

# ECONOMIC AND QUALITY OF LIFE BURDEN OF PAEDIATRIC INFLUENZA IN AUSTRALIA

Aghajanian L, Tilden D, Valeri M  
THEMA Consulting Pty Ltd, Pyrmont, Australia

## INTRODUCTION

- Seasonal influenza is a major contributor to the preventable disease burden of Australians.
- On average each year, approximately 5,100 hospitalisations and 100 deaths directly attributable to influenza are notified annually. In Australia, as in other developed countries, older people and children less than 5 years of age have the highest rates of influenza hospitalisation (AIH, 2019).
- Influenza notification and hospitalisation rates between 2006 and 2015 (excluding the 2009 pandemic year) in Australia were highest among children aged 0-23 months (300-327 per 100,000 and 109-192 per 100,000, respectively), with high notification rates observed for all children aged 0-4 years (Li-Kim-Moy 2016).
- It is acknowledged that these data, as estimated by national surveillance, underestimate the true burden of influenza disease in Australia.
- Seasonal influenza vaccination in Australia is currently funded under the National Immunisation Program (NIP) for: individuals aged 65 years and over; individuals aged 6 months and over at increased risk of severe influenza outcomes; all Aboriginal and Torres Strait Islander people aged 6 months and over; and pregnant women (DOH 2019).
- The influenza vaccine is therefore not universally funded for children aged 6 months to <5 years, despite children having a disproportionately higher risk of influenza-related morbidity and mortality.
- Given the negative impacts of the disease, in terms of health-related quality of life (HrQoL) for both patients and their families, and productivity losses during the influenza season, it is important to ensure high vaccination rates among populations at greatest risk of influenza.

## OBJECTIVES

- In order to inform a cost-effectiveness evaluation, an estimation of direct and indirect healthcare costs and resource utilisation and quality of life burden associated with influenza was required.
- The aim of the study was to evaluate the quality of life burden and healthcare resource utilisation attributable to influenza in children within the Australian setting from published literature sources.

## METHODOLOGY

- Literature searches using the Medline database (PubMed platform) were performed in November 2018.
- Health state utility search (Search 1):** The search identified 142 citations. Studies reporting quality-adjusted life years (QALYs) lost for a day with influenza were included. Where a study reported the disutility of influenza, the average number of days with influenza was applied to determine the QALYs lost for a day with influenza.
- Resource utilisation (Search 2):** The search identified 558 citations. Studies reporting resource utilisation and/or costs specific to influenza burden from an ordinary influenza season and within an Australian treatment setting were included.
- Summaries of the methodologies and results of the literature searches are presented in **Table 1**.

Table 1. Literature search methodology

SEARCH 1: HEALTH STATE UTILITY		SEARCH 2: RESOURCE UTILISATION		
Database	Medline database using PubMed			
Date	8 <sup>th</sup> November 2018	14 <sup>th</sup> November 2018		
Search terms/no. of hits				
#1	(((health outcomes) OR health states) OR QALY) OR Quality-adjusted life year) OR utility	221,330	((healthcare) OR resource) OR cost	1,947,236
#2	Influenza	88,355	(Influenza) OR flu	105,090
#3	Cost effectiveness	53,276	Australia*	564,801
#4	#1 AND #2 AND #3	142	#1 AND #2 AND #3	558
Exclusion criteria				
A	Not reporting a health state utility value for influenza	60	Not estimating resource utilisation or costs specific to influenza burden	539
B	Not original source	72	Not from an Australian source	10
C	Not in English	2	Full text unavailable	1
D	Not in children	1	Not representative of ordinary influenza season	1
Total excluded		136		551
Total number of included citations		6		7

## RESULTS

### SEARCH 1: HEALTH STATE UTILITY

- The search identified six (6) studies evaluating quality of life burden of influenza in children.
- Across the identified studies, QALYs lost due to a single case of influenza ranged from 0.005 to 0.0085 (**Figure 1**).

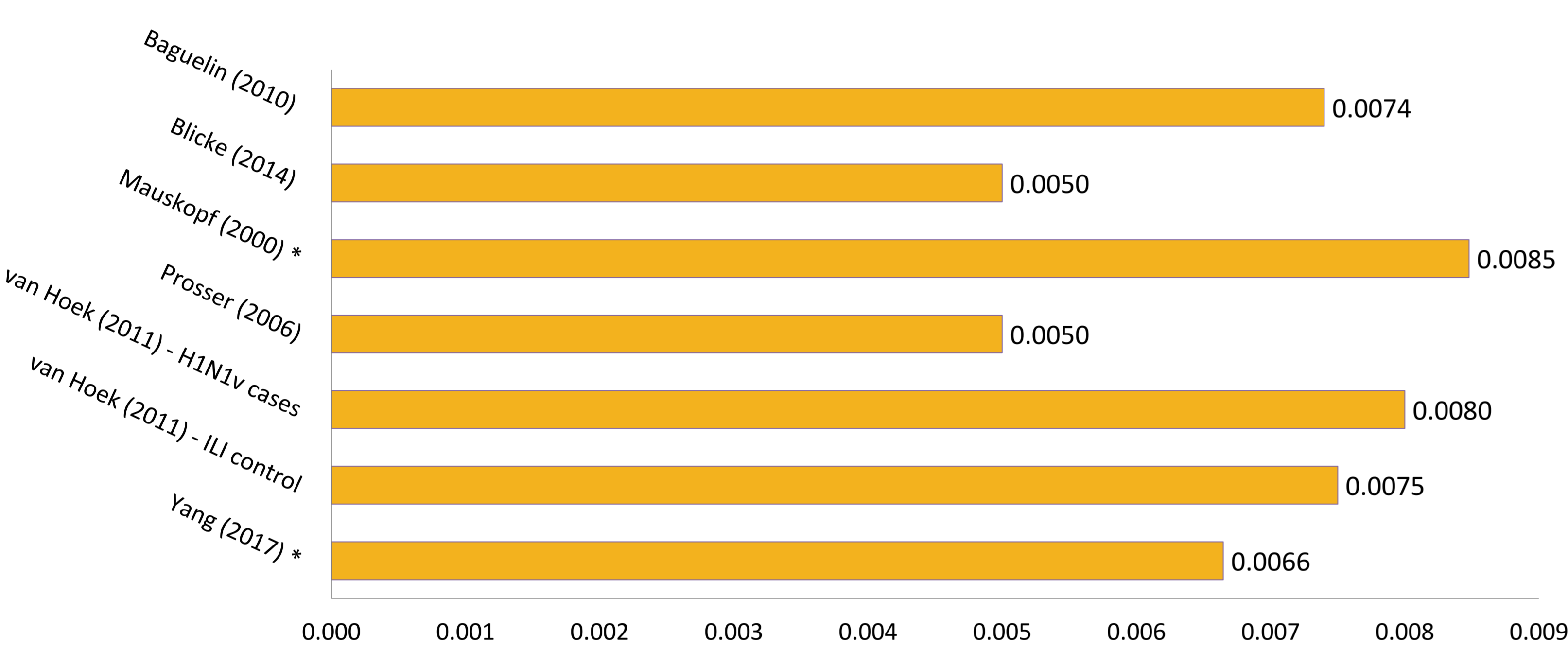


Figure 1. QALYs lost per case of influenza

\* Calculated from disutility and number of days with influenza (Mauskopf 2000 reported a utility weight for a day with influenza symptoms of 0.5579 and an average of 7 days with influenza; Yang 2017 reported a utility weight of 0.6087 and an average of 6.2 days with influenza)  
Note: Where results for various settings and/or populations were reported, the estimates relevant to children within an outpatient or community setting are presented.

- A summary of the identified health utility studies is presented in **Table 2**.
- None of the studies reported utility estimates pertinent to young children (aged 6 months to 5 years) with influenza from an Australian setting.
- The majority of studies employed the EQ-5D questionnaire (n=3).
- Baguelin (2010) reported QALY estimates specific to a cohort of non-hospitalised children; although was conducted in England during the 2009 pandemic influenza year. As a result, the QALY estimates may not be representative of an ordinary flu season in an Australian population.
- Prosser (2006) was the only utility valuation of influenza conducted exclusively in children; however the applicability of the study was limited given the influenza health state was valued from the perspective of adults, not the child with influenza, using time trade off interviews.
- Reported values by Blicke (2014), Mauskopf (2000); Van Hoek (2011) and Yang (2017) were not disaggregated by age (i.e., population comprised of children and adults).
- Mauskopf (2000) was a trial-based evaluation (MIST RCT) in patients aged >12 years with virologically confirmed influenza, with >90% of subjects recruited within Australia and therefore deemed as most relevant to the Australian setting.

Table 2. Summary of key characteristics of identified utility studies

STUDY	METHOD	LOCATION	POPULATION	SUITABILITY FOR COST-UTILITY ANALYSIS
Baguelin (2010)	EQ-5D	England (outside London and the West Midlands) in 2009	228 children and adults with confirmed H1N1v infection	Patients had suspected H1N1v (novel strain of influenza A identified during the pandemic 2009 influenza season).
Blicke (2014)	SF-12v2 Health Survey	Belgium in 2012	2,250 children and adults who complied with the definition for ILI	Non-specific to children; 27% of patients were aged 0-17.
Mauskopf (2000)	Quality of well-being scale	Australia (over 90%), New Zealand and South Africa in 1997	455 patients aged >12 years with virologically confirmed influenza enrolled in the MIST RCT	Relevant to Australian setting. Non-specific to children
Prosser (2006)	Time-trade-off (telephone interview)	New England, United States in 2001	112 adults selected at random from a New England HMO	Values the influenza health state of a child from the perspective of an adult
Van Hoek (2011)	EQ-5D	England in 2009	269 children and adults with reported ILI	Non-specific to children; 30% of ILI controls and 38% of H1N1v cases were children.
Yang (2017)	EQ-5D-3L	China in 2013	778 laboratory confirmed influenza outpatients and inpatients >18 months of age registered in the ILINet	Non-specific to children; 23.1% of outpatients were aged <5 years and 46.5% were aged 5-15.

Abbreviations: EQ-5D, EuroQol 5 dimensional; ILI, influenza like illness; HMO, health maintenance organisation; RCT, randomised controlled trial; SF, short form

### SEARCH 2: RESOURCE UTILISATION

- The search identified seven (7) studies that estimated influenza-related resource utilisation in children from Australia. Key characteristics of the identified studies are presented in **Table 3**.
- The majority of resource use studies were prospective cohort studies (85.7%) reporting both the direct and indirect burden of influenza in children within a hospital (n=2) or community based settings (n=4).
- The mean cost per episode of community-managed influenza, comprising of direct and indirect productivity costs was estimated in three studies (Lambert 2004; Lambert 2008 and Yin 2013).
- Resource utilisation estimates without cost-related information were reported in another three studies, whilst one cost-of-illness study by Newall & Scuffham 2008 estimated that the cost of influenza-related illness in a typical season is \$115 million from the perspective of the Australian healthcare system

Table 3. Summary of resource utilisation studies

Resources	Iskander (2009)	Lambert (2004)	Lambert (2005)	Lambert (2008)	Newall & Scuffham (2008)	Willis (2018)	Yin (2013)
<b>Trial design / characteristics</b>							
Population	< 5 years	12-71 months	12-71 months	Preschool	All ages	6-59 months	6-36 months
Year conducted	2006	2001	2001	2003-2004	2000-2006	2008-2014	2010
Prospective cohort studies	✓	✓	✓	✓		✓	✓
Hospital based	✓					✓	
Community based		✓	✓	✓	✓		✓
Reported cost per influenza episode		✓	✓	✓			✓
<b>Direct resources</b>							
GP visit	✓	✓	✓	✓	✓	✓	✓
Other HCP visit	✓	✓	✓	✓	✓	✓	✓
Hospital/Emergency department visit	✓	✓	✓	✓	✓	✓	✓
Diagnostic tests	✓	✓	✓	✓			✓
Antibiotics	✓	✓	✓	✓		✓	✓
Other prescription medicine	✓	✓	✓	✓			
OTC medicine		✓	✓			✓	✓
<b>Indirect resources</b>							
Productivity (e.g. carers time off work)	✓	✓	✓	✓		✓	✓

Abbreviations: GP, general practitioner; HCP, health care professional

- The mean costs per episode of community-managed influenza were \$240.88 [2001/2002 \$AUD; Lambert 2004], \$308.70 [2003 \$AUD; Lambert 2008] and \$626 [2010 \$AUD; Yin 2013]. Direct costs accounted for 13.9%, 8.8% and 35.1%, respectively. Accordingly, the key driver was indirect productivity costs such as carer time away from usual activities and work (**Figure 2**).
- Inflating reported costs to 2018 figures resulted in a mean cost per influenza case ranging from \$544 to \$882 AUD
- It is noted that prescription medicines (other than antibiotics) and diagnostic test costs were omitted from Yin 2013 whilst Lambert 2008 did not include other prescription and OTC medicines costs in their analysis, potentially underestimating the overall cost of an influenza related episode in children.

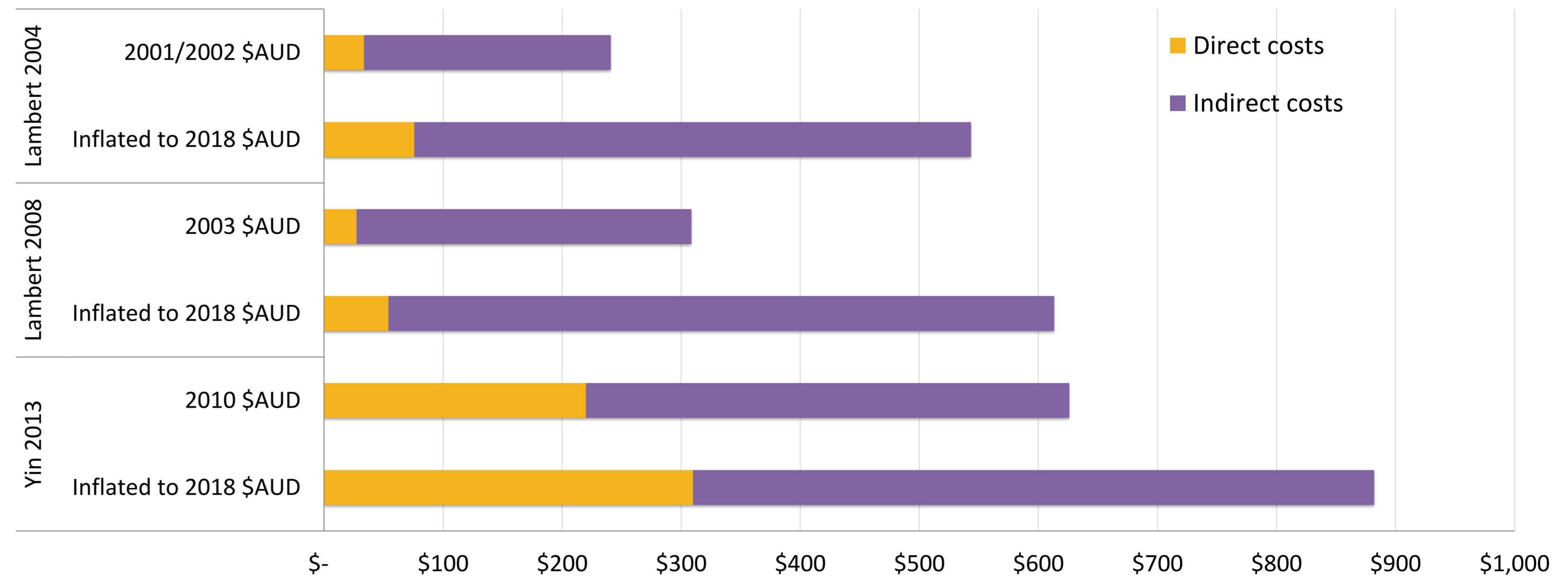


Figure 2. Mean cost per episode of community-acquired influenza  
Prices inflated to 2018 \$AUD using health CPI index

## CONCLUSIONS

- The quality of life implications and economic burden of influenza infection in children are significant, particularly when indirect societal costs such as carer absenteeism and lost productivity are considered, which highlights the potential importance of adopting a societal approach when evaluating the cost-effectiveness of interventions for influenza.
- This review of published literature identified relevant sources reporting the quality of life impact and resource utilisation attributable to influenza from an Australian perspective and setting which will help inform the cost-effectiveness of a universal influenza vaccine program in children.

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