

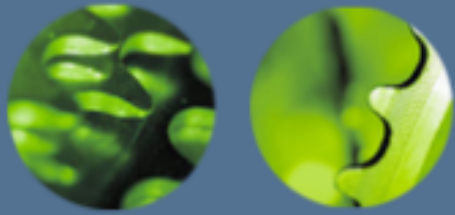
# 戒菸治療之成本效果分析

## Cost Effectiveness Analysis of the Smoking Cessation

高雄榮總家庭醫學部

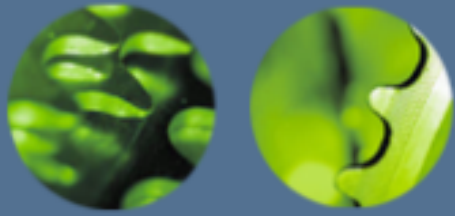
主治醫師

薛光傑



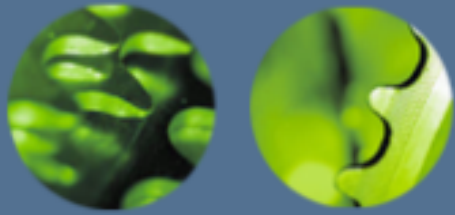
# Background

- **Healthcare advances (new drugs, devices, or screening and diagnostic tests)**
- **Rising healthcare costs**
- **Health budgets can't meet all of the possible demand**
- **Cost-effectiveness evaluation can assist decision-makers**
- **Maximize the net public health benefit**



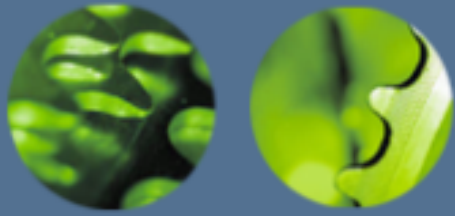
# 醫療相關之經濟分析

- 一、成本確認分析（**Cost-identification analysis**）
- 只確定或檢驗醫療成本之分析法，一般來說，其分析側重於醫療之成本計算（如直接成本、間接成本），其好處是計算方式直接而簡單，可得到一個單純之成本數字，並對於某醫療之花費有一個大約之概念
- 其缺點則是對於非經濟之因素（如健康之改善程度、壽命之延長）則通常不予考慮，亦無法比較何種醫療為最有效或最經濟之處置，在臨床上容易忽略隱藏之成本並造成醫療之浪費。



## 醫療相關之經濟分析

- 二、成本效益分析（**Cost-benefit analysis**）
- 將成本與健康結果同時納入分析，成本與健康結果之單位皆為金額，所以多種不同之醫療方案能夠用同樣之單位互相比較成本與結果
- 前提為必須將**健康結果**予以**金額化**，並在考量折現之前提下計算社會之淨效益（net social benefit）
- Because assigning a monetary value to a health outcome (or life) raises many ethical objections, cost-benefit analysis has generally **not** been accepted in healthcare.

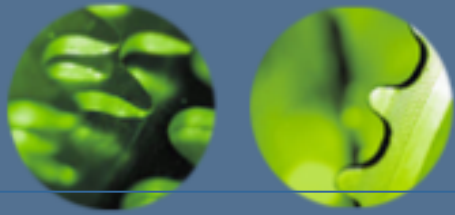


## 醫療相關之經濟分析

- 三、成本效果分析 (**Cost-effectiveness analysis CEA**)
- 常用於醫療之經濟評估方法，成本之單位為金額，效用單位或健康結果則以所拯救或延長之年數計算（例如**Life Years Saved, LYS**）。
- 通常以「可以延長或拯救一年壽命之花費」來表示醫療成本

【公式】拯救一年生命年數之成本

$$= \text{醫療之花費} / \text{拯救之生命年數(LYS)}$$



# 各種醫療介入之成本效果分析

## 醫療介入種類

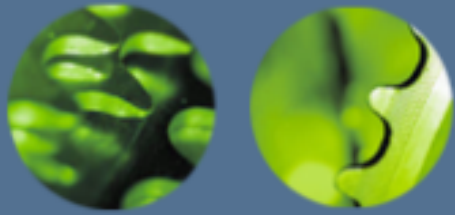
每拯救一年生命年數花費 (美金)

戒菸	2,587~ 6,828
老年人肺炎疫苗注射	1,500
冠狀動脈繞道手術	4,329
苯酮尿篩檢	7,000
腎臟移植	9,756
子宮頸癌篩檢	10,000~ >1,000,000
中度高血壓之治療 (舒張壓 > 110 mmHg)	11,300
心臟移植	16,239
荷爾蒙替代療法	23,500
輕度高血壓之治療 (舒張壓 90 - 110 mmHg)	24,408
乳癌篩檢	26,800
膽固醇之治療 (>265 mg/Dl, 使用cholestyramine)	36,000~ >1,000,000
血液透析	37,000
65歲以上老人之急性心肌梗塞Streptokinase治療	55,000



## “Incremental” cost-effectiveness

- **COST-EFFECTIVENESS RATIO** —
- The average cost-effectiveness ratio divides each intervention's costs by its effectiveness. This can result in misleading conclusions about an intervention's cost-effectiveness.
- A preferable way to express cost-effectiveness is **“Incremental” cost-effectiveness**, which refers to the additional cost and the additional benefit of one intervention compared with another.

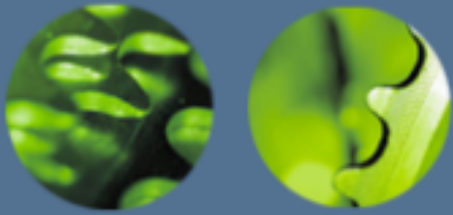


## 醫療相關之經濟分析

- 四、成本效用分析 (**Cost-Utility Analysis, CUA**)
- 成本效用分析 (**CUA**) 屬於成本效果分析 (**CEA**) 之技術運用。在延長了生命之後，再加上了生活品質之考量，是目前最廣為人用也最被接受之醫療經濟評估方式
- 效用單位則以『生活品質調整生命年數』 (**quality adjusted life year, QALY**) 表示。也就是除了延長生命之成本之外，亦計算所延長生命之生活品質

【公式】拯救一年生活品質調整生命年數(QALY)成本  
= 醫療之花費 / 拯救之生活品質調整生命年數QALYs





# Quality Adjusted Life Years

Quality Adjusted Life Years  
(QALYs)

=

Time  
(years)

x

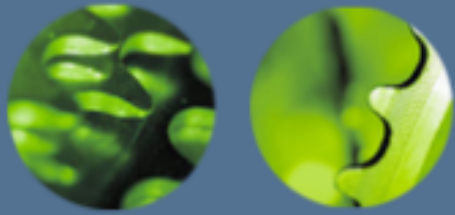
Quality of Life  
(0-1 scale)

1 QALY = 1 year x Perfect health  
(score of 1)

0.8 QALY = 1 year x score of 0.8

OR

0.8 QALY = 0.8 year x Perfect health



## 醫療相關之經濟分析

- 戒菸治療最主要涉及戒菸個案日後因戒菸所獲得之生命延長與生活品質改善，故臨床上比較常用之分析為

**成本效果分析 (Cost-effectiveness analysis)**

**成本效用分析 (Cost-Utility Analysis)。**



# 醫療成本與效益之計算基礎

- 一、醫療成本：
  1. **直接成本**：治療疾病產生之醫療與其他費用。主要為醫師費.住院.與藥品.手術.護士費用.交通費.停車費.油資等.
  2. **間接成本**：因治療疾病所產生之生產力之損失或額外之費用為間接成本(工作人力減損.治療副作用處理.併發症治療.等)



# 醫療成本與效益之計算基礎

- 二、效益部份：

成效或效果之計算一般乃根據半年或一年（或推估）之戒菸成功率，計算每一位成功戒菸者之成本，並依文獻之參數，計算戒菸可拯救之生命年數（**LYS**）與生活品質調整生命年數（**QALY**）

- 再以公式一、二計算，即為最基本之成本效果分析。

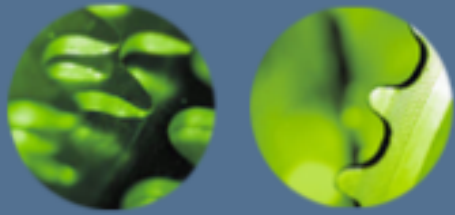


## 醫療成本與效益之計算基礎

- 二、效益部份：
- 折現方面，因醫療介入所獲得之生命年數因為必須考慮時間因素加以折現或折舊，一般選用**3%~5%**。
- **25~29**歲個案因戒菸可獲得**4.73**年之延壽，但在現實生活中，此壽命之延長是**70**歲之後的事件，故必需加以折現；以**3%**折現後其時間價值等於**1.31**年，以**5%**折現後其時間價值等於**0.95**年

戒菸年數 ≥15年	每位吸菸者所拯救的生命年數			每位吸菸者品質調整後的生命年數		
戒菸年齡	未折現	3%折現	5%折現	未折現	3%折現	5%折現
<b>男性</b>						
25-29	4.73	1.31	0.95	6.55	2.34	1.32
30-34	4.47	1.39	1.03	6.09	2.38	1.40
35-39	4.09	1.43	1.06	5.48	2.34	1.44
40-44	3.59	1.40	1.08	4.75	2.20	1.41
45-49	3.03	1.30	1.00	3.96	1.98	1.32
50-54	2.35	1.11	0.89	3.08	1.67	1.16
55-59	1.76	0.91	0.74	2.31	1.35	0.97
60-64	1.23	0.70	0.59	1.62	1.01	0.77
65-69	0.76	0.47	0.40	1.04	0.69	0.54
<b>女性</b>						
25-29	6.71	1.43	1.01	6.60	1.94	1.01
30-34	6.66	1.63	1.13	6.34	2.04	1.10
35-39	6.44	1.80	1.29	5.93	2.08	1.17
40-44	6.00	1.90	1.32	5.38	2.06	1.19
45-49	5.56	1.95	1.39	4.77	1.97	1.19
50-54	4.94	1.92	1.38	4.08	1.81	1.13
55-59	4.28	1.85	1.33	3.39	1.62	1.05
60-64	3.53	1.69	1.24	2.67	1.39	0.94
65-69	2.67	1.41	1.07	1.93	1.08	0.77

資料來源：Fiscella and Franks (1996)



## 戒菸醫療成本與效益之文獻

- 1996年美國的衛生保健政策研究處(Agency for Health Care Policy and Research ; AHCPH)就已經開始計算醫師以諮商方式(不用藥物)幫助群眾戒菸之成本效果(依據上表推估,採3%折現)做出計算

- 結果:

每幫一人成功戒菸花費	3,779 美元
每拯救一生命年數 (LYS)	<b>2,587 美元</b>
拯救一QALY	1,915 美元

- 其成本效果遠較與其他預防醫療或臨床醫療介入優勝



## 戒菸醫療成本與效益之文獻

- 1997年梅約診所（Mayo Clinic）單一機構之經驗，其收集了1988至1992年間統計5,544位戒菸者之世代追蹤研究，以6個月之戒菸率、5%折現為基礎加以計算，結果每一LYS花費為**6,828美元**
- 研究者（Fiscella 和 Franks）指出，以戒菸貼片幫助戒菸個案戒菸，其增加之成本效果（**Incremental cost effectiveness**，3%折現）：每增加一個終身戒菸者亦只需花費**7,332美元**
- 每增加一QALY，男性需花費**4,390~10,943美元**  
女性需花費**4,955~ 6,983美元**





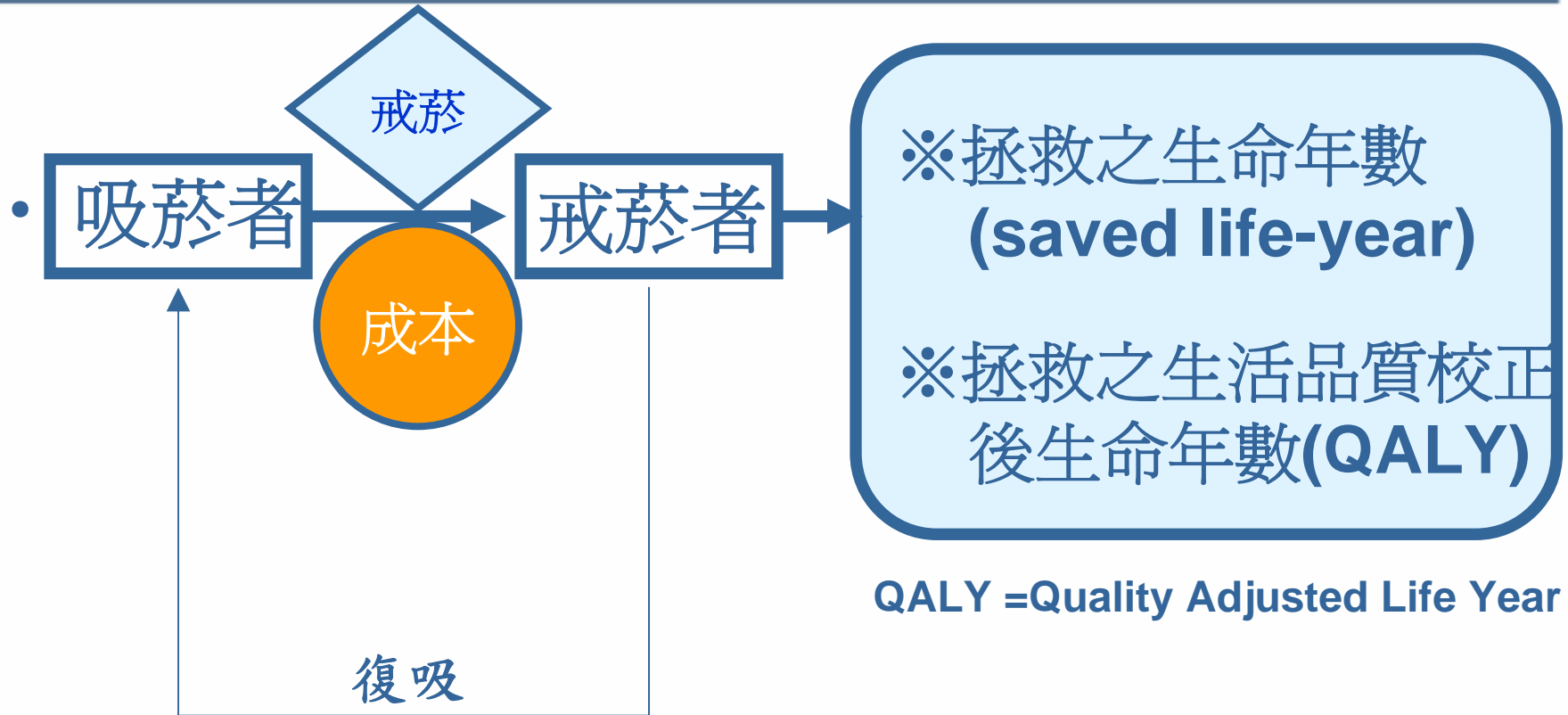
## 戒菸醫療成本與效益之文獻

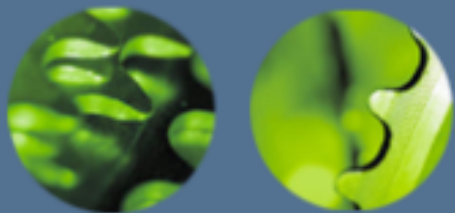
- 1997年另一個以13個雙盲試驗追蹤半年結果所計算出使用貼片可增加之成本效果(ICER)依不同年齡層其每拯救1生命年數  
在男性為 1,796~ 2,949美元  
女性則為 3,040~ 4,391美元

Wasley MA, McNagny SE, Phillips VL, Ahluwalia JS. The cost-effectiveness of the nicotine transdermal patch for smoking cessation. *Prev Med* 1997 ; 26(2):264-70.



# Cost Effectiveness Analysis Cost Utility Analysis

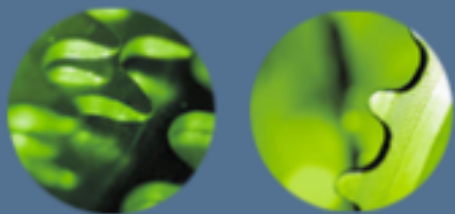




# 成本計算

## 就診八次範例

療程	1st週	2nd週	3rd週	4th週	5th週	6th週	7th週	8th週	總計
掛號費用	100	100	100	100	100	100	100	100	800
藥費	貼片 250 + 差額	貼片 250 + 差額	貼片 250 + 差額	貼片 250 + 差額	貼片 250 + 差額	貼片 250 + 差額	貼片 250 + 差額	貼片 250 + 差額	2000 + 總差額
醫師費	衛教 250	衛教 250	衛教 250	衛教 250	衛教 250	衛教 250	衛教 250	衛教 250	2000
累積費用	500 100+ 差額	1000 200+ 差額	1500 300+ 差額	2000 400+ 差額	2500 500+ 差額	3000 600+ 差額	3500 700+ 差額	4000 800+ 差額	4000 800+ 差額



# 成本計算

療程A：一天抽菸量大於或等於一包者

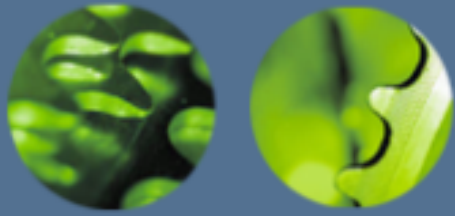
1 <sup>st</sup> 週	2nd週	3rd週	4th週	5th週	6th週	7th週	8th週
克菸貼片 <b>30</b> 號				克菸貼片 <b>20</b> 號		克菸貼片 <b>10</b> 號	
藥價差額 <b>372</b> 元/週				差額 <b>367</b> 元/週		差額 <b>317</b> 元/週	
30				20		10	

療程B：一天抽菸量小於一包者

1 <sup>st</sup> 週	2nd週	3rd週	4th週	5th週	6th週	7th週	8th週
克菸貼片 <b>20</b> 號						克菸貼片 <b>10</b> 號	
差額 <b>367</b> 元/週						差額 <b>317</b> 元/週	
20						10	

# 基本資料 (n=547)

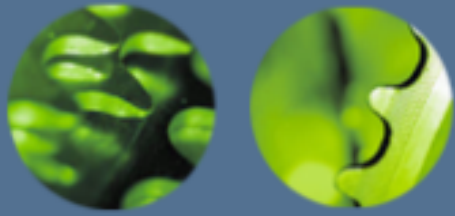
基本特質	人數 (%)	一年電訪追蹤 戒菸成功者n (%)	p值
總人數	547 (100)	163 (29.8)	
性別 <sup>a</sup>			
男性	495 (90.5)	153 (30.9)	<u>0.080</u>
女性	52 (9.5)	10 (19.2)	
年齡 (範圍18-84歲) <sup>t</sup>	mean±SD=47.0 ±16.5		
18-24	22 (4.0)	7 (31.8)	<b>0.036*</b>
25-29	48 (8.8)	14 (29.2)	
30-34	75 (13.7)	17 (22.7)	
35-39	75 (13.7)	25 (33.3)	
40-44	75 (13.7)	18 (24.0)	
45-49	38 (6.9)	4 (10.5)	
50-54	45 (8.2)	14 (31.1)	
55-59	34 (6.2)	11 (32.4)	
60-64	29 (5.3)	12 (41.1)	
65-69	22 (4.0)	6 (27.3)	
70(含)以上	84 (15.4)	35 (41.7)	
教育程度 <sup>a</sup>			
國小及以下	45 (8.2)	17 (37.8)	<b>0.424</b>
國初中	67 (12.3)	19 (28.4)	
高中職	200 (36.6)	53 (26.5)	
大學(含)以上	235 (43.0)	74 (31.5)	



# 門診戒菸兩性成本分析

## COST、CEA、CUA

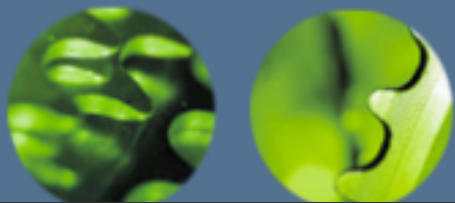
性別	掛號費 藥價自付額 藥品補助 醫師費用 總成本	藥品補助 醫師費用 補助成本	成功 人數	每一戒菸 成功個案 平均成本	每1戒菸成功個案 平均補助成本
女性	100470	70250	10	10047	7025
男性	1157323	809250	153	7564	5289
總計	1257793	879500	163	7717	5396



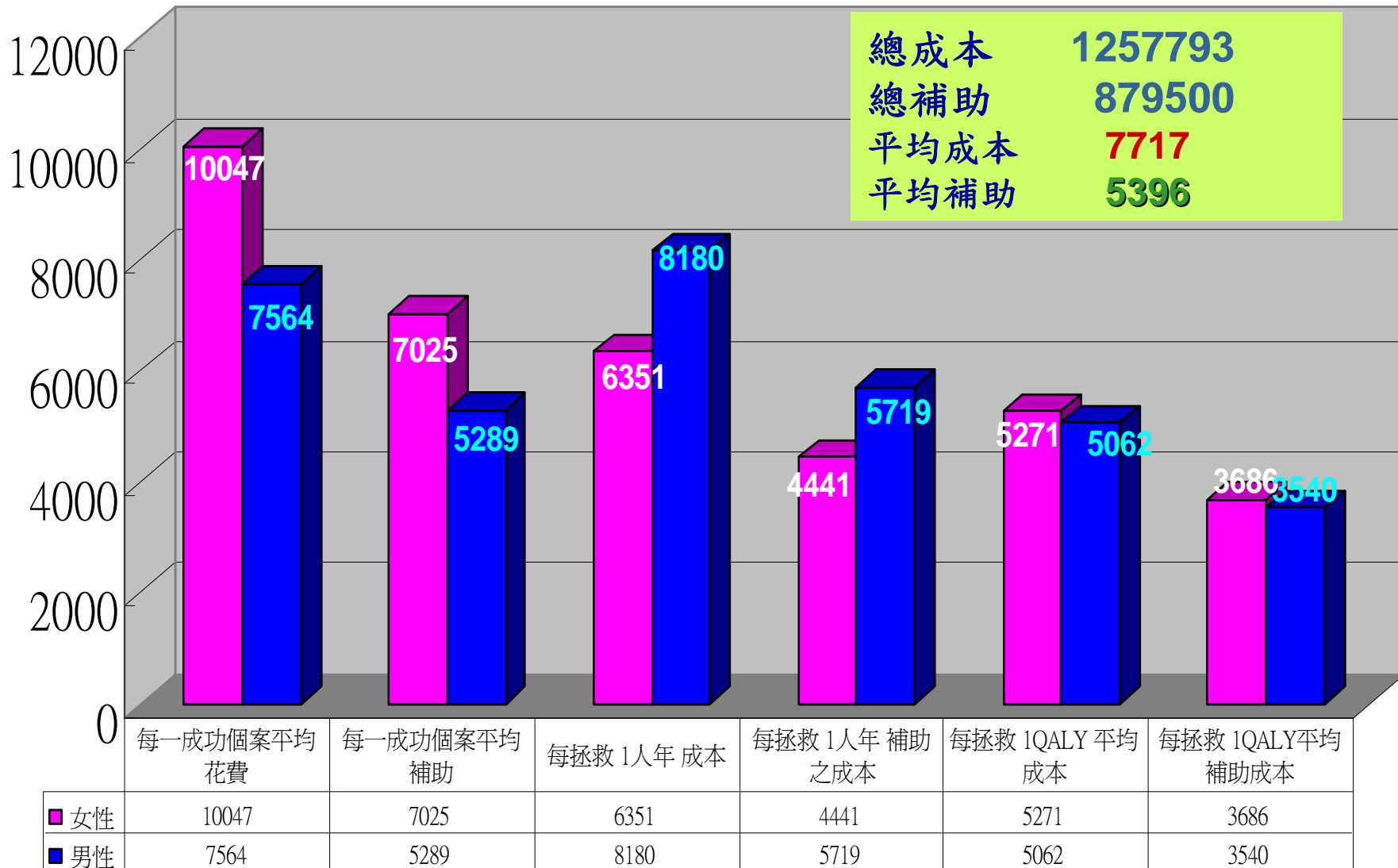
# 門診戒菸兩性成本分析

## COST、CEA、CUA

性別	總成本	補助成本	總拯救人年數	總拯救QALY	每拯救1人年平均成本	每拯救1人年平均補助	每拯救1QALY平均成本	每拯救1QALY平均補助
女性	100470	70250	15.8	19.1	6351	4441	5271	3686
男性	1157323	809250	141.5	228.6	8180	5719	5062	3540
總計	1257793	879500	157.3	247.7	7996	5591	5078	3551



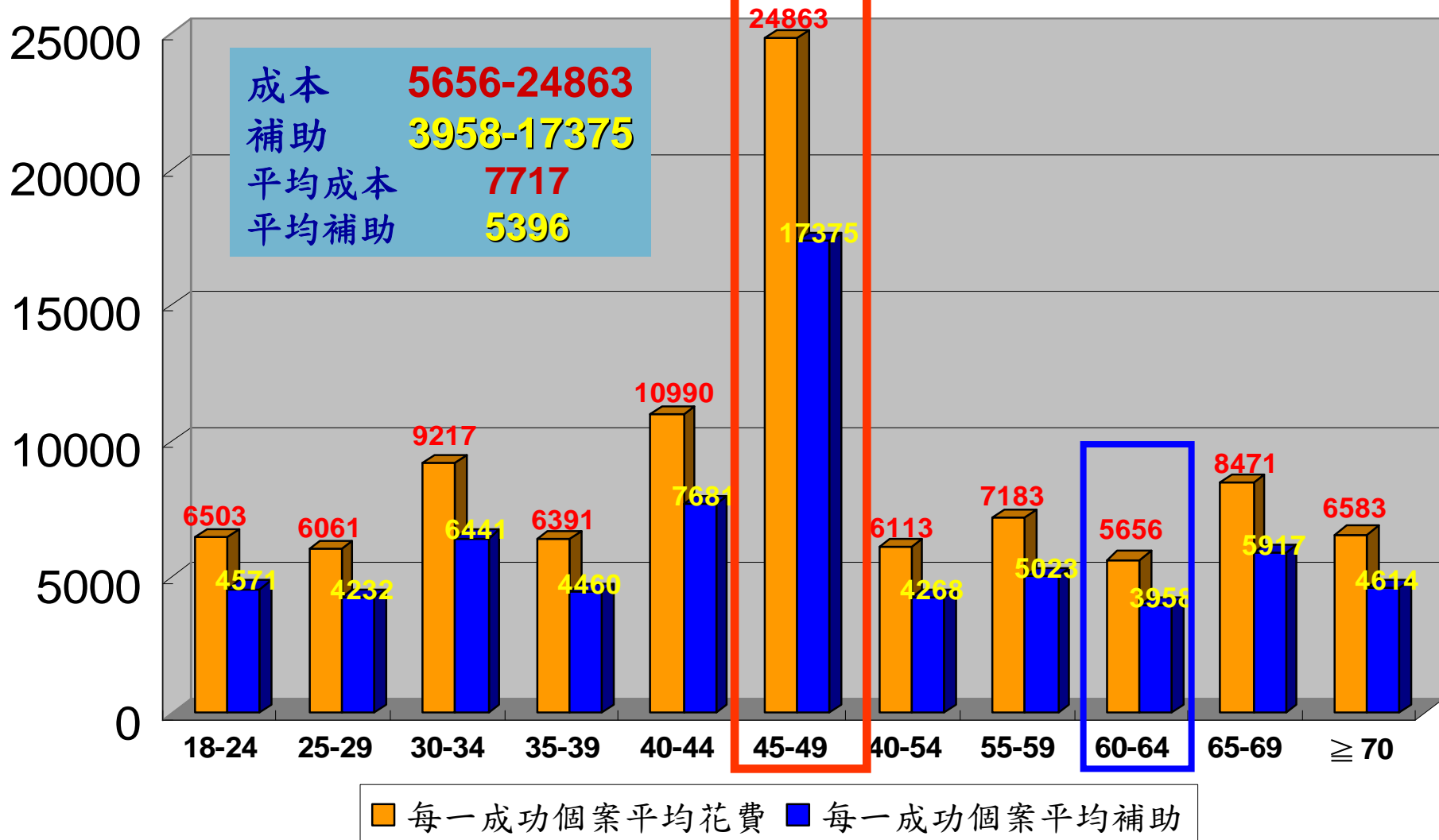
# 門診戒菸兩性成本分析

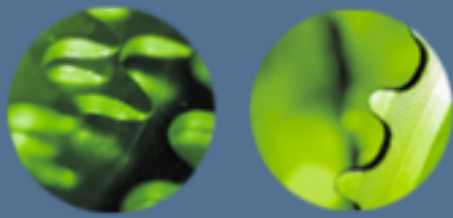






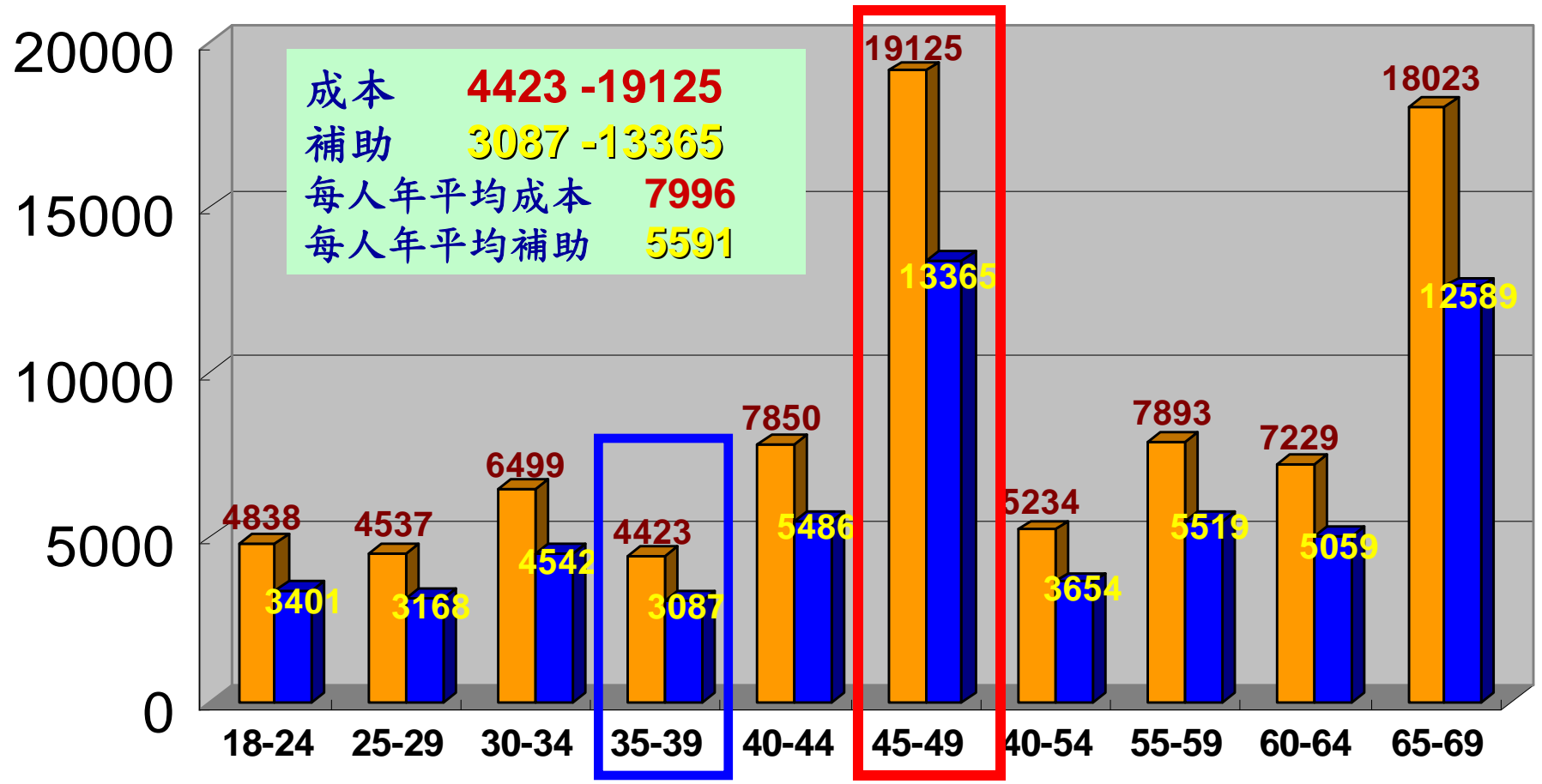
# 門診戒菸年齡別成本分析



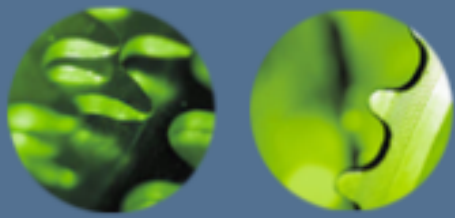


# 門診戒菸年齡別成本分析

## Cost per saved life-year(CEA)

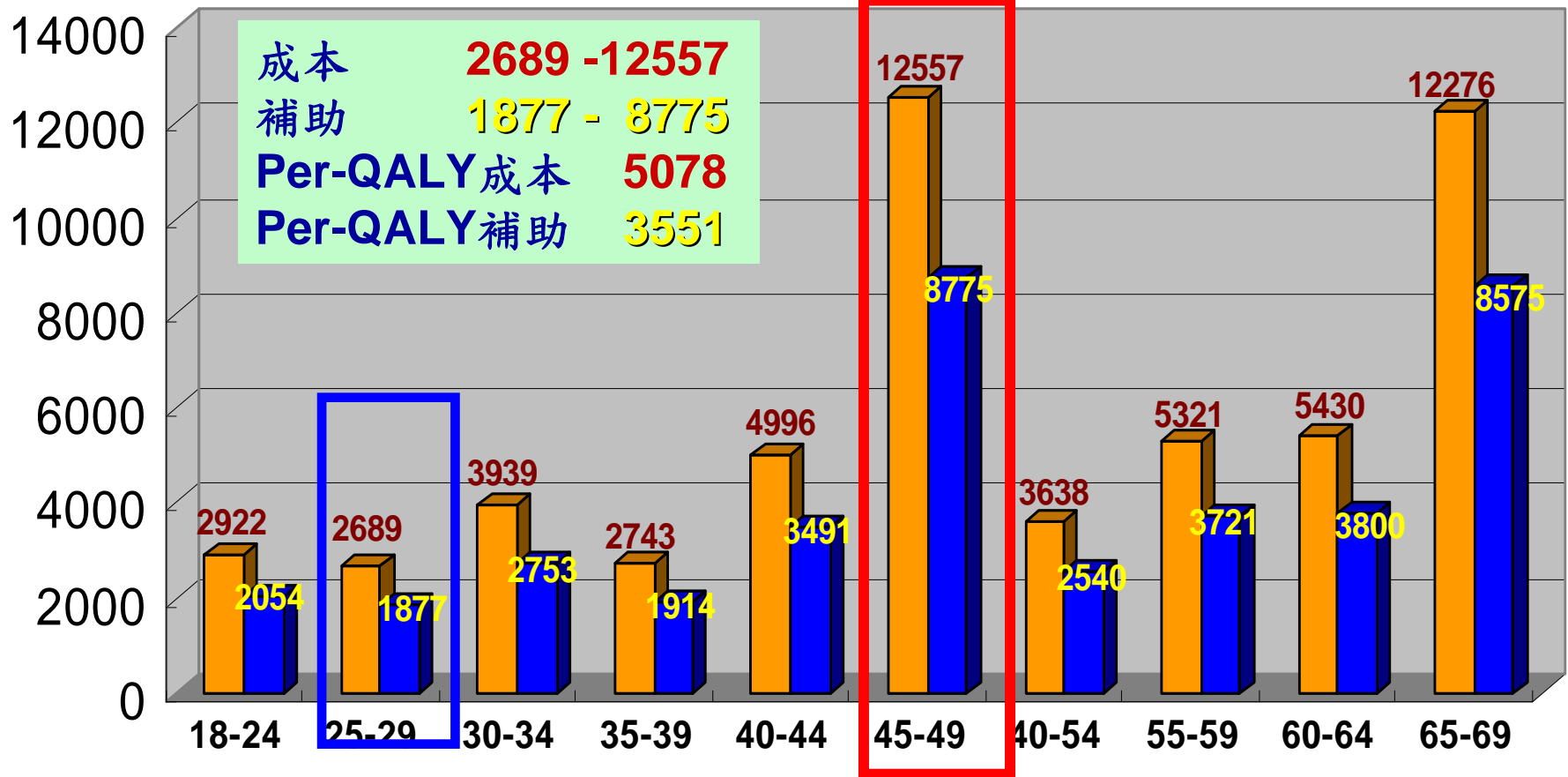


■ 每拯救 1 人年 平均成本 ■ 每拯救 1 人年 平均補助



# 門診戒菸年齡別成本分析

## Cost per saved QALY(CUA)



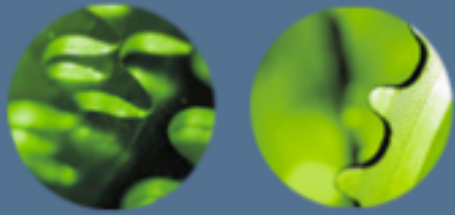
成本 2689 - 12557  
補助 1877 - 8775  
Per-QALY 成本 5078  
Per-QALY 補助 3551

每拯救 1QALY 平均成本

每拯救 1QALY 平均補助

# 敏感度分析

0% 復吸率 3% 折現率	性別	成本	總成本	35% 復吸率 3% 折現率	性別	成本	總成本
			補助成本				補助成本
		人年	總成本			總成本	
			補助成本			補助成本	
		QALY	總成本			總成本	
			補助成本			補助成本	
	年齡別	成本	總成本		總成本		
			補助成本		補助成本		
		人年	總成本		總成本		
			補助成本		補助成本		
		QALY	總成本		總成本		
			補助成本		補助成本		
0% 復吸率 5% 折現率	性別	成本	總成本	35% 復吸率 5% 折現率	性別	成本	總成本
			補助成本				補助成本
		人年	總成本			總成本	
			補助成本			補助成本	
		QALY	總成本			總成本	
			補助成本			補助成本	
	年齡別	成本	總成本		總成本		
			補助成本		補助成本		
		人年	總成本		總成本		
			補助成本		補助成本		
		QALY	總成本		總成本		
			補助成本		補助成本		



# 敏感度分析

敏感度分析		0% 復吸率 3% 折現率	35% 復吸率 5% 折現率
平均一人戒菸	成本	7717	11866
	補助成本	5289	8297
每一LY saved	平均成本	7996	16335
	補助成本	5591	11422
每一QALY saved	平均成本	5078	12453
	補助成本	3551	8708



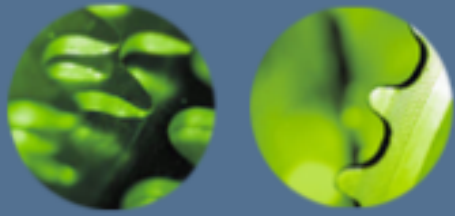
## 戒菸醫療成本與效益之文獻

- 紐西蘭的Feenstra TL與 Hamberg-van Reenen HH等人則使用荷蘭**The National Institute for Public Health and the Environment (RIVM)** 模式作慢性病預估與戒菸成本效益之計算
- 包括**11種吸菸相關疾病之罹病率預測**
- 分析五種戒菸方式（電話諮詢、簡短諮詢、簡短諮詢加尼古丁替代療法、深度諮詢加尼古丁替代療法、深度諮詢加耐菸盼）之成本效果
- 並以**簡短諮詢**為基礎，計算其他四種戒菸方式所增加之成本效果（ICER. 4%折現）

**Table 4** Incidence rates, risk ratios for incidence for current and former smokers and quality-of-life weights of 11 smoking-related diseases, stratified by sex

Disease	Incidence rates (per 1000) [45,46]		Risk ratios for incidence for current and former smokers* [52]				Quality-of-life weights [51,52]	
	Women	Men	Current smokers		Former smokers		Women	Men
			Women	Men	Women	Men		
Acute myocardial infarction	1.7	3.2	3.2	2.9	1.3	1.6	0.71	0.71
Coronary heart disease	2.2	3.1	3.2	2.9	1.3	1.6	0.71	0.71
Stroke	2.3	2.0	3.8	3.3	1.4	1.3	0.39	0.39
COPD	1.4	2.4	11.8	13.1	7.9	10.7	0.69	0.69
Lung cancer	0.23	1.0	14.2	26.8	4.5	10.6	0.57	0.57
Larynx cancer	0.014	0.083	17.8	10.5	11.9	5.2	0.88	0.88
Oral cavity cancer	0.058	0.12	5.6	27.5	2.9	8.8	0.88	0.88
Esophagus cancer	0.042	0.091	10.3	7.6	3.2	5.8	0.27	0.27
Pancreas cancer	0.088	0.092	2.3	2.1	1.8	1.1	0.44	0.49
Bladder cancer	0.065	0.22	1.9	2.9	1.9	2.6	0.89	0.91
Kidney cancer	0.078	0.11	2.0	3.0	1.9	2.1	0.62	0.76

\*Never smokers are reference (risk ratios equal 1).



# 戒菸醫療成本與效益之文獻

結果顯示四種戒菸介入方式與其他當時之醫療介入比較皆具成本效果

戒菸介入的種類	花費 (歐元) per LYS	花費 (歐元) per saved QALY
電話諮詢	1,400	1,100
簡短諮詢	-----*	-----*
簡短諮詢加尼古丁替代療法	1,800	1,400
深度諮詢加尼古丁替代療法	6,200	4,900
深度諮詢加耐菸盼	4,300	3,400

Feenstra TL, Hamberg-van Reenen HH, Hoogenveen RT, et al. Cost-effectiveness of face-to-face smoking cessation interventions: a dynamic modeling study. Value Health 2005; 8(3):178-90



# Cost-Effectiveness of Face-to-Face Smoking Cessation Interventions: A Dynamic Modeling Study

Talitha L. Feenstra, PhD,<sup>1,2</sup> Heleen H. Hamberg-van Reenen, MSc,<sup>1,2</sup> Rudolf T. Hoogenveen, MSc,<sup>1</sup> Maureen P.M.H. Rutten-van Mölken, PhD<sup>2</sup>

<sup>1</sup>National Institute of Public Health and the Environment, Bilthoven, The Netherlands; <sup>2</sup>Institute for Medical Technology Assessment, Erasmus University Rotterdam, The Netherlands

## ABSTRACT

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**Objectives:** To estimate the cost-effectiveness of five face-to-face smoking cessation interventions (i.e., minimal counseling by a general practitioner (GP) with, or without nicotine replacement therapy (NRT), intensive counseling with NRT, or bupropion, and telephone counseling) in terms of costs per quitter, costs per life-year gained, and costs per quality-adjusted life-year (QALY) gained.

**Methods:** Scenarios on increased implementation of smoking cessation interventions were compared with current practice in The Netherlands. One of the five interventions was implemented for a period of 1, 10, or 75 years reaching 25% of the smokers each year. A dynamic population model, the RIVM chronic disease model, was used to project future gains in life-years and QALYs, and savings of health-care costs from a decrease in the incidence of 11 smoking-related diseases over a time horizon of 75 years. This model allows the repetitive application of increased cessation rates to a population

with a changing demographic and risk factor mix. Sensitivity analyses were performed for variations in costs, effects, time horizon, program size, and discount rates.

**Results:** Compared with current practice, minimal GP counseling was a dominant intervention, generating both gains in life-years and QALYs and savings that were higher than intervention costs. For the other interventions, incremental costs per QALY gained ranged from about 1100€ for telephone counseling to 4900€ for intensive counseling with nicotine patches or gum for implementation periods of 75 years.

**Conclusions:** All five smoking cessation interventions were cost-effective compared with current practice, and minimal GP counseling was even cost-saving.

**Keywords:** bupropion, cost-effectiveness, counseling, dynamic modeling, nicotine replacement therapy, smoking cessation.

# Cost-effectiveness of pharmacotherapies for nicotine dependence in primary care settings: a multinational comparison

J Cornuz, A Gilbert, C Pinget, P McDonald, K Slama, E Salto, F Paccaud

*Tobacco Control* 2006;15:152–159. doi: 10.1136/tc.2005.011551

**Table 3** Incremental cost per life-year saved for a 45-year-old smoker: gum, patch, spray

	Gum				Patch				Spray		
	Men	Women	Ratio*		Men	Women	Ratio*		Men	Women	Ratio*
Spain	2230	3370	1.00	Spain	1758	2657	1.00	Spain	1935	2923	1.00
Canada	2820	4260	1.26	France	2518	3804	1.43	Switzerland	3438	5194	1.78
France	3228	4876	1.45	Canada	2527	3817	1.44	UK	3498	5285	1.81
Switzerland	3612	5457	1.62	Switzerland	2904	4387	1.65	US	5275	7969	2.73
UK	3766	5689	1.69	US	3099	4682	1.76	Canada	N/A	N/A	
US	5059	7643	2.27	UK	3396	5131	1.93	France	N/A	N/A	

**Table 4** Incremental cost per life-year saved for a 45-year-old smoker: inhaler, bupropion

	Inhaler				Bupropion		
	Men	Women	Ratio*		Men	Women	Ratio*
Switzerland	3480	5257	1.00	Canada	792	1196	1.00
UK	3716	5614	1.07	Spain	878	1326	1.11
US	5086	7685	1.46	France	1268	1915	1.60
France	5759	8700	1.65	UK	1433	2165	1.81
Canada	N/A	N/A		Switzerland	1492	2254	1.88
Spain	N/A	N/A		US	1934	2922	2.44

單位~美元

# Cost-effectiveness of pharmacotherapies for nicotine dependence in primary care settings: a multinational comparison

J Cornuz, A Gilbert, C Pinget, P McDonald, K Slama, E Salto, F Paccaud

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*Tobacco Control* 2006;15:152–159. doi: 10.1136/tc.2005.011551

- **Conclusions:**

- The cost-effectiveness of the pharmacotherapies varied significantly across the six study countries
- However, in each case, the results would be considered favourable as compared to other common preventive pharmacotherapies

# CHEST<sup>®</sup>

Official publication of the American College of Chest Physicians



## The Cost Utility of Bupropion<sup>x</sup> in Smoking Cessation Health Programs

Kristian Bolin, Björn Lindgren and Stefan Willers

*Chest* 2006;129:651-660  
DOI 10.1378/chest.129.3.651

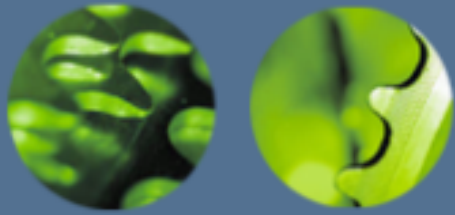
- Patients consisting of 612,851 male and 780,970 female smokers, >35 yrs old
- Interventions: Bupropion, as compared to NRT ( patches and gums) in smoking cessation programs for a follow-up period of 20 years.
- The incremental costs per QALY gained were relatively low for bupropion in comparison to nicotine patches (€25) per QALY gained for men and €535 for women.
- Cost-utility analyses of relevant chronic pulmonary disease (asthma and COPD) treatments ranging from €7,900 to €41,400 per QALY gained
- **Conclusions:** Bupropion is a cost-effective therapy in smoking cessation programs



## 戒菸醫療成本與效益之文獻

- 戒必適(Varenicline)戒菸新藥的出現，又有許多文獻將其成本效果與其他戒菸藥物比較
- 一般而言，新的治療方式是否有取代原來治療方式之價值，其比較兩者之**增加之成本效果**（Incremental cost effectiveness）應不大於**50,000美金<sup>#</sup>**（約**3~4,0000歐元**）

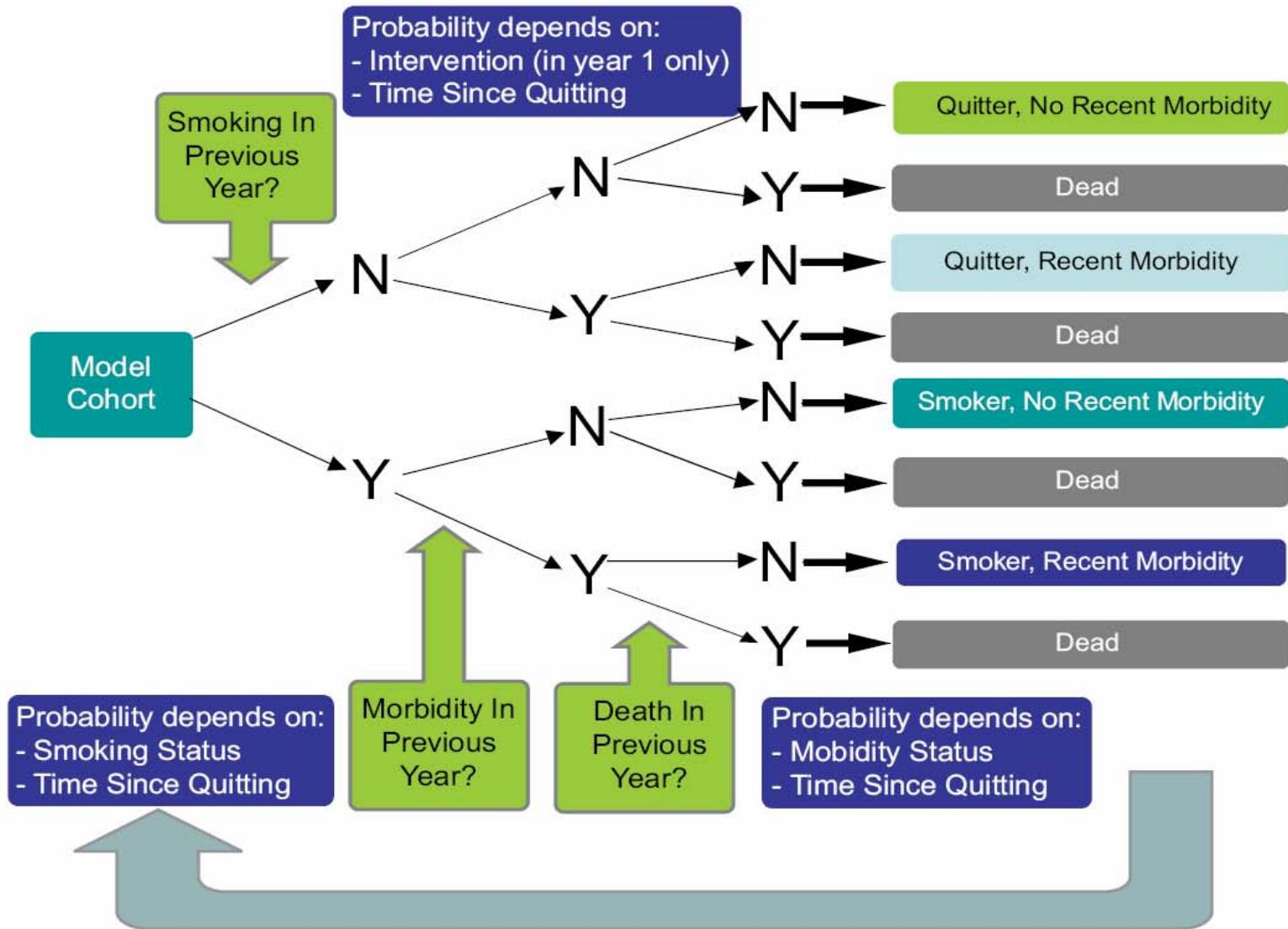
# Mark DB, Hlatky MA. Medical Economics and the Assessment of Value in Cardiovascular Medicine. Part 1. Circulation 2002; 106:516 - 520



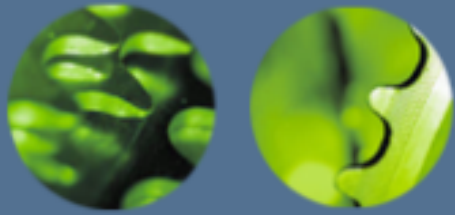
## **BENESCO 模式** ( The **B**enefits of **S**moking **C**essation on **O**utcomes Simulation Model )

- The Surgeon General's 2004 report lists 29 diseases for which the evidence is sufficient to support a causal relationship with smoking cigarettes.
- **Some of the most common comorbidities used, include:**
  - Cancers
  - Cardiovascular diseases
  - Respiratory diseases
  - Infant-related conditions

Figure 1. State Transitions in BENESCO Model.

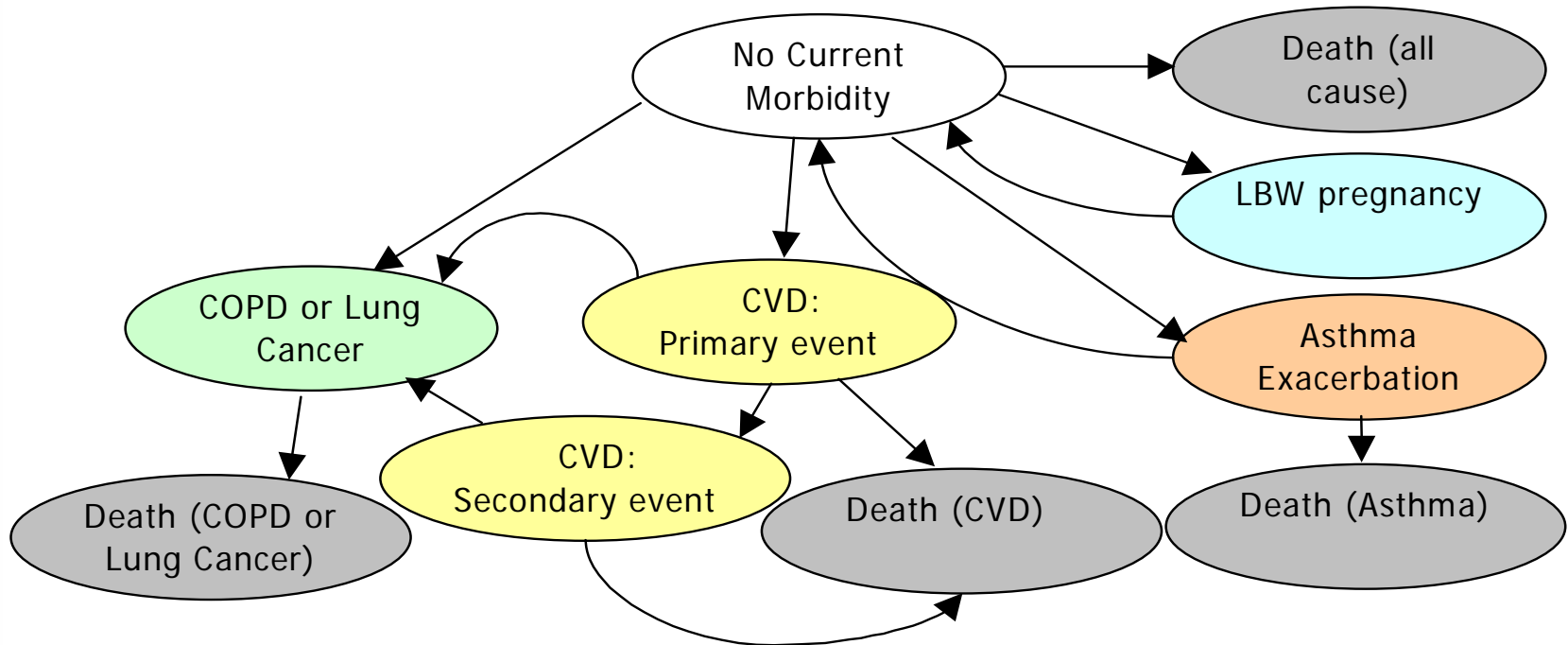


Cycles repeat until all members of cohort have died or reached 100 years



# Morbidity Status

- Subjects transition through the listed health states in the following manner

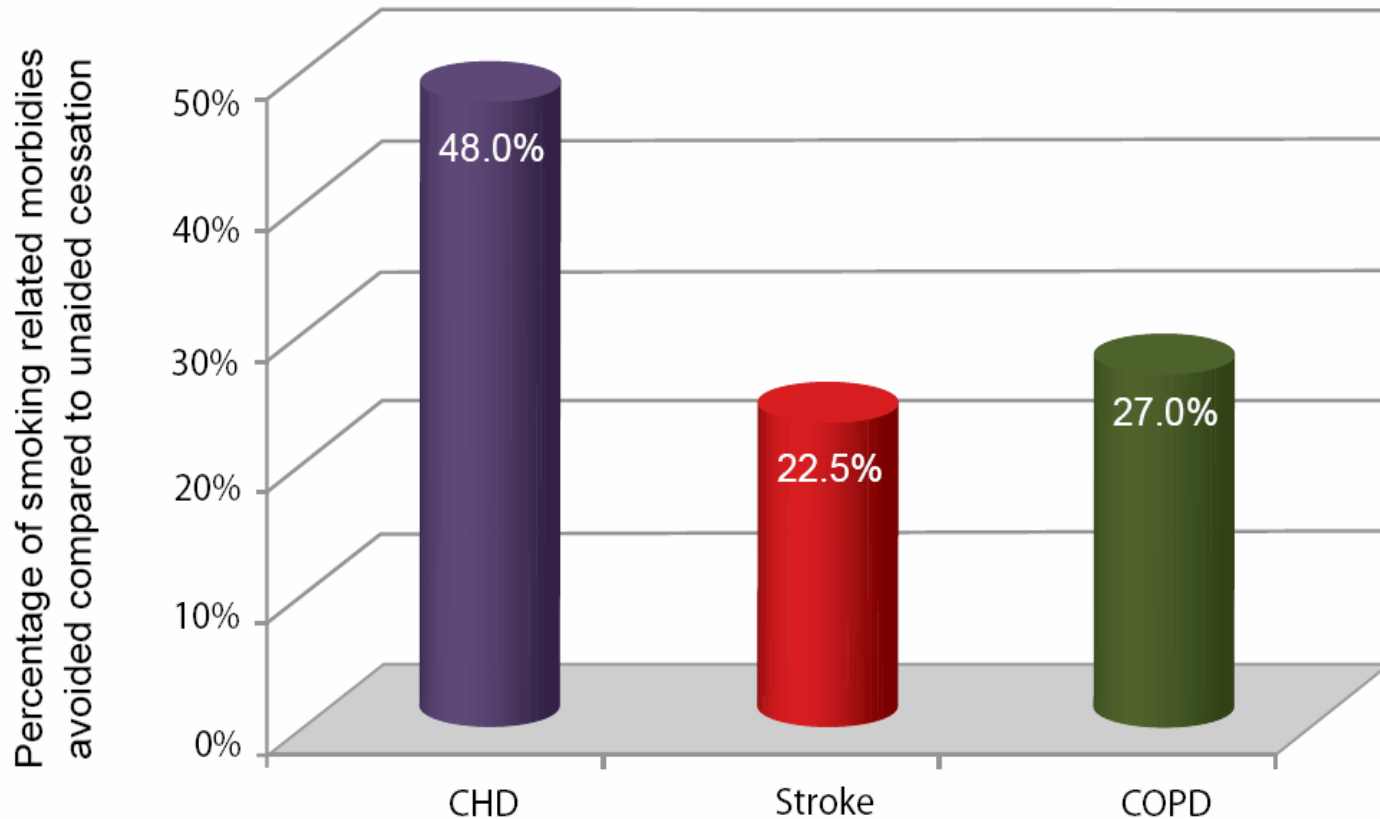


Note, this schematic is for example only and does not reflect all the possibilities of transition.



## Model included 979,110 males and 86,090 females

Figure 2. Percentage of Smoking Related Morbidities Avoided with Varenicline Over 20-year Period.



- 48% of CHD cases were prevented in group using varenicline.
- 22.5% of stroke cases were prevented in group using varenicline.
- 27% of COPD cases were prevented in group using varenicline.



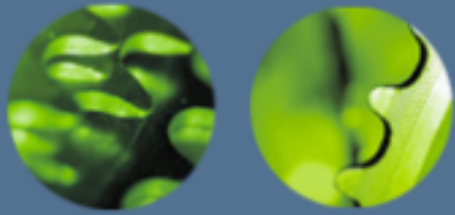
1687

Table 1. Costs (\$US), Quality-adjusted Life Years, Life Years Gained and Incremental Cost in a Lifetime of Varenicline Compared with Bupropion, Nicotine Replacement Therapy, and Unaided Cessation

Smoking Cessation Intervention	Costs	QALYs	Life Years Gained	Incremental Results vs. Varenicline
Varenicline	47,406,749,000	14,230,922	29,079,006	-
Bupropion	48,020,845,000	14,198,675	29,050,568	Dominated
NRT	48,029,444,000	14,198,767	29,050,650	Dominated
Unaided cessation	48,947,255,000	14,150.305	29,007.911	Dominated

3460

1687



# CONCLUSIONS

- In Taiwan, treatment with varenicline in a population of one million smokers would lead to an overall savings of **US\$ 615 to 1537** million during their lifetime.
- Varenicline was shown to have higher cost savings due to reduced incidence of smoking-related morbidities in comparison to **bupropion, NRT, and unaided cessation.**
- This study demonstrated the cost effectiveness of varenicline and its beneficial impact on the health care expenditure.



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## Varenicline as compared to bupropion in smoking-cessation therapy—Cost–utility results for Sweden 2003

Kristian Bolin<sup>a,b,\*</sup>, Ann-Christin Mörk<sup>e</sup>, Stefan Willers<sup>d</sup>, Björn Lindgren<sup>b,c</sup>

*Design:* The Benefits of Smoking Cessation on Outcomes (BENESCO) simulation model was used for a male and female cohort, respectively, as a point of departure but further extended in order to include the indirect effects of smoking-cessation on production and consumption in the economy. All calculations were performed in 2003 Swedish prices.

*Setting:* Sweden in 2003.

*Patients or participants:* Model cohort consisting of 25% of all smokers among men and women (168,844 males and 208,737 females), distributed by age, 18 and older, as in the Swedish population of 2003.

*Interventions:* Varenicline as compared to bupropion, in smoking-cessation programmes for 20-year, 50-year, and lifetime follow-up periods.

*Measurements and results:* When the indirect effects on production and consumption were included, the incremental costs per QALY gained were €2056 (€14,743) for men and €1193 (€14,214) for women, in comparison to bupropion and computed for a time horizon



## 戒菸醫療成本與效益之文獻

- 美國的Howard P, Knight C 等人使用 **BENESCO** 模式
- 將戒必適與耐菸盼、尼古丁替代療法、無使用藥物戒菸等情況作比較，亦得到類似的結果
- 也就是戒必適較其他戒菸方式具成本效果優勢
- If 25% of the current population of US smokers made a one-time attempt to quit using varenicline compared with unaided cessation, almost **144,000** smoking-related deaths and over **261,000** cases of asthma exacerbations, COPD, CHD, stroke and lung cancer could be avoided compared with an unaided smoking cessation strategy.

Howard P ,Knight C, Boler A, Baker C. Cost-utility analysis of varenicline versus existing smoking cessation strategies using the BENESCO Simulation model: application to a population of US adult smoker. *Pharmacoeconomics* 2008;26(6):497-511

# Cost Effectiveness of Varenicline in Belgium, Compared with Bupropion, Nicotine Replacement Therapy, Brief Counselling and Unaided Smoking Cessation

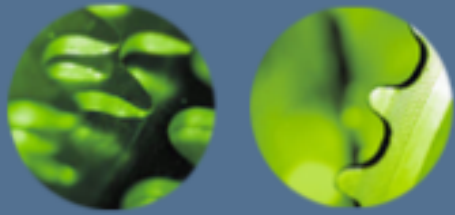
## A BENESCO Markov Cost-Effectiveness Analysis

**Table III.** Number of additional quitters, incremental life-years (LYs) and quality-adjusted LYs (QALYs) for varenicline compared with unaided cessation, brief counselling alone and other smoking cessation interventions per 1000 quitters making a one-time quit attempt: lifetime horizon

Variable	Varenicline			
	vs unaided cessation	vs brief counselling alone	vs bupropion	vs NRT
Additional number of quitters <sup>a</sup>	104	78	42	45
Incremental LYs gained <sup>a</sup>	85	63	34	37
Incremental QALYs gained <sup>a</sup>	113	84	46	49
Incremental direct medical costs in thousand € <sup>a</sup>	187	20	-44	-93
Incremental cost <sup>b</sup> per LY gained (€)	2206	320	Dominant	Dominant
Incremental cost <sup>b</sup> per QALY gained (€)	1656	240	Dominant	Dominant

a Per 1000 quitters.

b Costs (positive value) or savings (negative value) from prevented diseases.



# CEA of HPV vaccine

- Incremental cost-effectiveness ratio (ICER)  
quadrivalent vaccine      euro **25,349 / QALY**  
bi-valent vaccine      euro **30,460 / QALY**

A cost-utility analysis of adding a bivalent or quadrivalent HPV vaccine to the Irish cervical screening programme. Dee A, Howell F. Eur J Public Health. 2009 Oct 28.

- Incremental cost-effectiveness ratio (ICER)  
euro **50,000~ 64,000 / LYG.**

The additional vaccination of boys increases the ICER to euro **299,000~311,000 / LYG**

Cost-effectiveness analysis of human papillomavirus-vaccination programs to prevent cervical cancer in Austria. Zechmeister I, Blasio BF, Garnett G, Neilson AR, Siebert U. Vaccine. 2009 Aug 13;27(37):5133-41. Epub 2009 Jun 28



## 結論

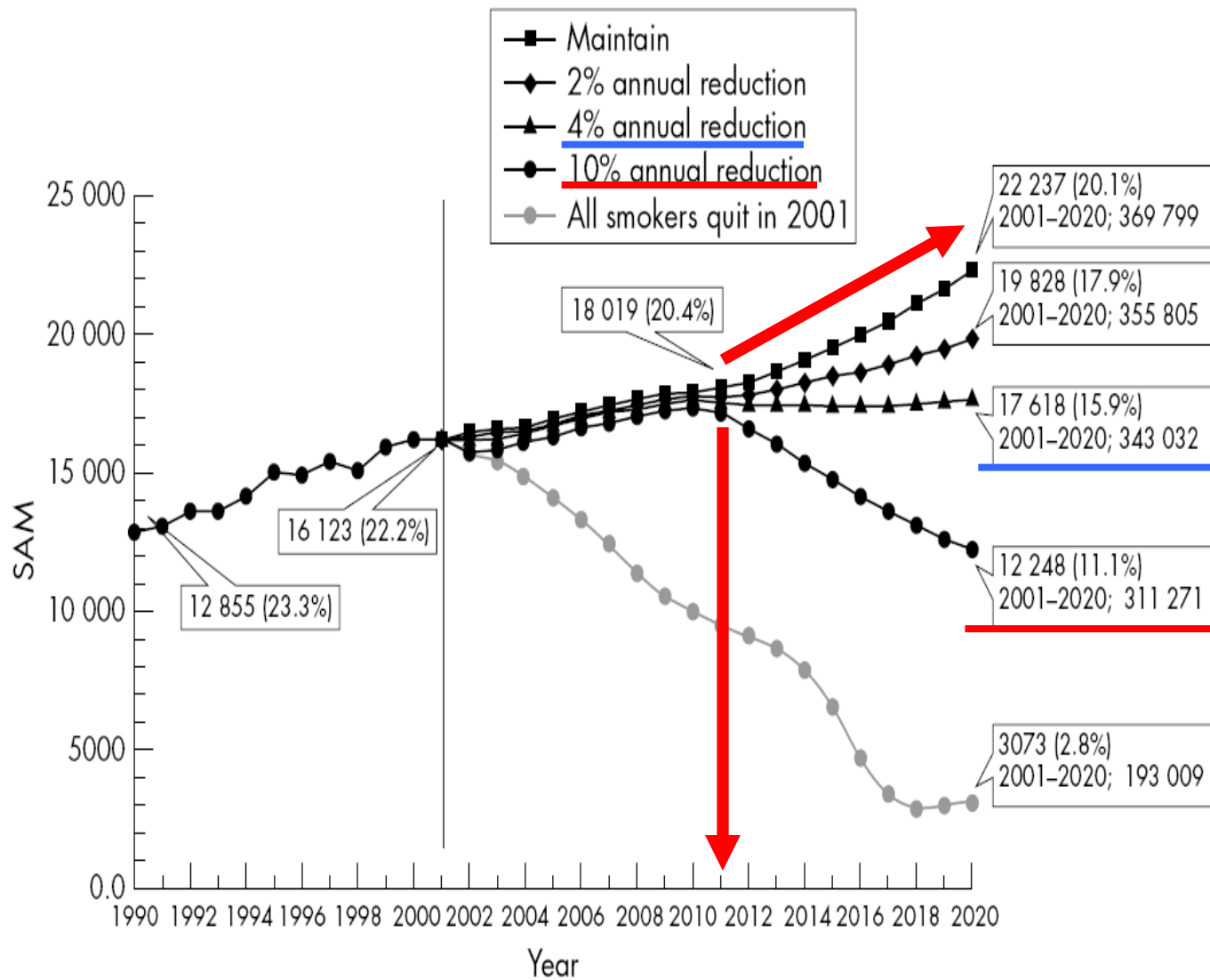
- 由於沒有一種完美的模型，可以控制所有的變項與計算所有的花費，各種藥物之價格與匯率亦隨時都與現實醫療之環境完全吻合
- 但是在可以接受的誤差範圍內，以折現之方式加上敏感度分析，將可以對於醫療之花費與成本效果做一個有效的預測
- 不管是最初之單純的成本效果計算（介入或不介入之差異），到後來各種療法間比較之新增成本效果(ICEA)，我們可以知道戒菸是最具成本效果之治療之一。





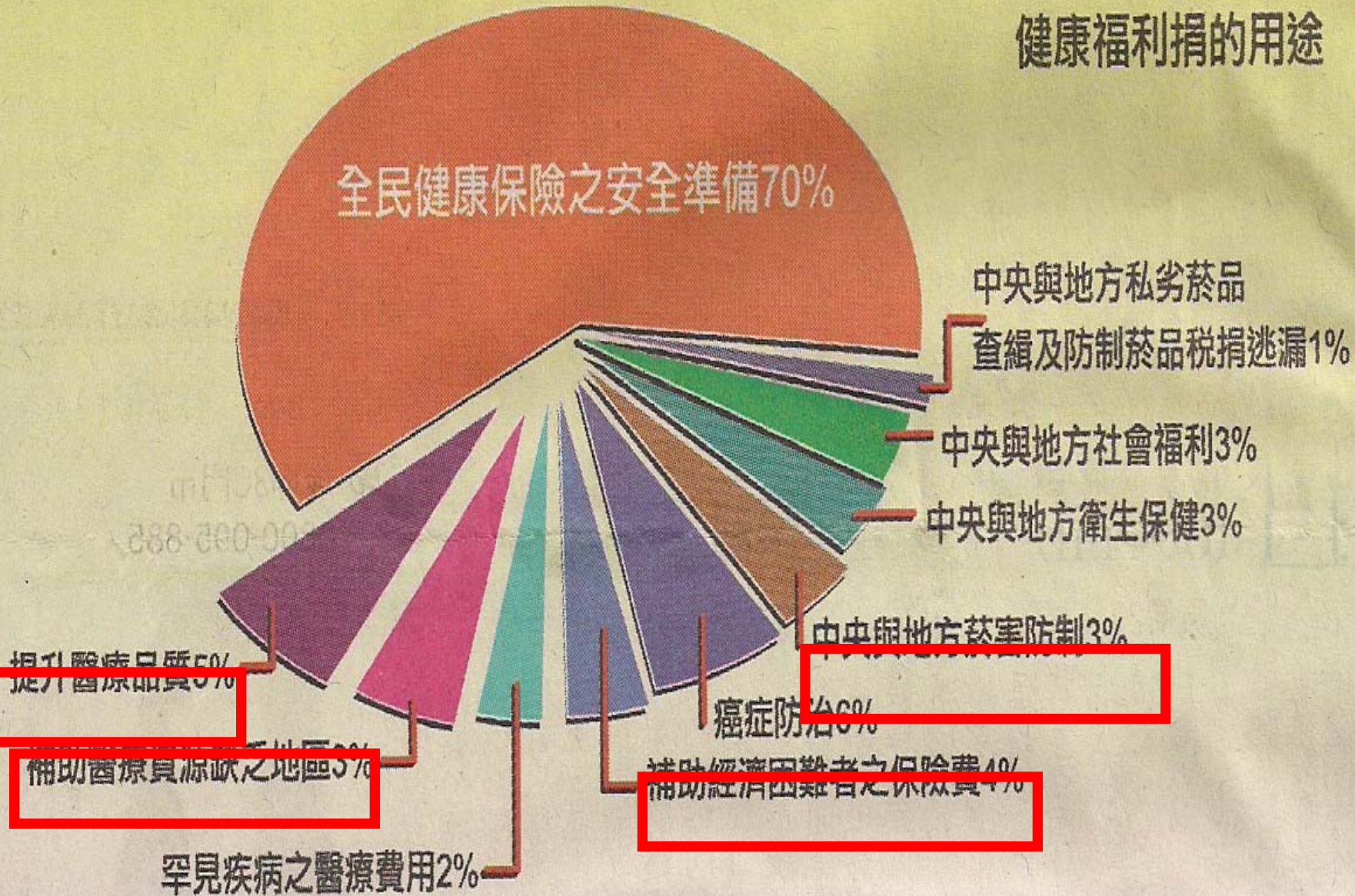
## 結論

- 目前所有的戒菸治療介入與其他的醫療介入相比（如高血壓、膽固醇控制、HPV疫苗施打等）皆具備有更好之成本效果
- 對於各種戒菸治療介入應更積極推廣
- 推動戒菸治療在未來可省下大筆的醫療經費



**Figure 2** Projected SAM for each of the next 20 years (2001–2020), with cumulative SAM for 20 years, based on different smoking rates. Number in parenthesis indicates SAM as percentage of total deaths in a given year. The bottom line, All smokers quit in 2001, or a 100% reduction of smoking rate, indicates continuing smoking related mortality by the ex-smokers. Over half of the cumulative SAM expected from maintaining the initial smoking rates would remain and amounted to nearly 200 000 deaths in the 20 years following the disappearance of smoking.

# 健康福利捐的用途





# 敬請指教

高雄榮總家庭醫學部 薛光傑