment stages 1 and 2,
 - Baseline: World is heading towards 3 degrees of warming
 - Health action: Hospitals are equipped to manage this at a cost of \$500 for each household
 - Health action: Equipment efficiency reduces hospital energy bills for services provided by an average of \$50 for each household

Climate + VHHP using CHET: Projecting the results between 2026 and 2035

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
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Filling in the scenario data for cold homes:

- Further specify the heat impacts (i.e. consequence of excessive heat)
- Assume: In a 2 degree world, the mortality and direct costs to the health system from cold homes is the same as the VHHP study
- Assume: In a 3 degree world, the mortality and direct costs to the health system from cold homes is reduced slightly by -50 YLL and -\$2m respectively

Climate + VHHP using CHET: Projecting the results between 2026 and 2035

Filling in the scenario data for excessive heat

- Assume: In a 3 degree world that
 - Excessive heat leads to a mortality level of 1000 YLL for these 1000 households between 2026 and 2035
 - Excessive heat leads to \$10m in additional direct health system costs, \$7m in costs to the patient/family, and \$5m in indirect health costs
- Assume: In a 2 degree world that
 - Excessive heat leads to a reduced mortality level 800 YLL for these 1000 households between 2026 and 2035
 - Excessive heat leads to reduction and \$5m in additional direct health system costs, \$2m in costs to the patient/family, and \$1m in indirect health costs
- Assume: Assessment 3 only addresses cold homes and does not affect excessive heat results

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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Climate + VHHP using CHET: Projecting the results between 2026 and 2035

Overall results using the synthetic data:

- Reducing the trajectory from a 3 degree world to a 2 degree world would cost the health system \$0.5m between 2026 and 2035 for 1000 households, for a health outcome benefit of \$48.75m, which has a BCR of **97.6**
- Applying the VHHP program in a 2 degree world would cost an additional \$5.5m, for a health outcome benefit of \$225.2m, which has a BCR of **41.13**
- Altogether, a path towards a 2 degree world with the VHHP in place would cost \$6m, for a health outcome benefit of \$273.95m, which has a BCR of **45.84**

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1					2. Health Action vs. 1. Inaction		3. Intervention vs. 2. Health Action		3. Intervention & 2. Health Action vs. 1. Inaction					
2				Improvement in Health Costs (\$m)	48.75		225.20		273.95					
3				Improvement in non-Health Costs (\$m)	0.05		0.85		0.90			VSLY (\$)		
4				Costs of action (\$m)	0.50		5.50		6.00			\$ 245,000.00		
5				Benefit-Cost Ratio (BCR)	97.60		41.13		45.84					
6	Case Study: Victorian Healthy Homes Program amid a Warming Climate				Scope of the results									
7					1000 households, over 10 years with a mean age of 74.85 years and 1.33 persons/hh between 2026 and 2035 Note: The choice to apply a discount factor or not, is built into the cumulative value									
8	A framework for the quantification and economic valuation of health outcomes originating from health and non-health climate change mitigation and adaptation action				Cumulatively Valued Health Impacts (\$m)	Morbidity (cumulative, YLD)	Mortality (cumulative, YLL)	DALYs (cumulative)	Monetised DALYs (cumulative, \$m)	Cumulative Economic Impacts (\$m)	Direct cost to the healthcare system (cumulative, \$m)	Direct cost to the patient / family (cumulative, \$m)	Indirect health cost (cumulative, \$m)	Cost of investment into action(s) (cumulative, \$m)
9	1. Health outcomes under inaction towards climate change													
10	What's the estimated climate in the future?				Assumption: Globally, the climate is heading towards 3 degrees of warming, this is an estimated impact on the health system for these 1000 households over 10 years (e.g. 2026-2035). The cold weather experienced is less severe, however heat stress is now a growing concern.									
11	Health economic outcomes				\$ 1,688.16	0.0	6890.5	6890.5	\$ 1,688.16	\$ 75.63	\$ 63.63	7.00	\$ 5.00	
12	Health impact #1: Cold related				\$ 1,443.16	0.0	5890.5	5890.5	\$ 1,443.16	\$ 53.63	\$ 53.63	-	\$ -	
13	Consequence of cold homes					0.0	5890.5	5890.5	\$ 1,443.16		\$ 53.63	-	\$ -	
14						0.0	0.0	0.0	\$ -		\$ -	-	\$ -	
15	Health impact #2: Heat related				\$ 245.00	0.0	1000.0	1000.0	\$ 245.00	\$ 22.00	\$ 10.00	7.00	\$ 5.00	
16	Consequence of excessive heat					0.0	1000.0	1000.0	\$ 245.00		\$ 10.00	7.00	\$ 5.00	
17						0.0	0.0	0.0	\$ -		\$ -	-	\$ -	
18	2. Health outcomes under health system action													
19	What changes in health system and how much do they cost?				Hospitals are reconfigured to deliver health care services in a 2 degrees warmer world (for 1000 households between 2026-2035)									
20	How are climate factors changed?				Australia plays it part to achieve 2 degrees of global warming, this is the estimated impact on the health system for these 1000 households between 2026-2035. Assumption: The cold weather experienced in Melbourne remains the same as in the VHHP study period.									
21	What are the other added benefits of these changes?				Efficiency improvements in central heating over 10 years									
22	What are the other added benefits of this intervention that cannot be monetised?				None identified at this time									
23	Resulting health outcomes				\$ 1,651.41	0.0	6740.5	6740.5	\$ 1,651.41	\$ 63.63	\$ 60.63	2.00	\$ 1.00	
24	Health impact #1: Cold related				\$ 1,455.41	0.0	5940.5	5940.5	\$ 1,455.41	\$ 55.63	\$ 55.63	-	\$ -	
25	Consequence of cold homes					0.0	5940.5	5940.5	\$ 1,455.41		\$ 55.63	-	\$ -	
26						0.0	0.0	0.0	\$ -		\$ -	-	\$ -	
27	Health impact #2: Heat related				\$ 196.00	0.0	800.0	800.0	\$ 196.00	\$ 8.00	\$ 5.00	2.00	\$ 1.00	
28	Consequence of excessive heat					0.0	800.0	800.0	\$ 196.00		\$ 5.00	2.00	\$ 1.00	
29						0.0	0.0	0.0	\$ -		\$ -	-	\$ -	
30	3. Health outcomes under further mitigation and adaptation action													
31	What is the intervention and how much does it cost?				Victorian Healthy Homes Program, delivered thermal comfort and energy efficiency upgrades to low-income Victorians with a health or social care need.									
32	How are climate factors changed?				Homes are being warmed to reduce to effect of cold days in the each household									
33	Further economic benefits not captured in the health costs?				Overall savings from reduced energy costs (\$85/household/winter) over 10 years and 1000 households									
34	List any other benefits that cannot be monetised.				From the VHHP report: Improved thermal comfort, Better mental health conditions, improved quality of life									
35	Resulting health outcomes				\$ 1,438.03	0.0	5869.5	5869.5	\$ 1,438.03	\$ 51.80	\$ 48.80	2.00	\$ 1.00	
36	Health impact #1: Cold related				\$ 1,242.03	0.0	5069.5	5069.5	\$ 1,242.03	\$ 43.80	\$ 43.80	-	\$ -	
37	Consequence of cold homes					0.0	5069.5	5069.5	\$ 1,242.03		\$ 43.80	-	\$ -	
38						0.0	0.0	0.0	\$ -		\$ -	-	\$ -	
39	Health impact #2: Heat related				\$ 196.00	0.0	800.0	800.0	\$ 196.00	\$ 8.00	\$ 5.00	2.00	\$ 1.00	
40	Consequence of excessive heat					0.0	800.0	800.0	\$ 196.00		\$ 5.00	2.00	\$ 1.00	
41						0.0	0.0	0.0	\$ -		\$ -	-	\$ -	

Conclusions

Summary

The Climate Health and Economic co-benefit Tool (CHET) is able to,

- Translate the WHO framework into a series of steps for analysis
- Provide a clear and structured framework to assess the various economic impacts of climate mitigation and adaptation actions
- Enable the valuation of both direct health benefits and broader system savings
- Allow flexible scenario analysis to suit different policy and research requirements
- Strengthen evidence-based decision-making by illustrating the economic case for health-related climate interventions



Gaps in the Application of CHET using the WHO Framework

- **Assessment of health outcomes under future climate scenarios**

This requires the development of a comprehensive and precise model that integrates climate projections with equivalent/consistent health outcomes downscaled to the relevant scope.

- **Regional and short-term climate projections**

Obtaining climate projections at regional or local scales and for shorter timeframes is challenging. Current climate projections are typically available at national or larger scales, and focus on longer-term horizons and snapshots (e.g., 2030, 2050, 2100).

- **Explicit valuation of health and economic impacts**

Calculating the economic costs associated with specific health impacts caused by climate-related factors remains complex and resource-intensive.

- **Development of tailored models for intervention assessment**

Users must build specific models to evaluate health outcomes (both morbidity and mortality) resulting from actions within the health sector, as well as interventions from other sectors.



Policy Implications

- **Drive Investment into Integrated Climate-Health Modelling**

There is a need for policy support to develop comprehensive regional-level models that integrate future climate scenarios with health outcomes.

- **Enhancement of Regional and Local Climate Projections**

Policies should support regional downscaling initiatives and the development of local climate-health databases to better inform regional planning and decision-making.

- **Support for Tailored Modelling of Intervention Impacts**

Policies should foster the creation of dynamic, scenario-based modelling tools that can support co-benefit analyses across different sectors.



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Thank you

Becca Liu & Dr Kelvin Say



Source: Pan American Health Organization