“The cost-effectiveness of polypharmacy”

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Overview

- Review of prior studies
- Impact of baseline patient risk
- Impact of price
- Impact of effectiveness estimates
- Health policy / financial considerations

Context and parlance for Choosing Interventions

1. Decreases quality and quantity of life and costs more "Dominated"—We should not do it!

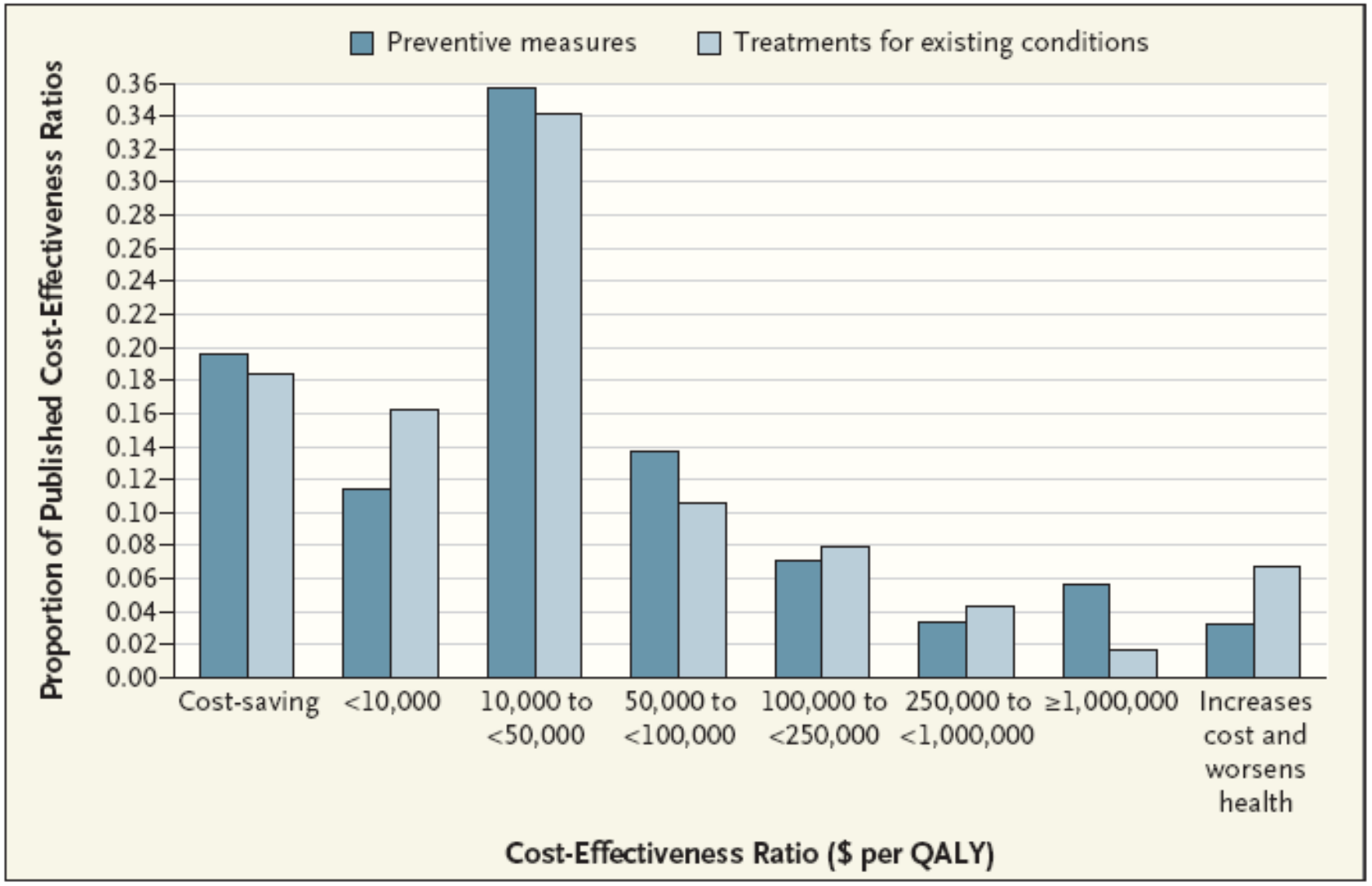
2. Improves quality or quantity of life and costs less, "Cost saving" We should do it!

3. Improves quality and quantity of life but costs more—Maybe we should do it?

What criterion for the C/E ratio?

- US: $50K, $100K, $230K
- NICE: £20-30K
- WHO-CHOICE:
  - < 1 GDP per capita, very good buy
  - (3x) GDP per capita, upper limit

Prevention vs. Treatment



Distribution of Cost-Effectiveness Ratios for Preventive Measures and Treatments for Existing Conditions.

Cohen, J et al, *NEJM* 2008;358(7):679-86.

Cost-effectiveness analysis

- Evaluates cost-effectiveness of the multi-drug regimens in developing countries
  - Secondary prevention
  - Strategy of treating all those over the age of 55
  - Primary prevention for various levels of 10-year absolute risk (AR) for CVD

Question

A) 55 y.o. man
- non smoker
- non diabetic
- TC:HDL 2.5
- BP of 120/85.

B) 46 y.o. man
- smoker
- non-diabetic
- TC:HDL ratio of 8
- BP of 139/84

Who gets treated according to age targeted guidelines – A or B?

Target Level Treatment

A) 55 y.o. man
- non smoker
- non diabetic
- TC:HDL 4
- BP of 149/85.

B) 54 y.o. man
- smoker
- non-diabetic
- TC:HDL ratio of 8
- BP of 139/84

A. Gets treated.

2.5 - 5%

20- 25%

Evidence-based regimens

- Secondary prevention regimen
  - Aspirin
  - Beta-blocker
  - ACEI
  - Statin
- Debate over primary prevention
  - Which antihypertensives?

Two regimens compared

- **Secondary**
  - **ASA, Beta-blocker, ACEI, Statin**
- **Primary**
  - **ASA, CCB, ACEI, Statin**

Maximal relative risk estimates of individual agents

	Death	IHD	Stroke
Primary Prevention			
Aspirin	*	0.68	0.84
Beta-blocker+ thiazide	*	0.66	0.51
Statin	*	0.64*	0.94
Secondary prevention			
Baseline probability (no treatment)	0.06	0.078	0.013
Aspirin	0.85	0.66	0.78
Beta-blocker	0.77	0.73	0.71
ACEI	0.84	0.80	0.68
Statin	0.78	0.71	0.81

*Risk is graduated from 0.89 (yr1), 0.76 (yr2), 0.67 (yr3-5)

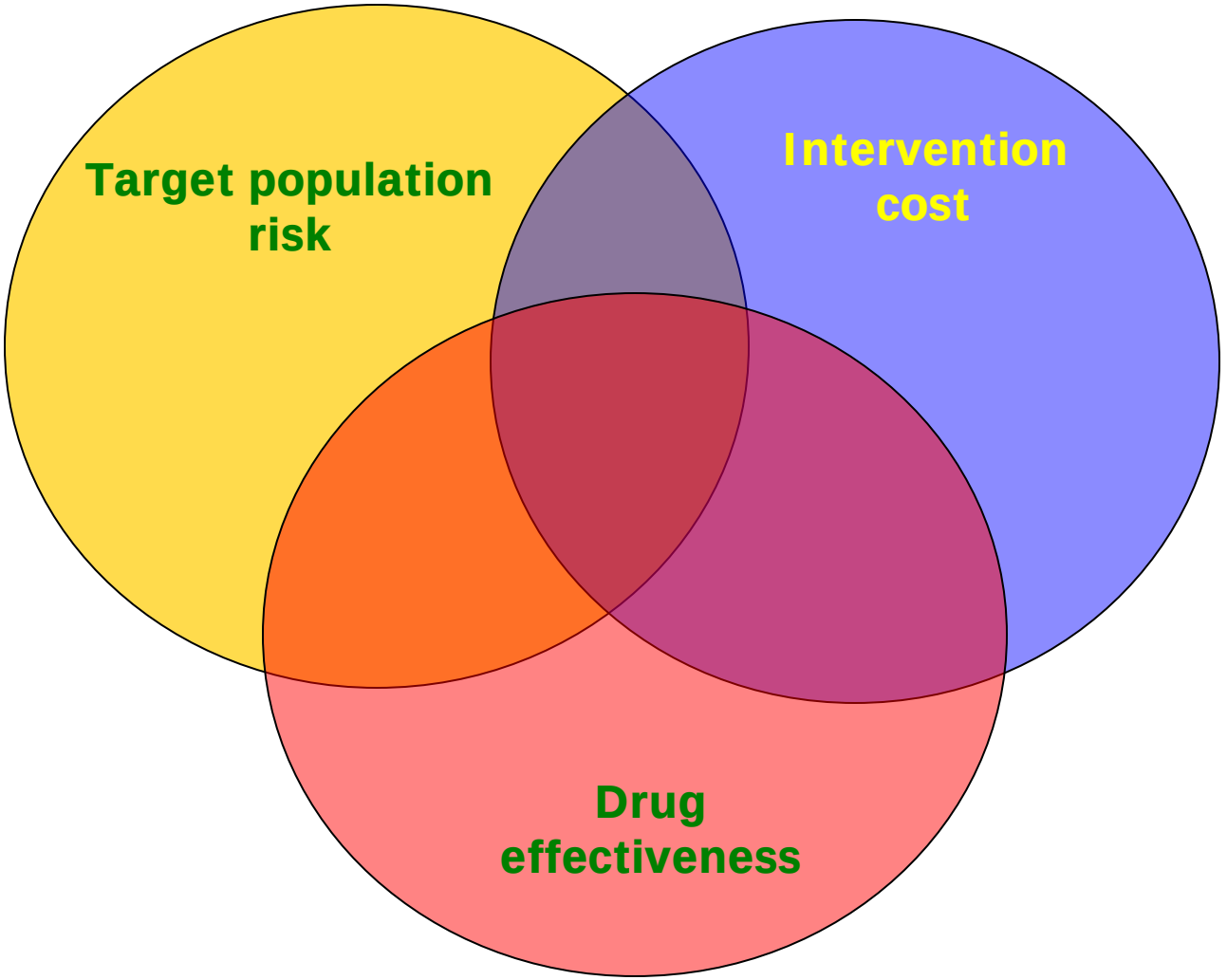
Gaziano, T et al Lancet

Range of costs of cardiovascular disease interventions ($US 2001)

Health care delivery costs	Values ($US 2001)
Event or annual care	
Myocardial infarction (MI)	270-690
Stroke	404-910
Re-infarction	32 -125
Annual care post-MI	54-64
Annual care post-stroke	408-775
Drug costs (Annual)	
Aspirin	2
Atenolol / Metoprolol	3 / 46
Amlodipine	9
Enalapril	7
Lovastatin	14
Screening	6-12
Monitoring	6-12

Gaziano TA,. *Lancet*. 2006;368(9536):679-86.

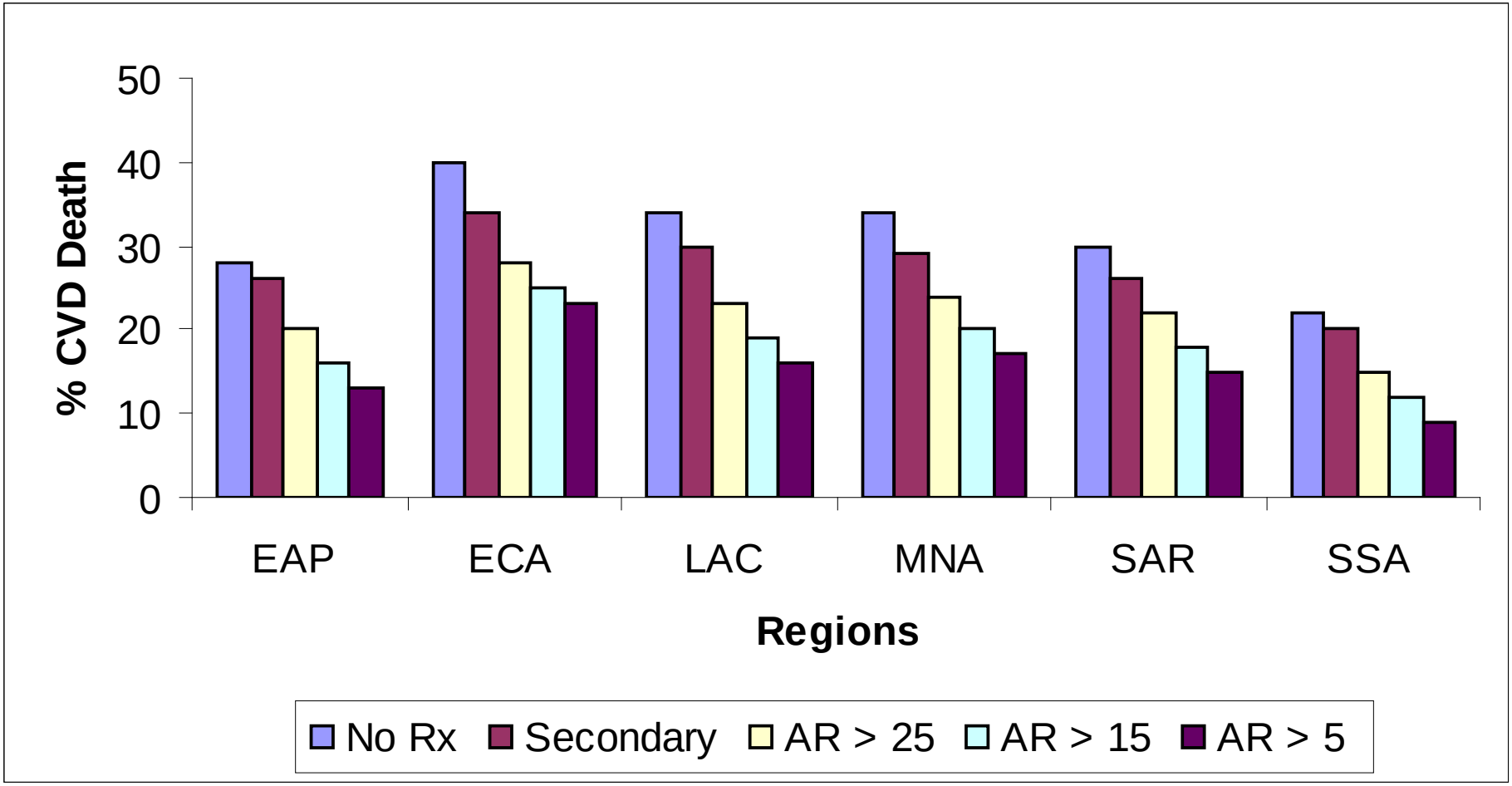
Key drivers of polypharmacy Cost-effectiveness



Factors influencing cost-effectiveness

- **Risk assessment of the individuals**
  - **Primary prevention**
  - **Secondary prevention**
- **Component cost of the intervention**
- **Risk reduction estimates**

Lifetime CVD Death Risk by Treatment Strategy



Results

Cost/QALY

Region	Secondary only	Primary Prevention Strategies			GNI X 3*
		AR 25%	15%	5%	
East Asia & Pacific	336	890	923	1214	3180
Europe & Central Asia	362	858	905	1207	6030
Latin America & Caribbean	388	881	930	1219	11010
Middle East & North Africa	341	872	930	1221	6270
South Asia	306	746	790	1039	1320
Sub-Saharan Africa	312	771	846	1145	1410

Gaziano TA. *Lancet*. 2006;368(9536):679-86.

Impact of baseline risk in Argentina

Intervention	US$ (1) / DALY (2)
Combined therapy 20% global CVD risk	$1200
Combined therapy 10% global CVD risk	$1371
Combined therapy 5% global CVD risk	$1510

Rubinstein, A et al, BioMed Central 2009 7, 10

Factors influencing cost-effectiveness

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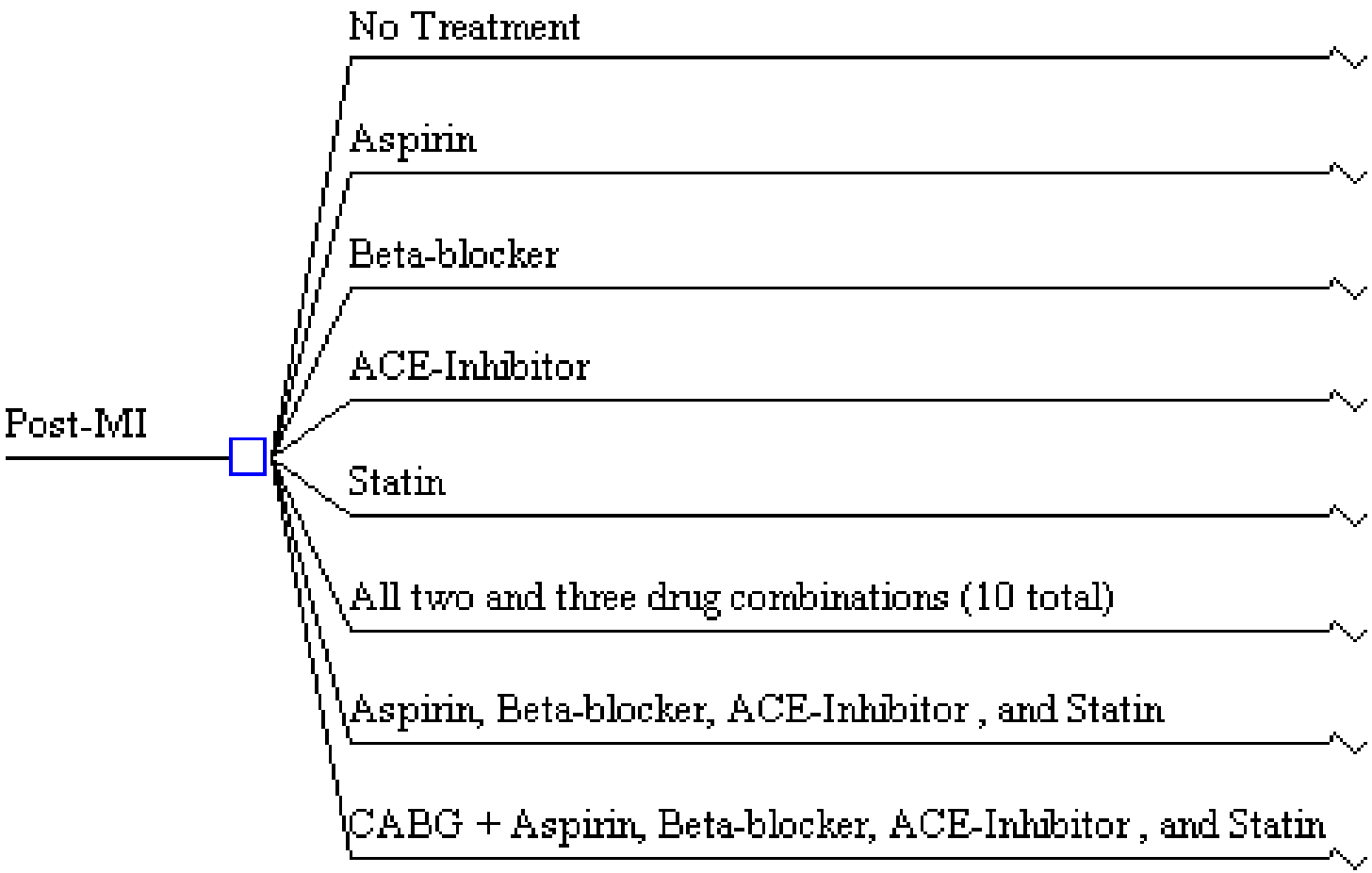
Interventions Compared

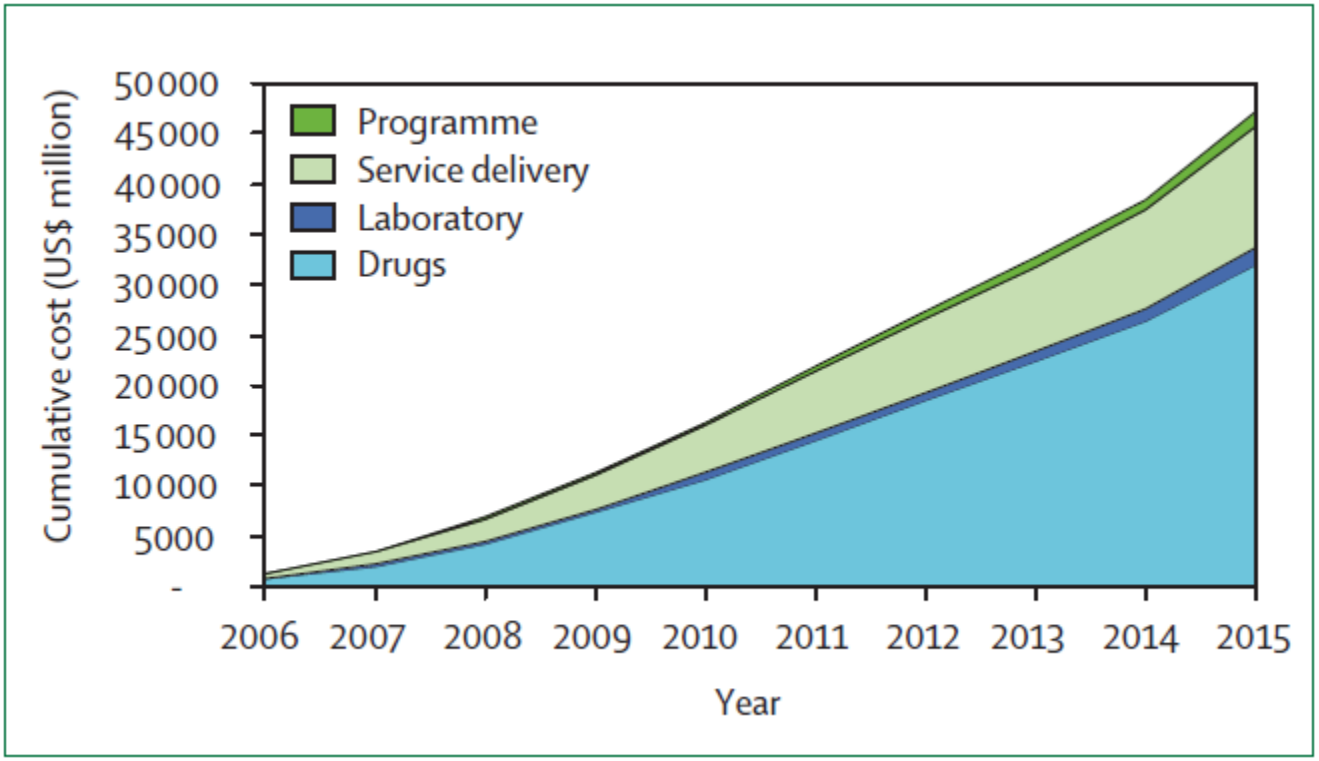


Stepwise benefits of individual agents

	Incremental C/E ratios $/DALY		
Region	ASA & BB	ASA, BB,& ACEI	ASA, BB,ACEI, & Statin*
EAP	Cost saving	781	1914
ECA	Cost saving	866	2026
LAC	Cost saving	821	1942
MNA	Cost saving	672	1686
SAR	Cost saving	715	1819
SSA	Cost saving	660	1720

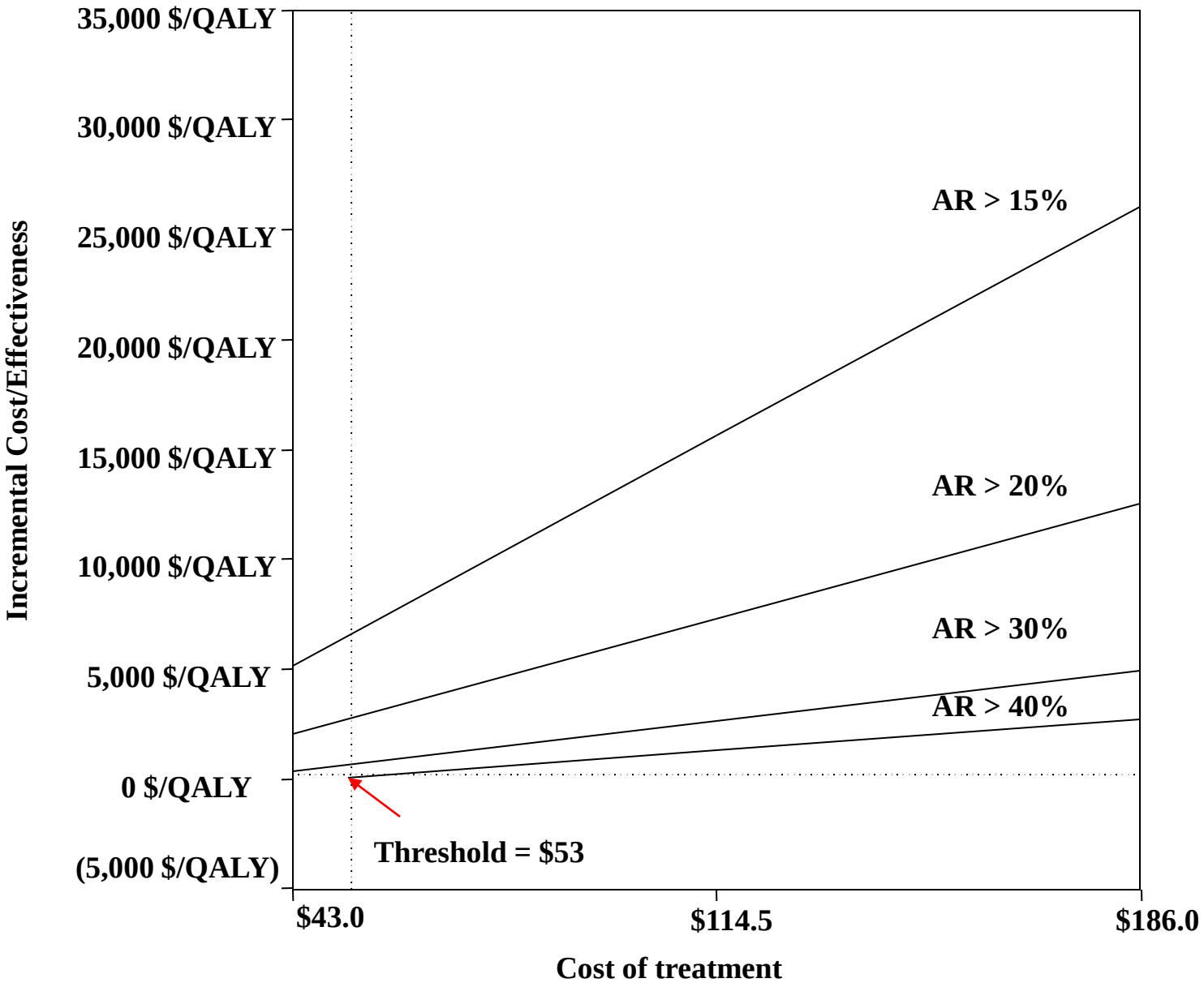
Rodgers, A, Lawes, C, Gaziano T. DCP2

Cumulative financial costs



Lim, SS, Gaziano TA, *Lancet*. 2007;370(2054-62).

Sensitivity analysis on cost of delivery

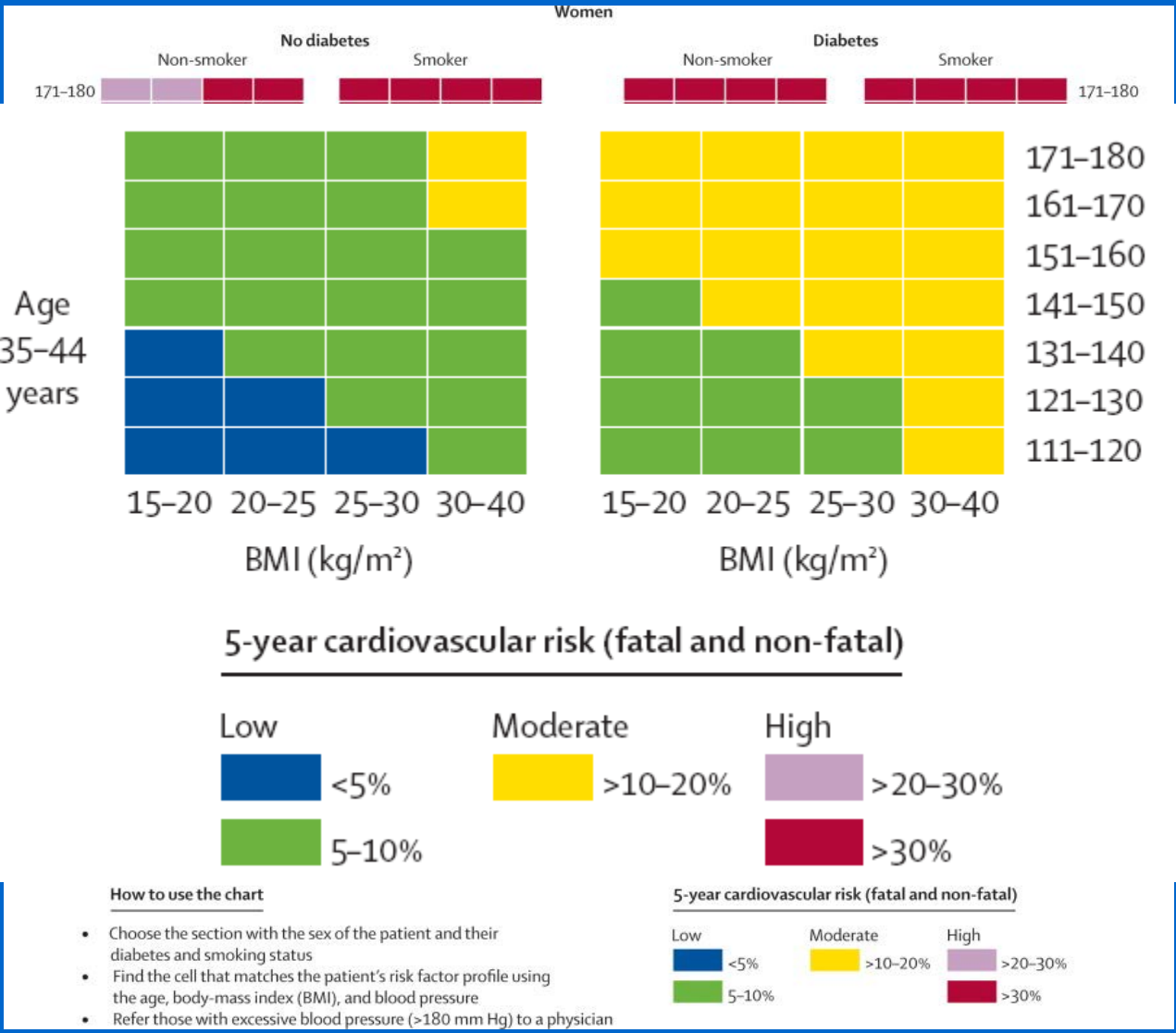


Sensitivity Analyses

- Even a doubling in the cost of treatment would only make the ICER above $1700/QALY limiting its use in South Asia and Sub-Saharan Africa to secondary prevention.
- Even a 10 fold increase in cost of screening makes it worthwhile to pursue versus age alone
- Eliminating lab costs cuts ratio in half.

Gaziano TA,. *Lancet*. 2006;368(9536):679-86.

Risk Prediction Chart for CVD Using Non-Laboratory Values



Gaziano, T, Lancet 2008; 371:923

Factors influencing cost-effectiveness

- Risk assessment of the individuals
  - Primary prevention
  - Secondary prevention
- Component cost of the intervention
- Risk reduction estimates

Sensitivity Analyses

- A decline in efficacy of up to 20% of the medications remained cost-effective according to WHO criteria

Gaziano TA,. *Lancet*. 2006;368(9536):679-86.

Dutch Study

- Objective: Determine drug cost thresholds

- Used Framingham Cohort males with Dutch costs

- Determined maximum costs at various willingness to pay thresholds

- Stratified by risk groups.

Franco, OH et al. J Epidmiol Community Health 2006 (60) 213-7.

Dutch Study Baseline Assumptions

- Wald and Law Rx effects– 80% benefit
- Cost of delivery excluding drugs $150 per year
- Cost of drug
- Stratified by risk groups.

Franco, OH et al. J Epidmiol Community Health 2006 (60) 213-7.

Maximum annual cost of the polypill by age group and level of CHD risk.

	Age 50			Age 60		
Cost effectiveness ratio	All risk groups cost	Moderate risk cost	High risk cost	All risk groups cost	Moderate risk cost	High risk cost
Cost saving	-	-	11	-	-	24
$25,000/YLS	22	103	302	409	196	410
$37,500/YLS	64	179	448	616	314	607
$50,000/YLS	108	256	594	823	433	801

Franco, OH et al. J Epidmiol Community Health 2006 (60) 213-7.

Sensitivity analysis: maximum annual cost of the polypill by age group and level of CHD risk considering 50% of the published effects of the polypill (44% reduction of CHD and 40% reduction of stroke risk).

	Age 50		Age 60	
Cost effectiveness ratio	Moderate risk cost	High risk cost	Moderate risk cost	High risk cost
$25,000/YLS	2.3	123	47	167
$37,500/YLS	45	211	110	274
$50,000/YLS	88	299	173	381

Franco, OH et al. J Epidmiol Community Health 2006 (60) 213-7.

Policy implications

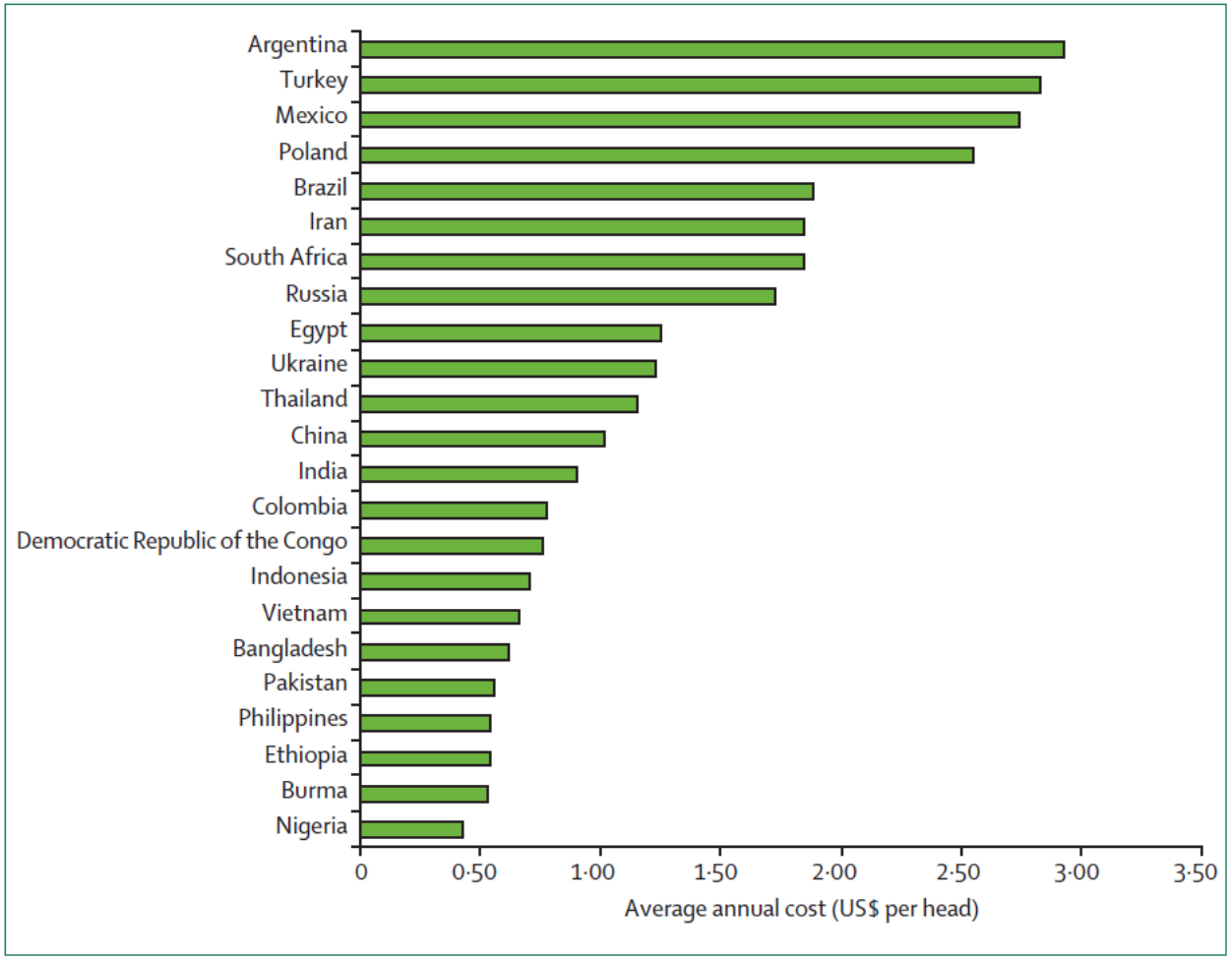
- Numbers eligible
- Per capita costs
- Workforce numbers to deliver

Individuals* eligible for the polypill and separate medication (% of total population)

	Polypill			Separate medication		
Risk threshold	5%	7.5%	10%	5%	7.5%	10%
All ages (40-75)	40.3	31.3	24.7	33.4	26.3	21.2

Franco, OH et al. J Epidmiol Community Health 2006 (60) 213-7.

Average per capita costs



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Implementation in India

- Just under 2 % of Indians have ischemic heart disease.
  - Treating all of them with the secondary prevention regimen would add about US $0.50 per capita or an increase of < 1%.
- Approximately 6% of the population has a 10 year risk of CVD of over 25%.
  - Treating all of them with the primary prevention regimen would add about US $1.50 per capita or an increase of < 2%.

Conclusions

- Multi-drug therapy for CVD is likely cost-effective in developing countries
- May require at least two different regimens for primary and secondary prevention
- Current health personnel and facilities can sustain treating those above 25% 10-year risk of CVD in all regions
- Some form of screening may be necessary to initiate treatment in primary prevention