

THE UNIVERSITY OF AUCKLAND
FACULTY OF MEDICAL AND
HEALTH SCIENCES



IMPROVING QUALITY AND ASSESSING PRACTICALITY BY INCORPORATING ECONOMIC EVIDENCE

Richard Milne

School of Population Health

University of Auckland

Principles

- Clinical guidelines must be
 - Based on evidence
 - Cost effective (good value for money)
 - Affordable (global budget)

Role of economic analysis in New Zealand guidelines

- NZGG has commissioned economic analyses for some guidelines
- Most of these comprise simple ‘balance sheets’ of costs and benefits
 - Rough estimates of costs and health benefits
 - Give little information on ‘cost effectiveness’

CASE STUDY

**Economic evaluation of the
updated New Zealand
Cardiovascular Guidelines**

Acknowledgements

Collaborator

Greg Gamble & Rod Jackson
University of Auckland

Discussion & Peer Review

Cardiovascular Guidelines Team

Funding



Why it matters

- Cardiovascular disease is the #1 cause of premature death in New Zealand and worldwide
- Many individuals *without known disease* are at high risk of a cardiovascular event (AMI, stroke)
 - 50% of CVD admissions/deaths
- Many such events are fatal or disabling/recurrent
- Huge national cost (diag, admissions, GP, drugs)

Effective interventions

- Screening methods
- Interventions that reduce CV risk
 - Dietary, exercise, smoking cessation etc
 - Diagnosis & management of diabetes
 - BP lowering
 - Lipid lowering
 - Anti-platelet (aspirin)

Benefits and costs

- Reducing the risk of CV events will improve population health
- *But* risk screening/management is costly
- Opportunity cost
 - Is it cost effective? For which groups?
 - Are there better ways to invest in health?

Risk management

- Traditionally, cardiovascular risk is managed by screening and treatment of modifiable risk factors
 - Routine BP measurement & therapy
 - Opportunistic lipid measurement & therapy
 - Diabetes diagnosis & therapy
 - Smoking cessation advice and/or therapy

Clinical guidelines

- Recent clinical guidelines emphasise overall risk management
 - Assess 5y risk and manage all risk factors
- BUT most Guidelines do not provide economic analysis of recommended strategies
- AND most economic analyses
 - Exclude screening
 - Focus on single interventions (e.g. BP, lipids)

Study Objective

- To inform the process of updating a national Clinical Guideline for screening and management of **cardiovascular risk** in *individuals without known CV disease*
 - Focus = screening + lipid lowering drugs
 - Reduce the prob. of AMI, stroke, PVD, HF

Required Outcomes

- A better screening strategy
- Cost effectiveness of a ‘screen and treat’ strategy in New Zealand compared to current practice (5y treatment)
- National budget impact of the new strategy
 - Govt: drugs, physician, laboratory, hospital
 - Personal: copays on drugs & physician visits

Cardiovascular risk screening

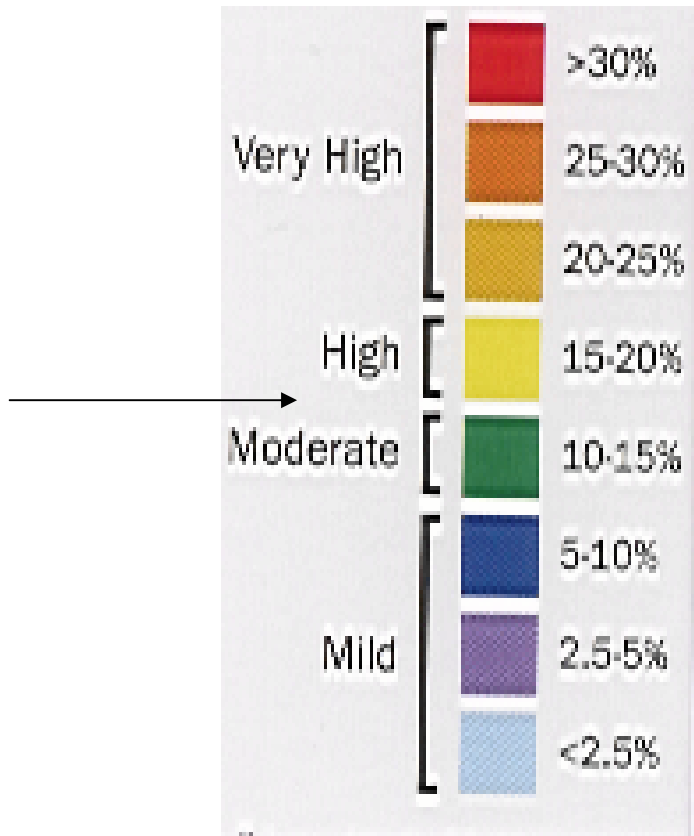
Measure

- Systolic BP (x2)
- Full lipid profile (x1-2)
- Fasting glucose (x1 unless high)

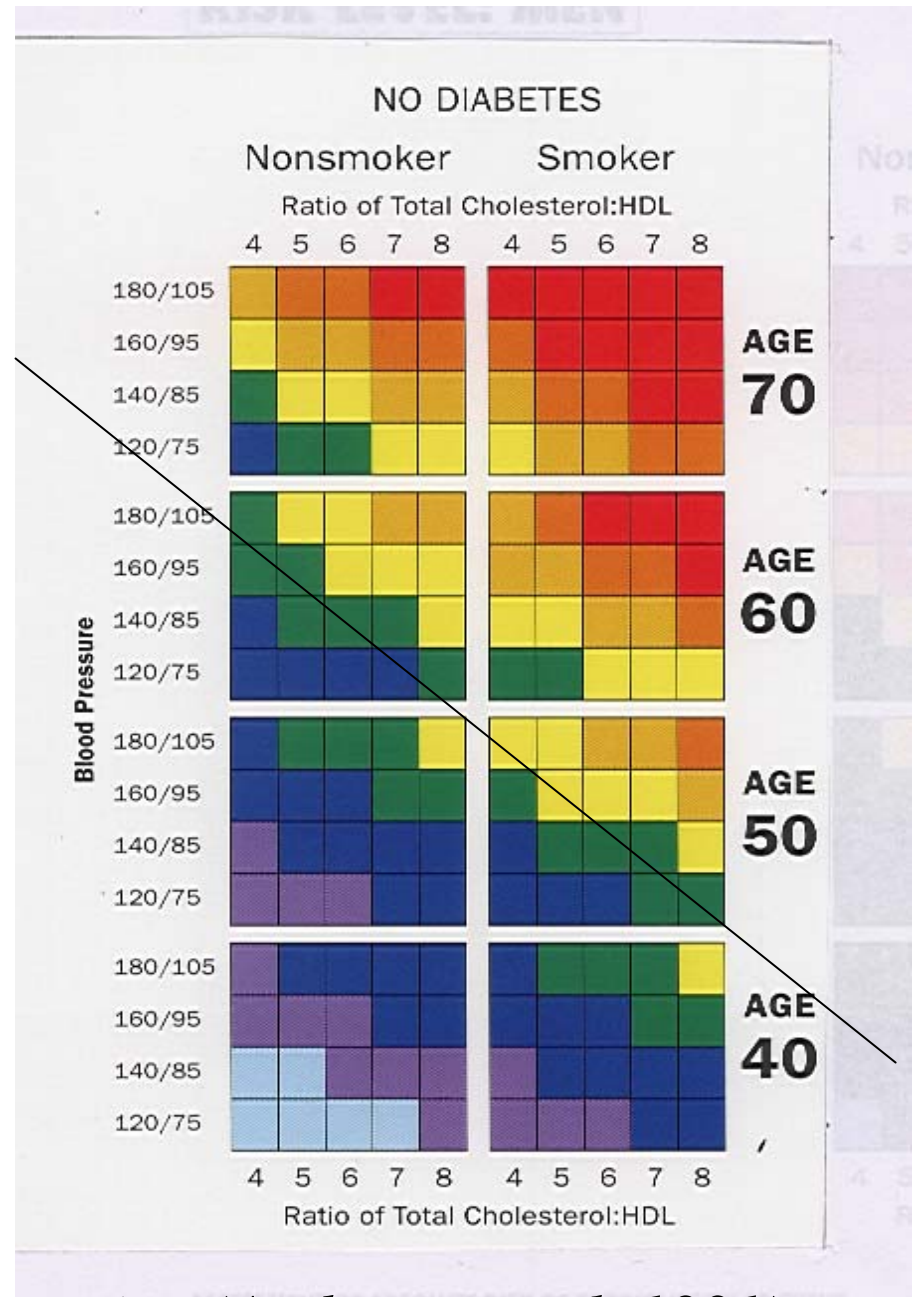
Estimate 5-year cardiovascular risk using Framingham risk equation (1991)

Fig. 1

National Heart Foundation CVD risk charts (5y event risk)



15%



Based on the Framingham risk equation (Anderson et al. 1991)

METHODS

- Obtain risk profiles from a large NZ study
 - Fletcher-Challenge & AK Univ Heart & Hlth (n=6675)
- Extrapolate to NZ
 - Estimate mean CV risk by 5y age group for all NZ men & women age 35-84
- Validate the Framingham risk equation for hospital admissions for CVD in New Zealand
 - Calibration, Sensitivity, Specificity

METHODS (cont)

- Decide on an efficient screening strategy
- Calculate 5y costs of screening + treatment by age/gender
- Calculate *lifetime* benefits of screening + treatment by age/gender
- Decide on a treatment threshold, based on cost effectiveness and available resources

METHODS (cont)

- Cumulate net costs & QALYs across all age/gender groups
- Calculate cost/QALY across the whole population
- Calculate budget impact for Govt and individuals

Inputs to the analysis

- NZ risk profiles by age and sex
 - Based on a cohort study
- Efficacy of lipid lowering therapy
 - Published clinical trials and meta-analyses
- Costs of CV admissions
 - National database
- Costs of drugs, labs, GP consults
 - National data
- Health utilities
 - Published values (post-stroke, post-AMI, PVD, HF)

RESULTS

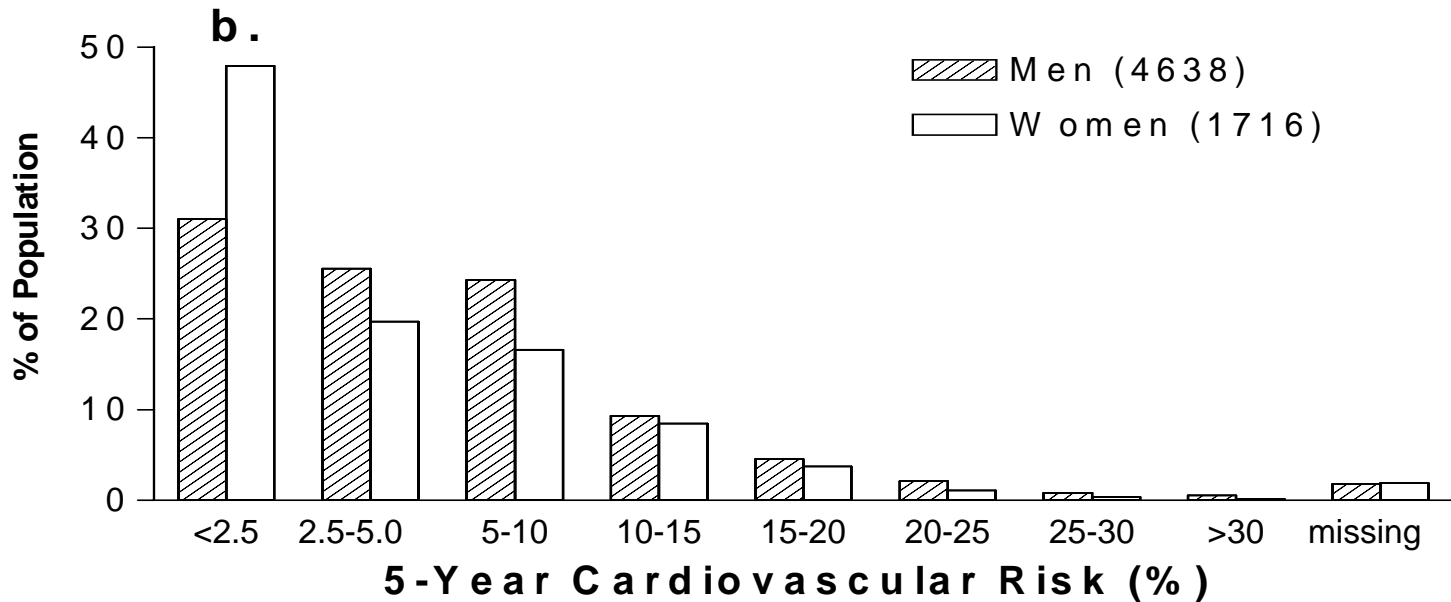
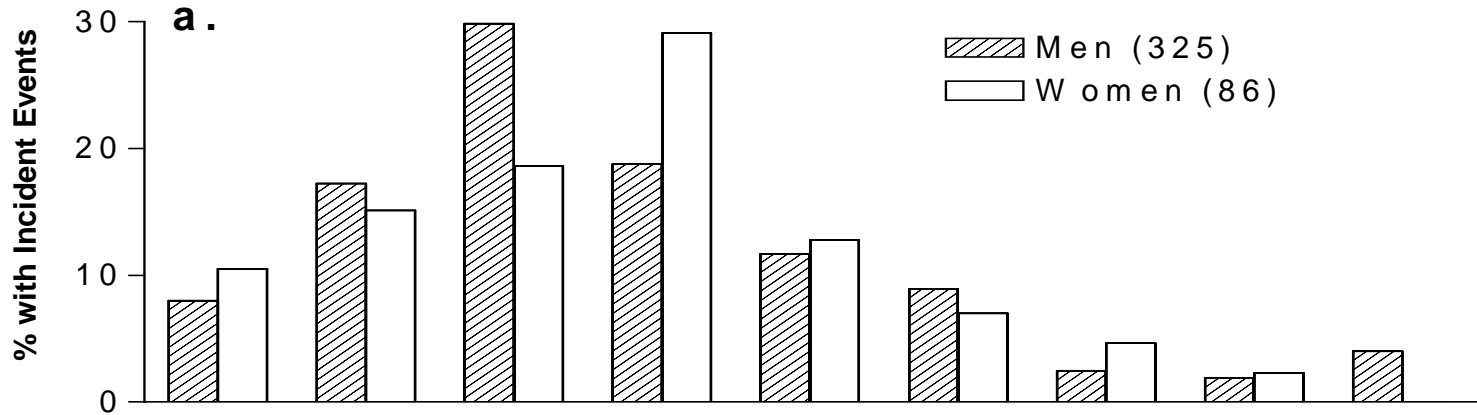
- Validation of risk equations
- Targeted risk screening
- Targeted risk management (treatment)
- Life time health benefits of targeted ‘screen and treat’ strategy
- Cost effectiveness of strategy
- Budget impact over 5 years

Fig Legends

- Figure 1 (a, b). Distribution of observed events (fig. 1a) and of individuals in the cohort (fig. 1b) across 5-year bands of cardiovascular risk (1) by age and sex.
- Figure 2 (a, b). Observed versus predicted cardiovascular events by age and sex (* = $P < 0.05$; χ^2 test).
- Figure 3. Observed versus predicted cardiovascular events across 5-year bands of cardiovascular risk for men and women combined (mean \pm 95% CI; * = $P < 0.05$; χ^2 test).

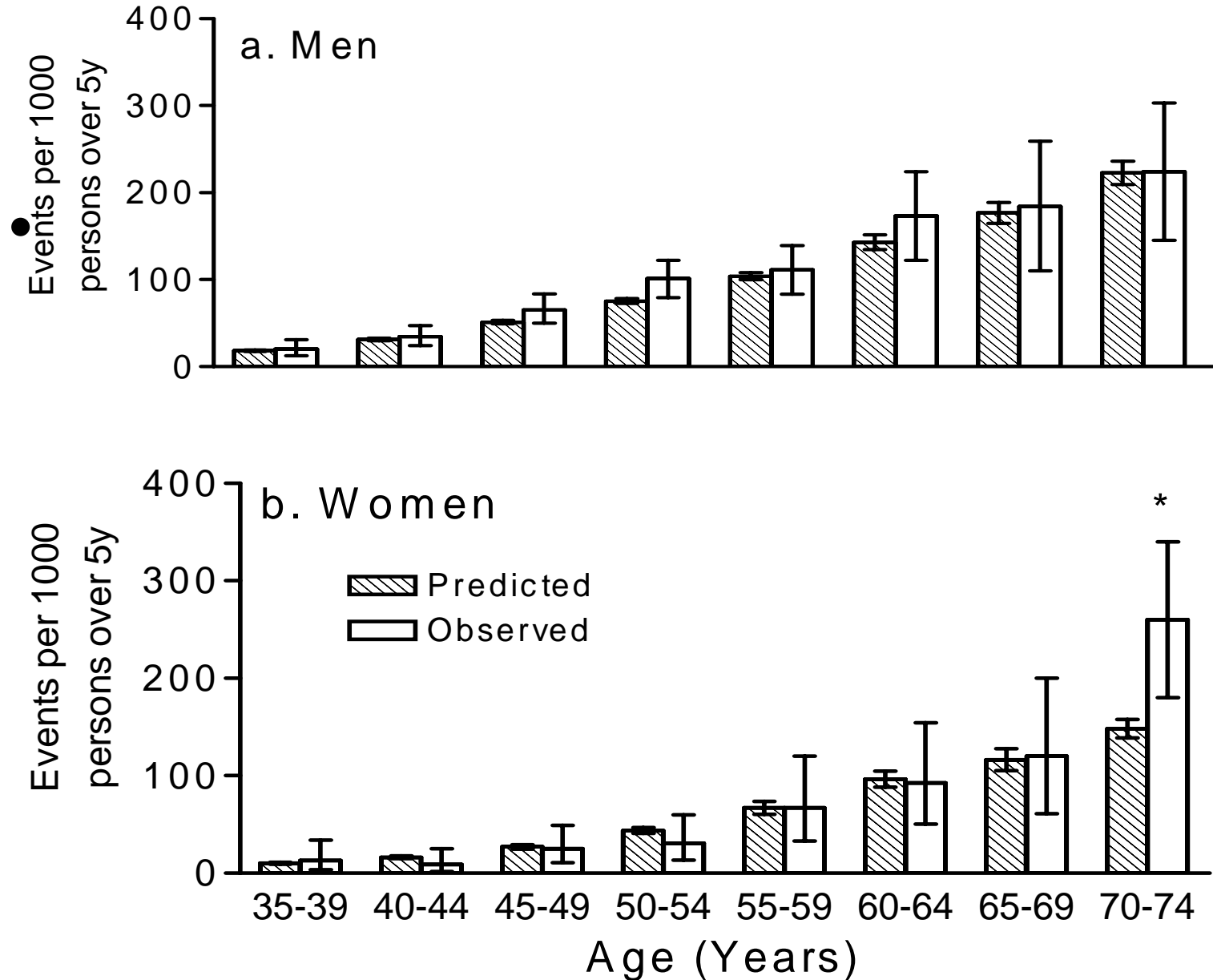
Cardiovascular risk

Figure 1



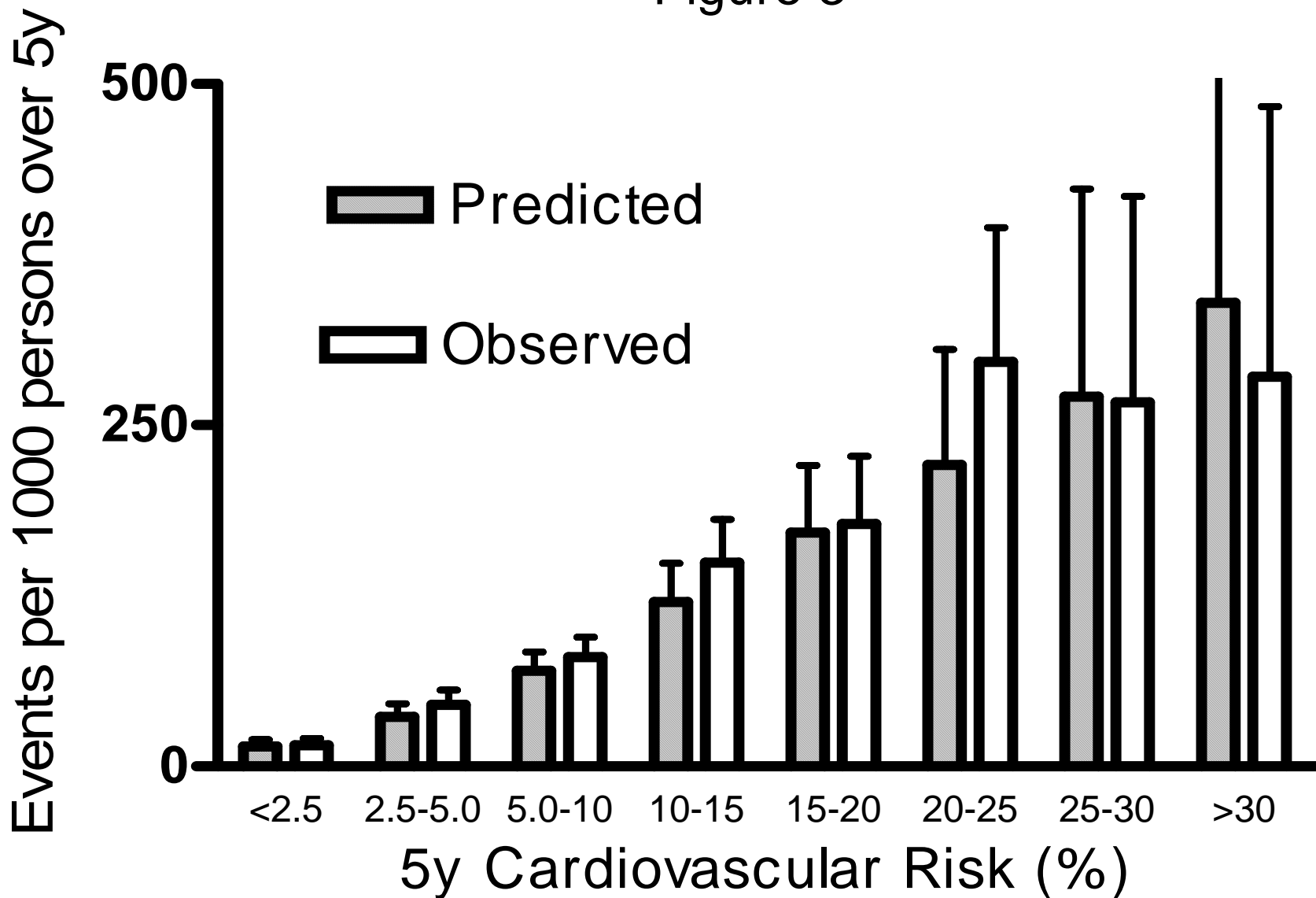
The risk equation predicts CVD hospital admissions

Figure 2



The risk equation predicts CVD hospital admissions

Figure 3



Receiver operating characteristics analysis

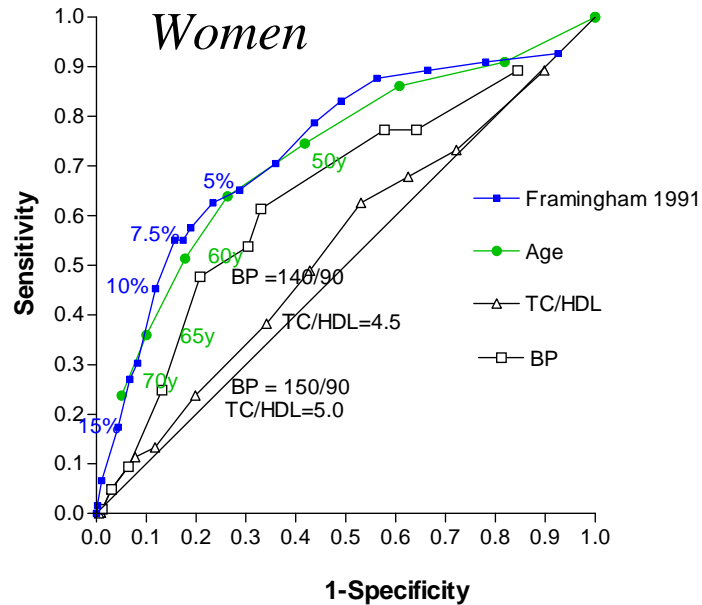
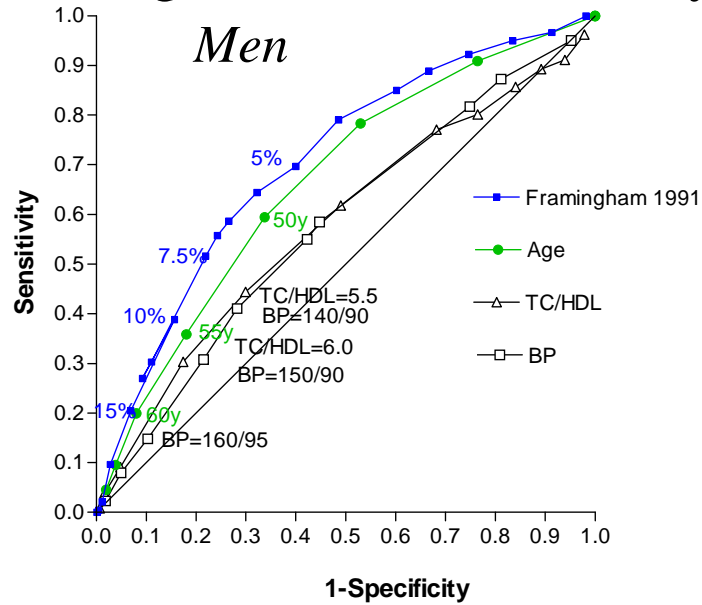
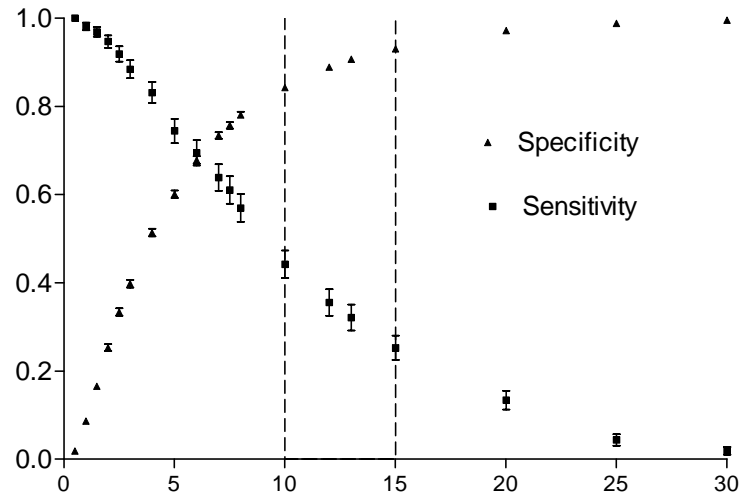
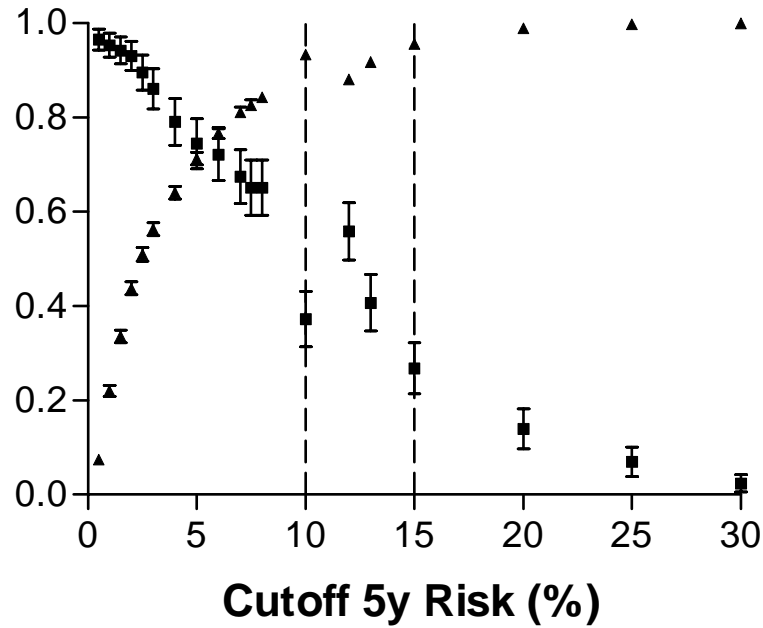


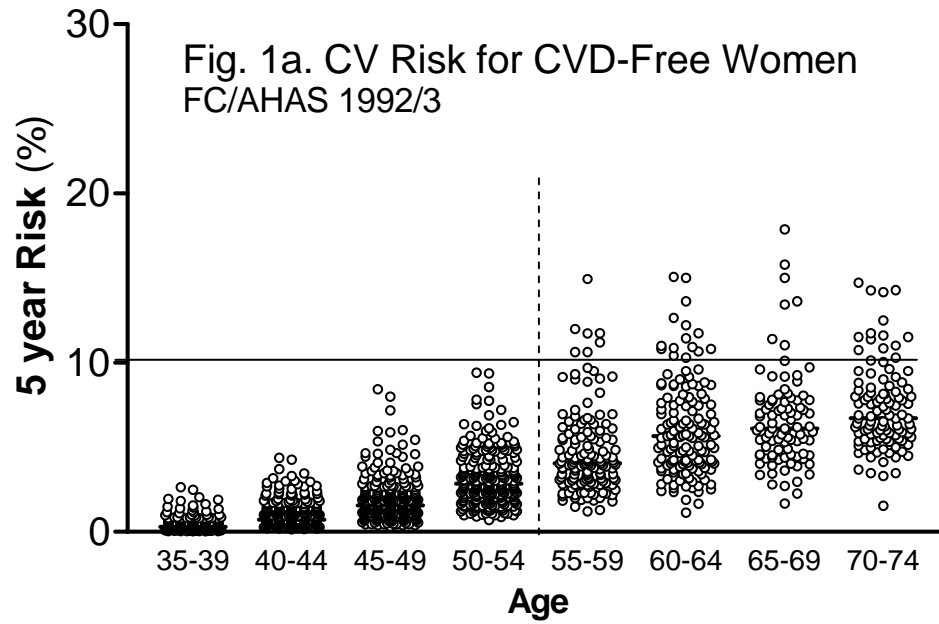
Figure 2

a. Men

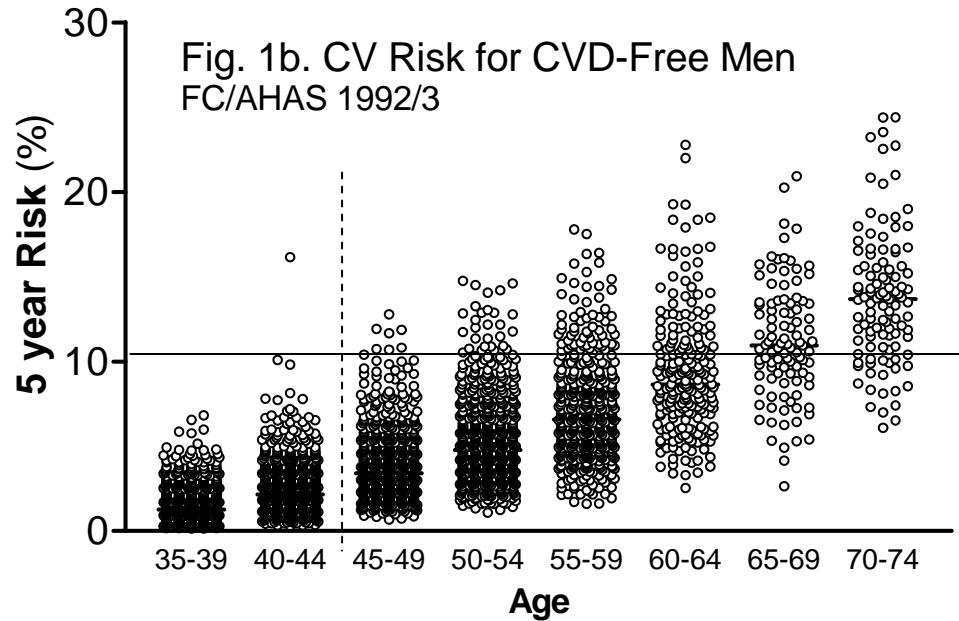


b. Women





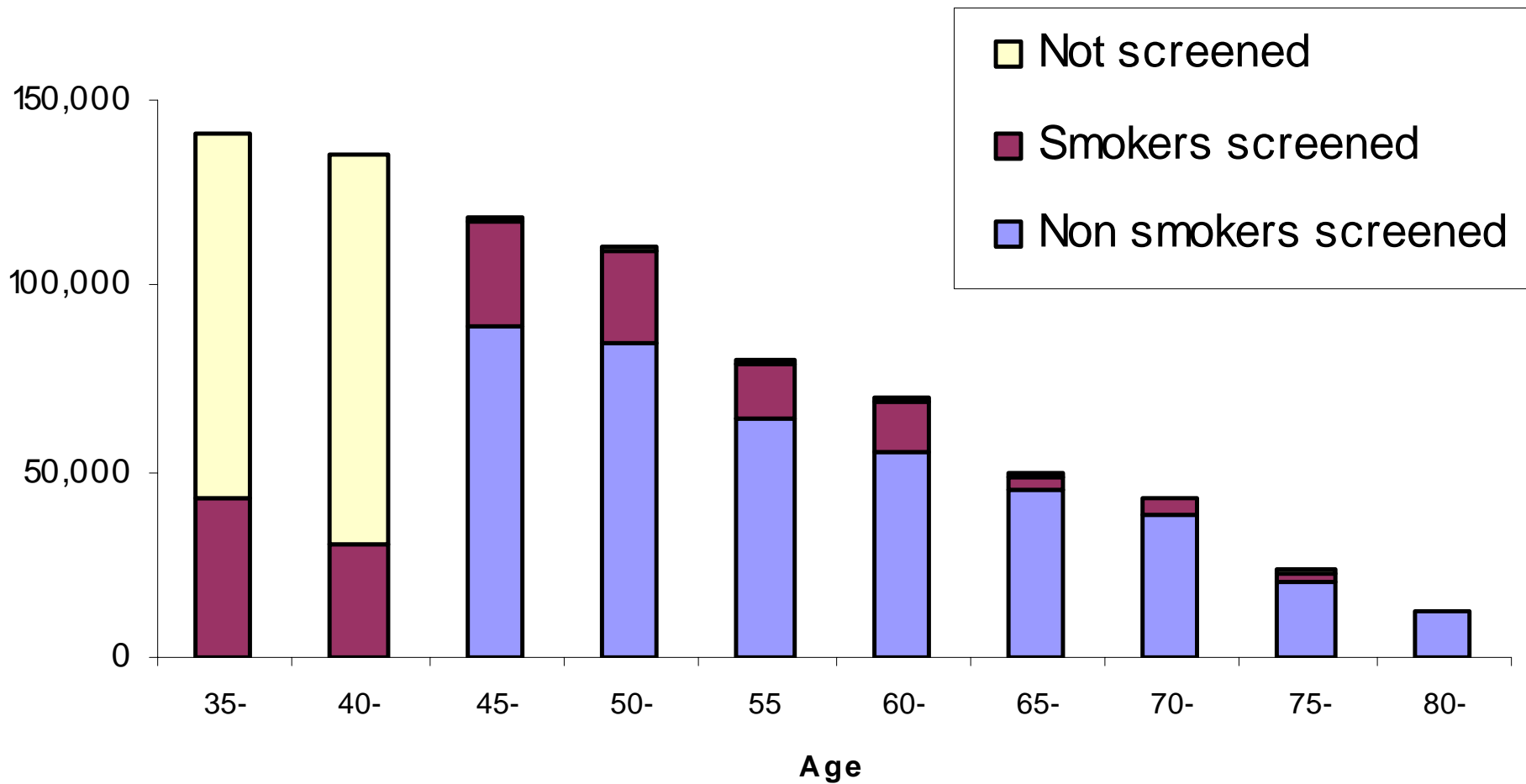
Dot = 1+ person



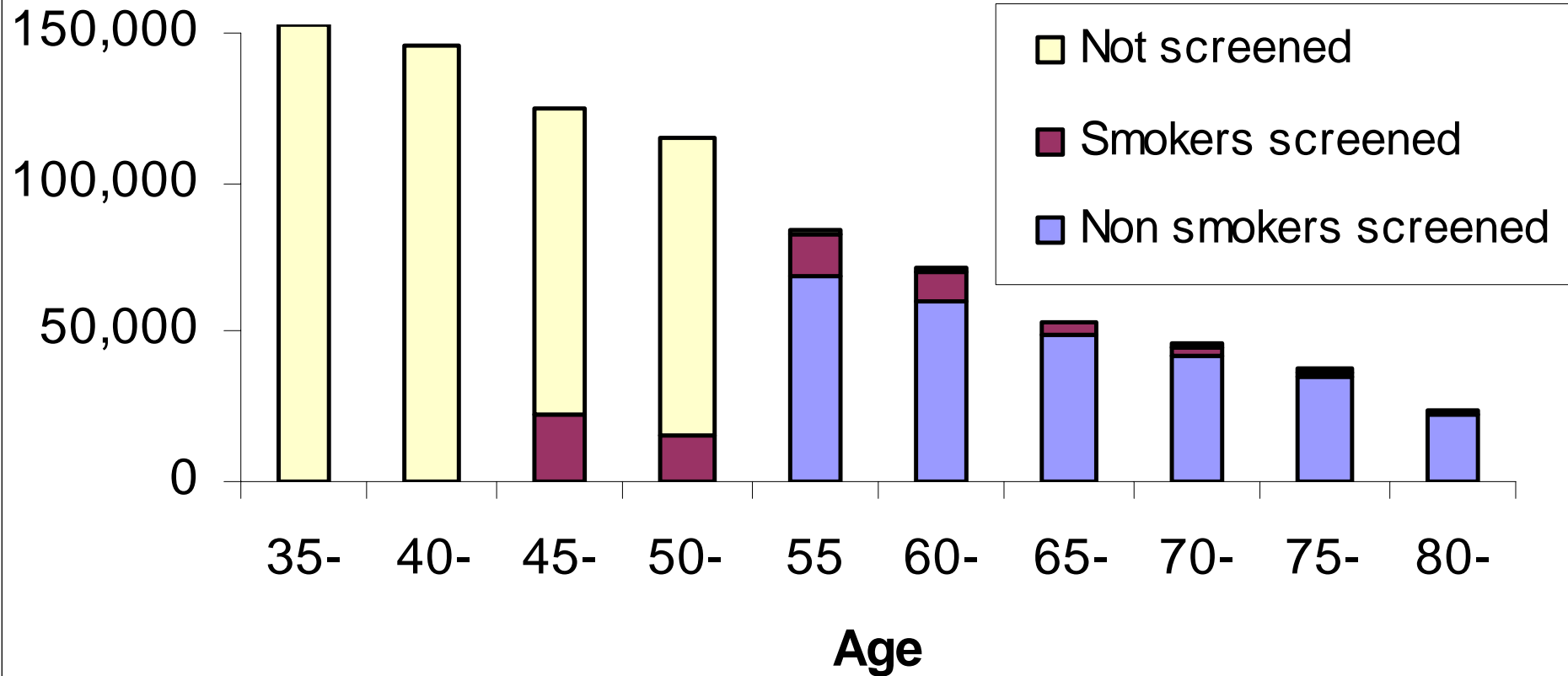
Targeted risk screening

- Screen only
 - Men age 45-84, women age 55-84
 - Known smokers 10y younger
 - Known diabetics at diagnosis

Cardiovascular risk screening (M)



Cardiovascular risk screening (F)



Population risk screening, age 35-84

	Population	Screened	%
Men	784,289	573,758	73%
Women	856,553	347,281	41%
Total	1,640,842	921,039	56%

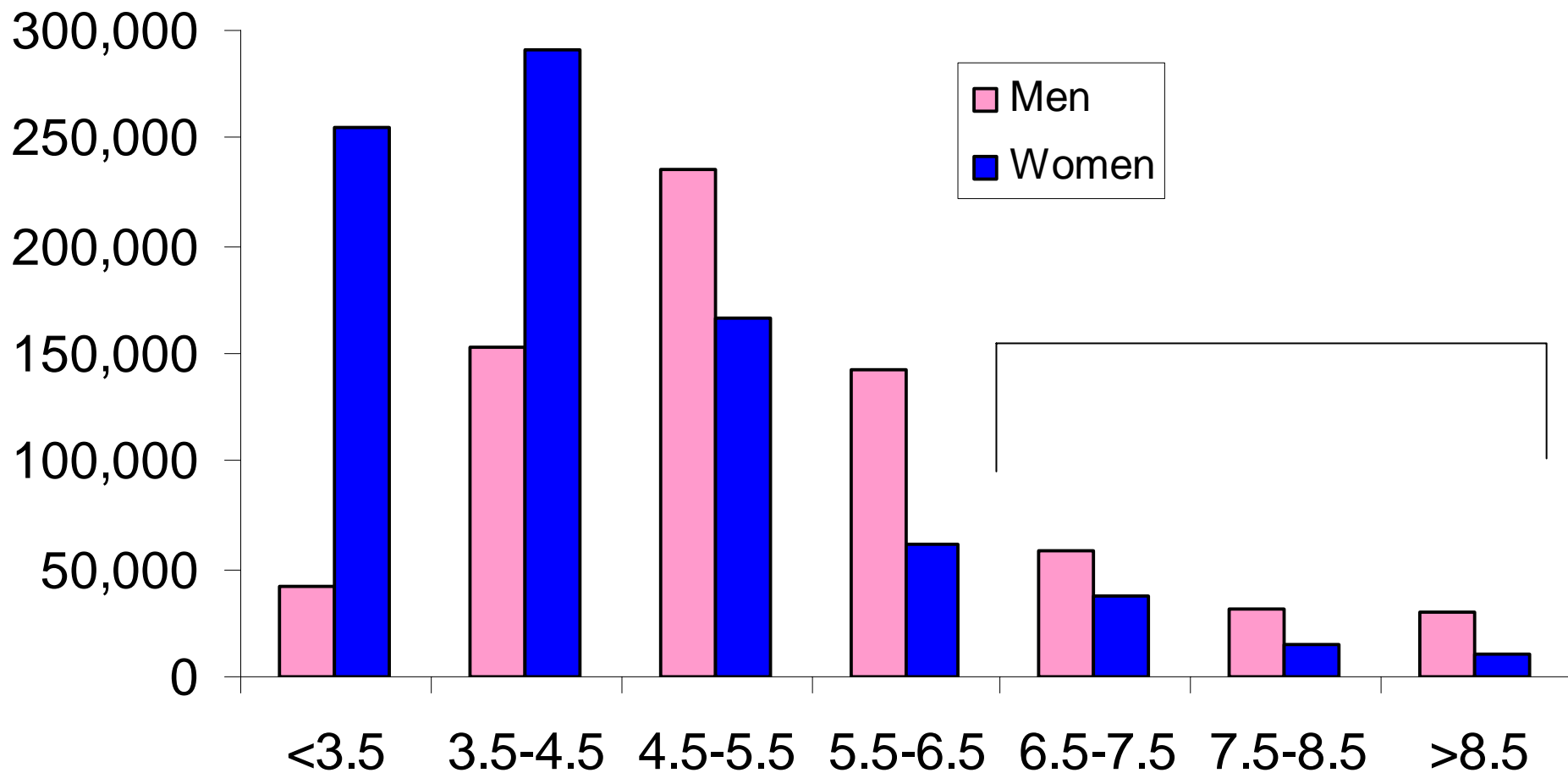
Screening more intensively is a waste of resources!

(GP time, lab tests etc)

Targeted risk management

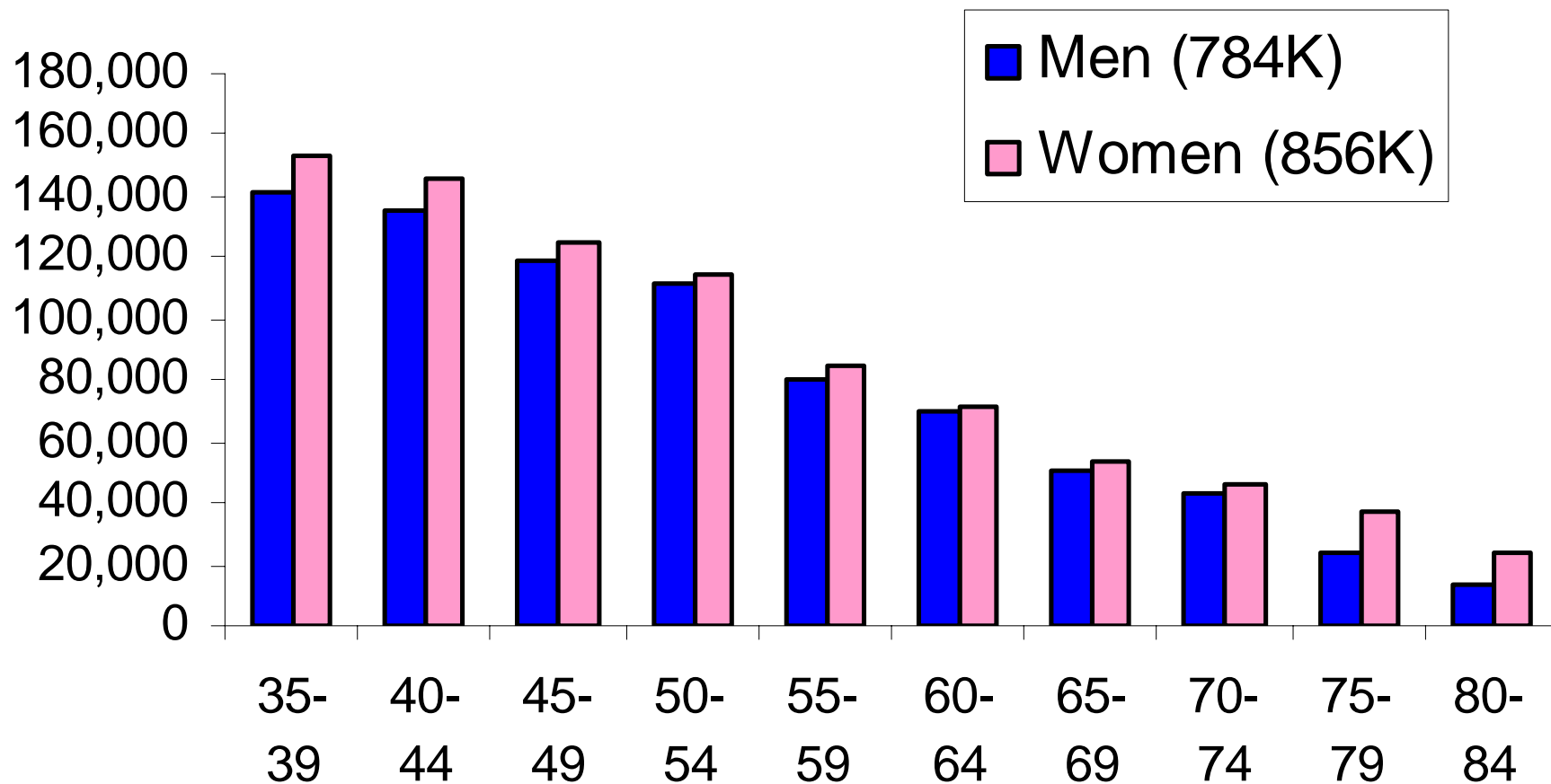
- Who will benefit most from treatment?
- Estimate 5y risk from the Framingham risk equation for ‘any first-ever cardiovascular event’
- Set treatment thresholds
 - 5-year risk $>15\%$ [*or 10%*]
 - **AND** lipid ratio Tc/HDLc > 4.5 (*evidence based*)
 - **OR** extremes: $Tc/HDLc > 8.0$ or $SBP > 160$ mm Hg

**Fig. 5. Lipid Profiles in CVD-Free
NZ Men & Women (age 35-84)**

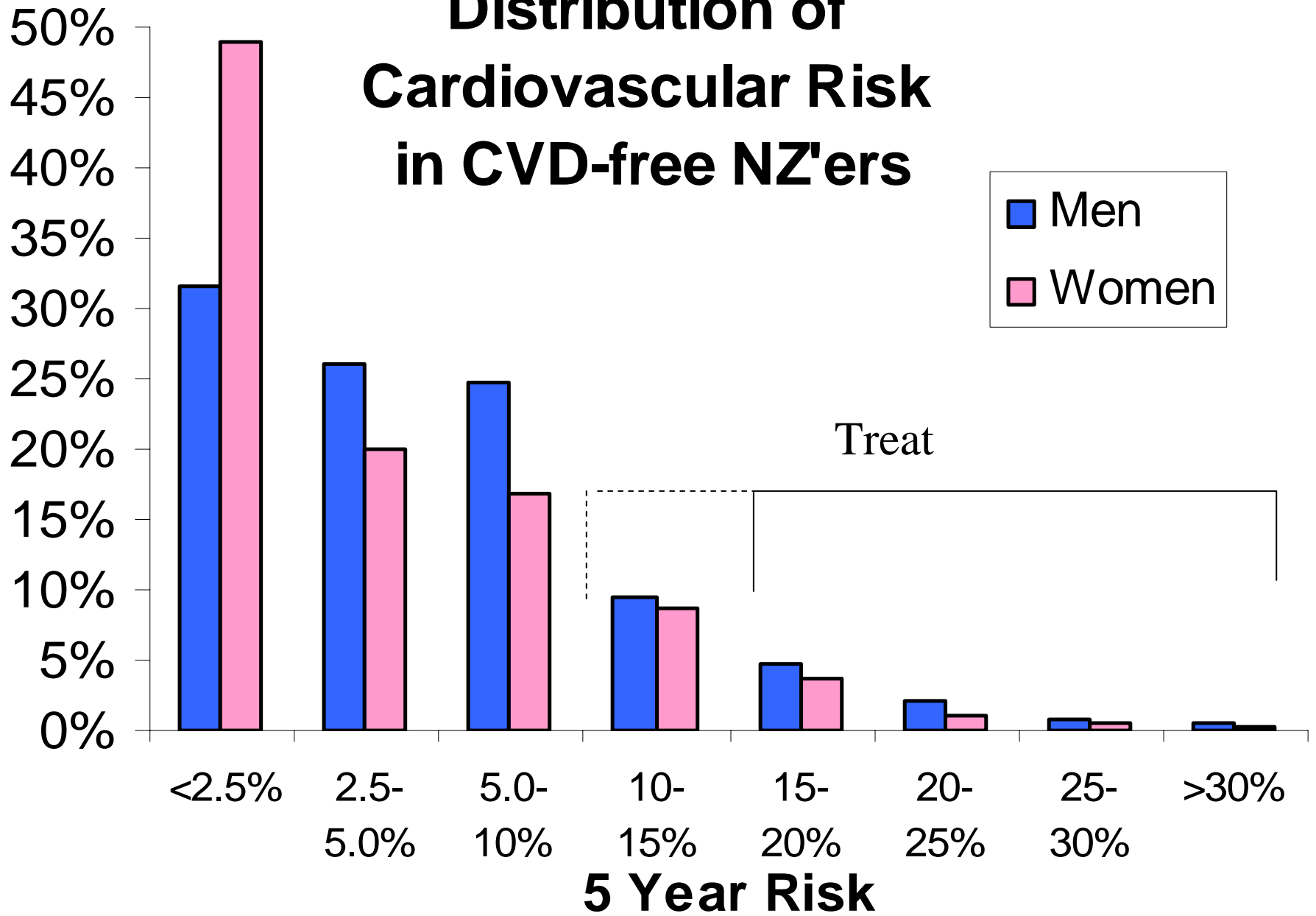


TcHDLc

NZ men and women age>34 without known cardiovascular disease

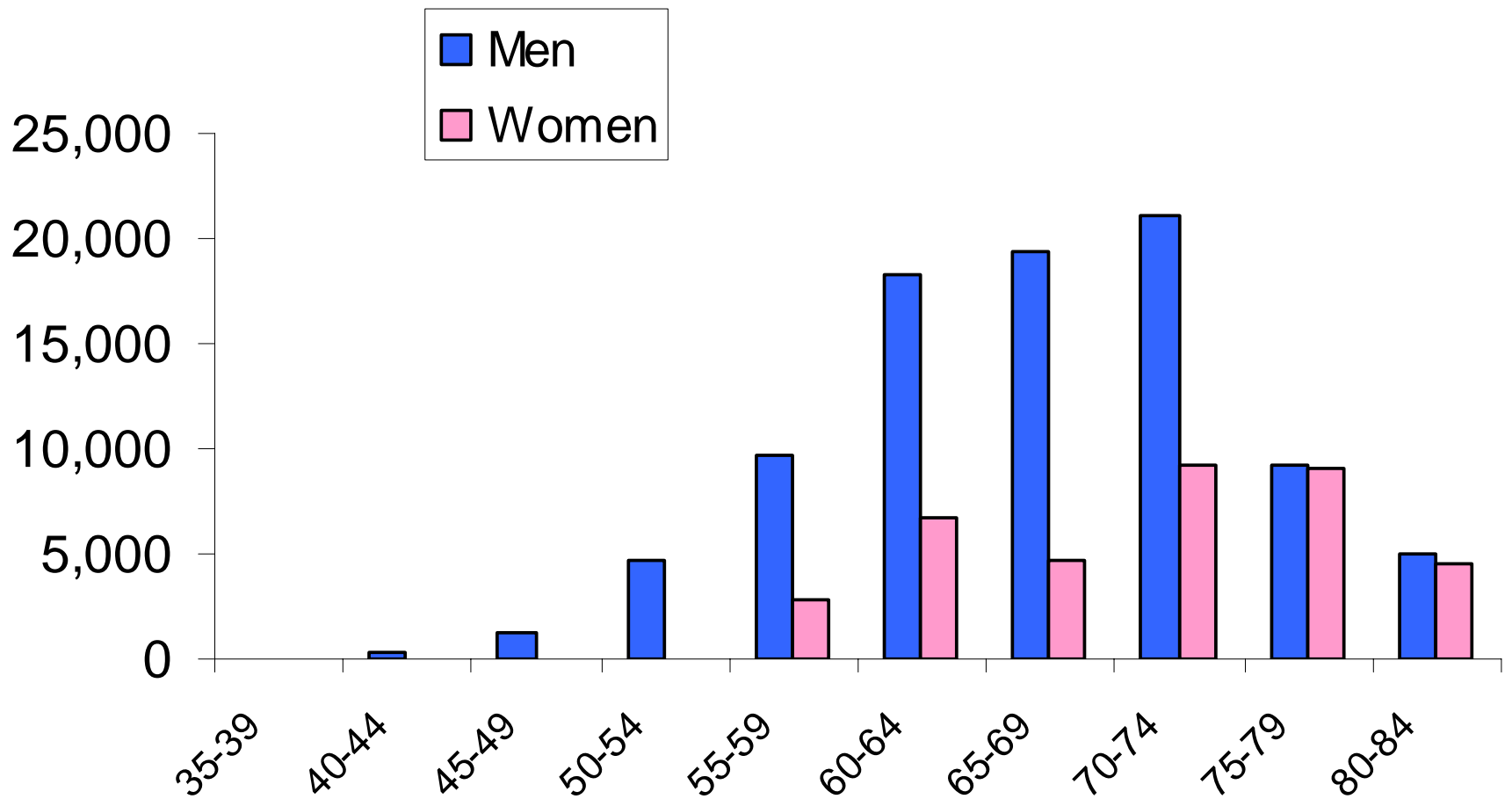


Distribution of Cardiovascular Risk in CVD-free NZ'ers

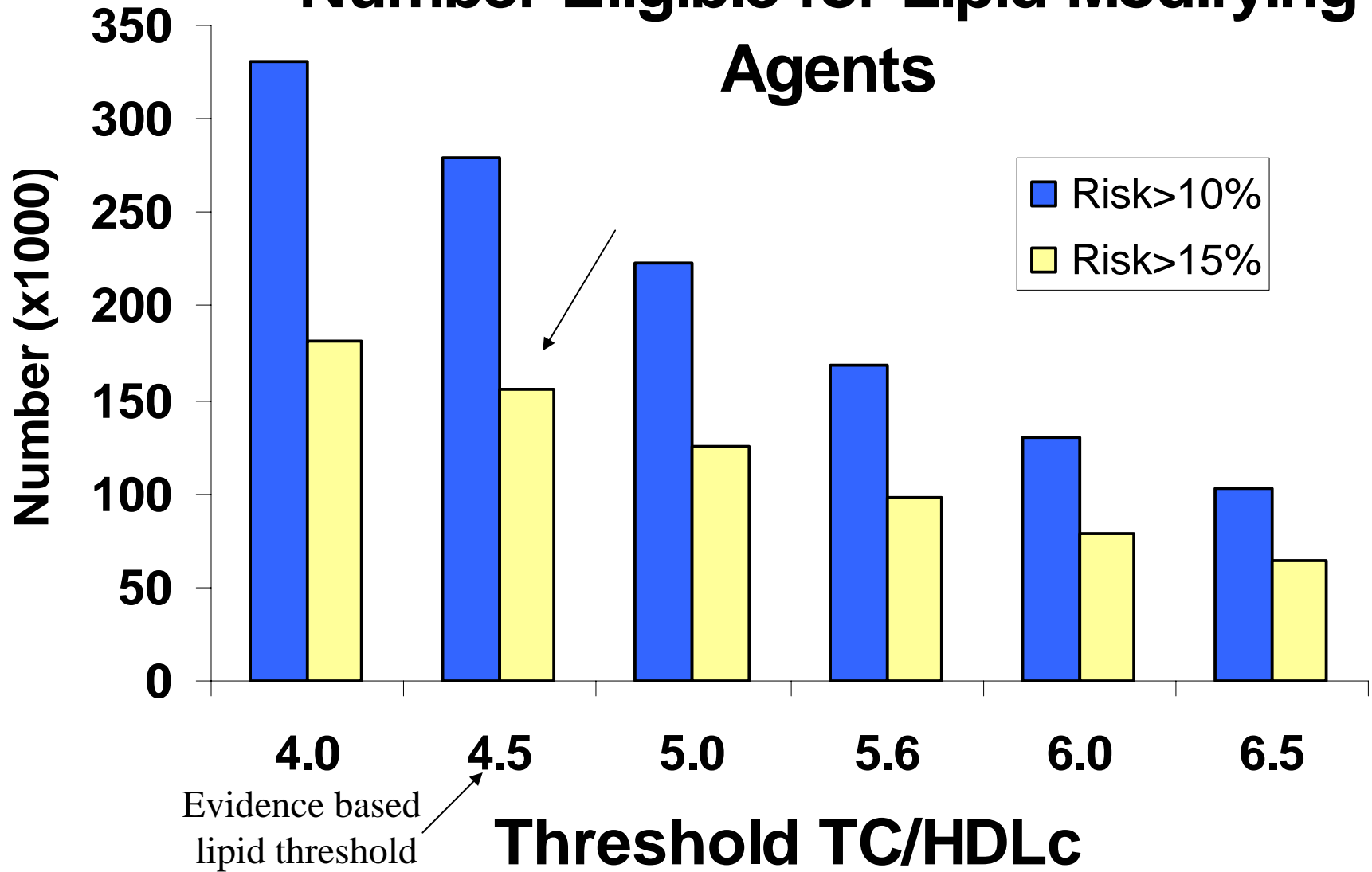


NZ'ers w/o CVD who are eligible for statins

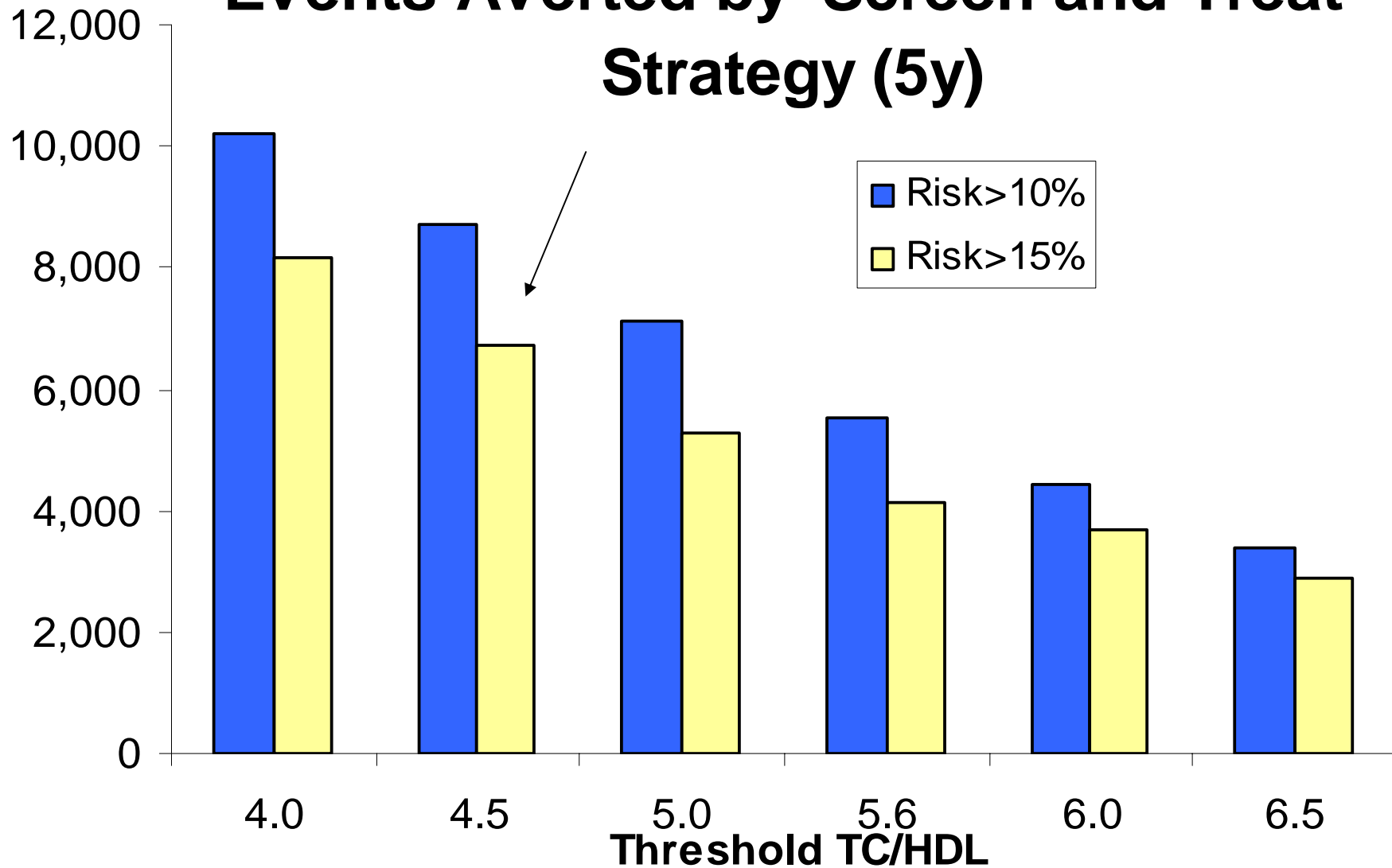
[TC/HDL>4.5, AR>15%, Total 155,000]



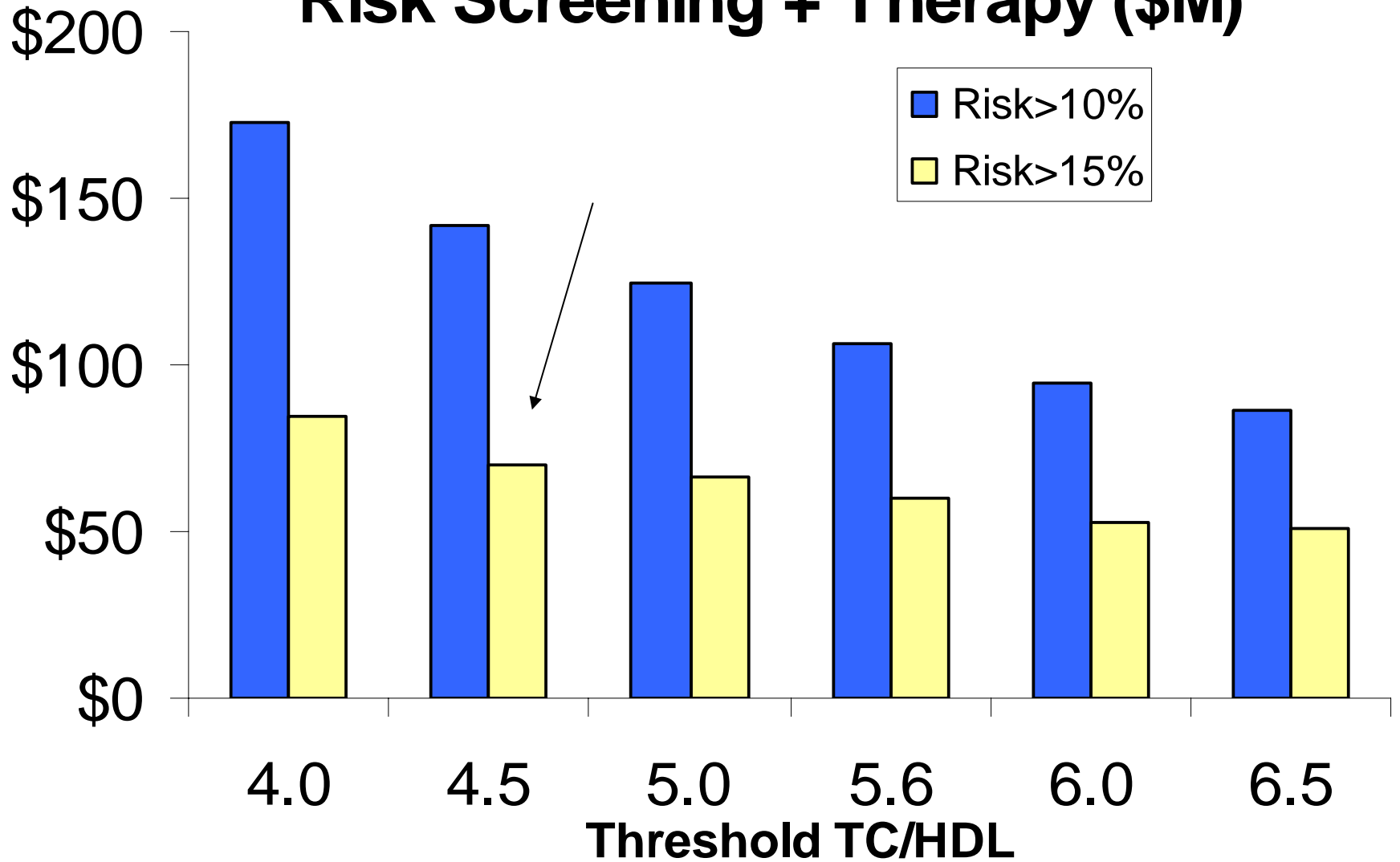
Number Eligible for Lipid Modifying Agents



Events Averted by 'Screen and Treat' Strategy (5y)



NPV 5y Cost of Risk Screening + Therapy (\$M)



a. Cost per Event Avoided in 5y

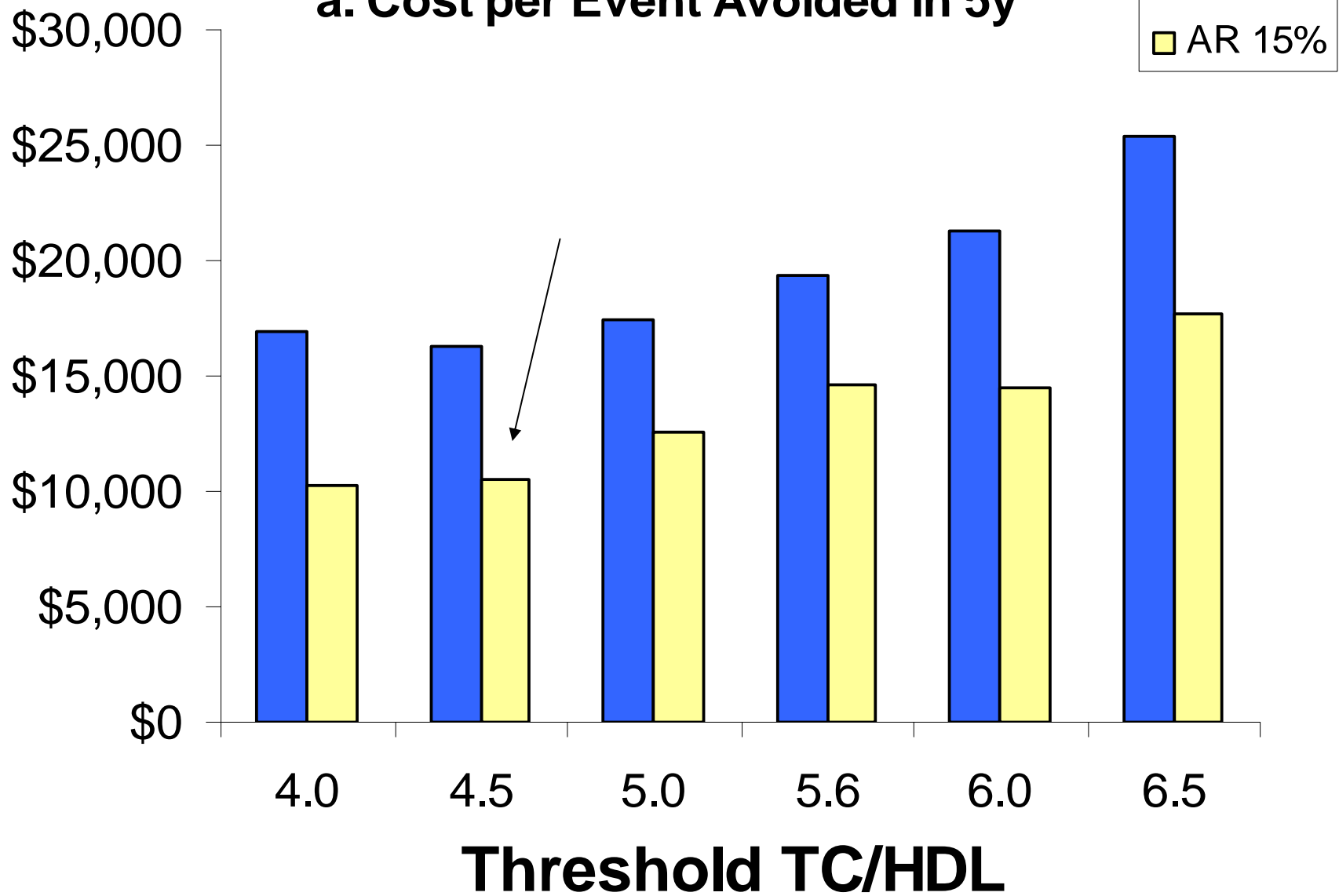
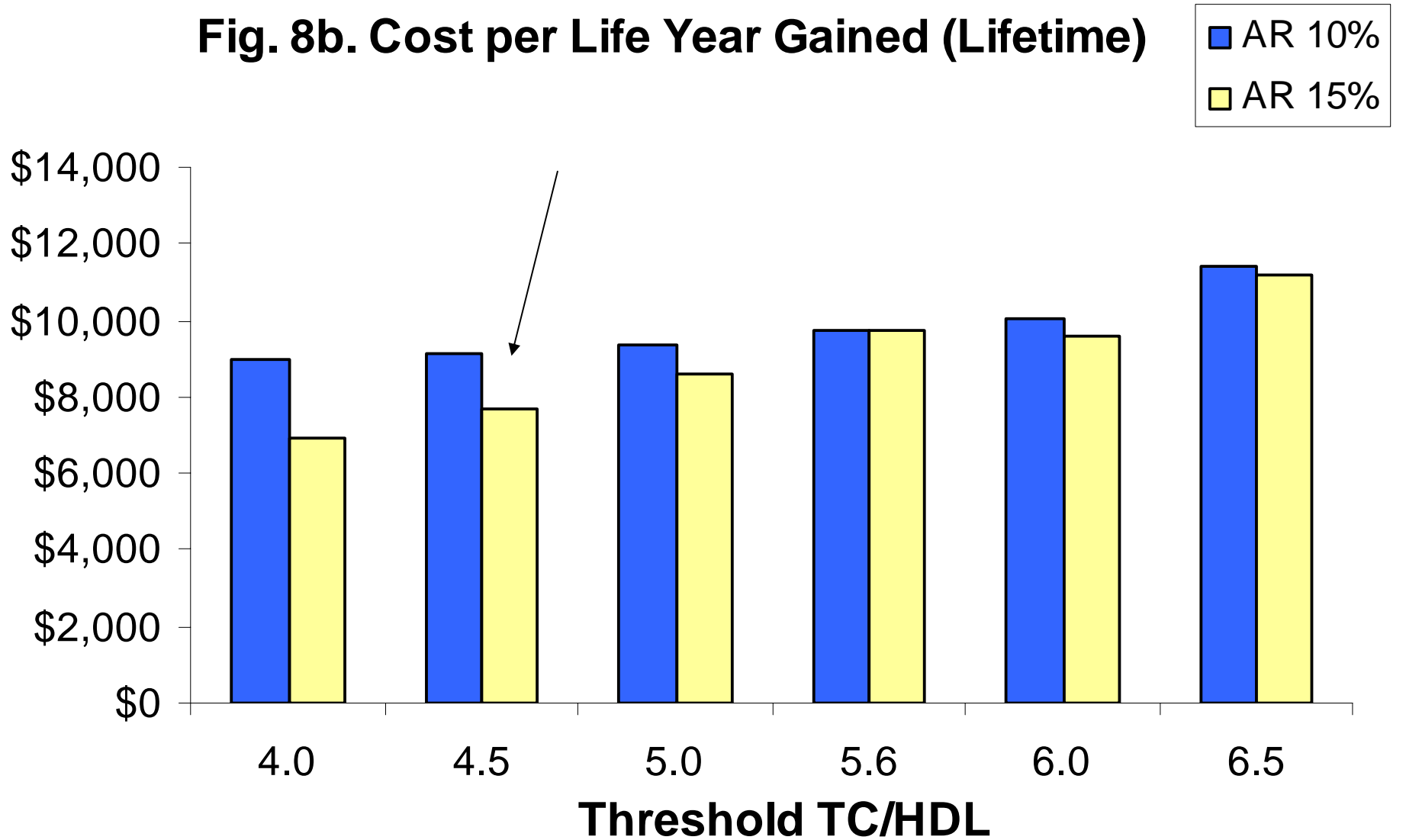
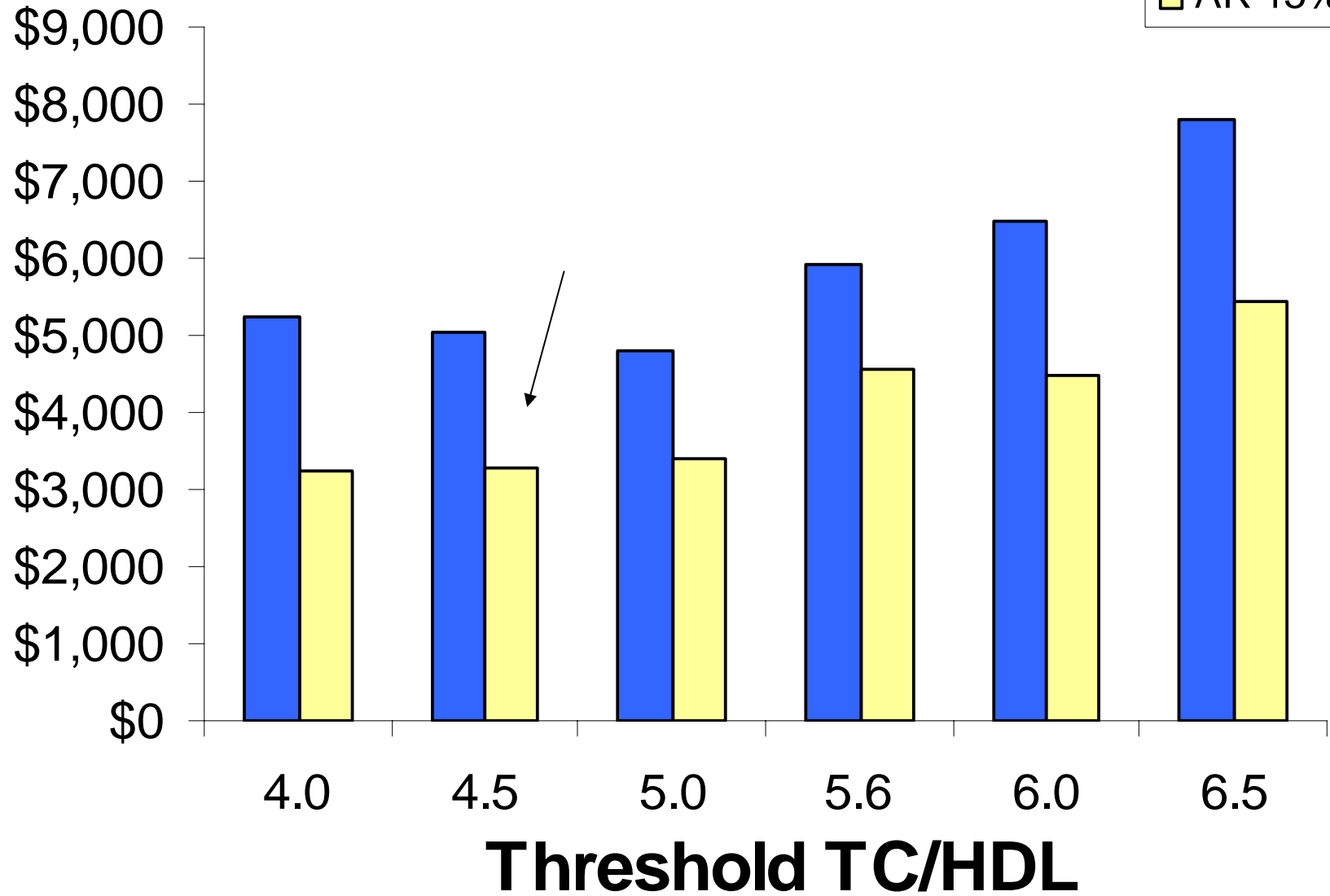
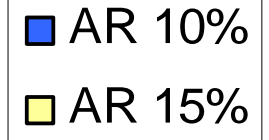


Fig. 8b. Cost per Life Year Gained (Lifetime)

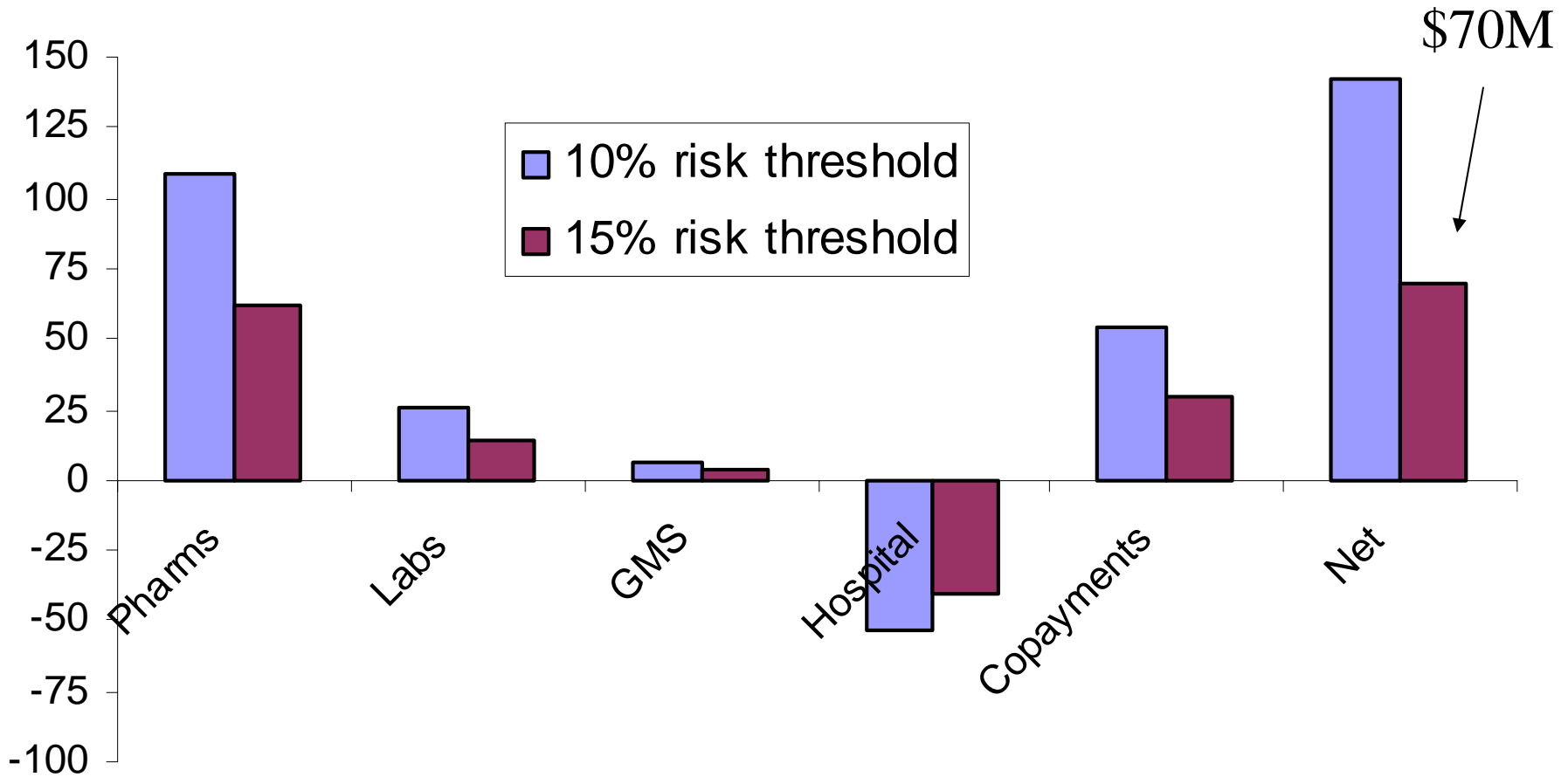


c. Cost per QALY gained (lifetime)



BUDGET IMPACT

NPV 5y Costs of 'Screen and Treat' (\$M)



Tc/HDLc > 4.5; 5% discount rate

COST EFFECTIVENESS over cohort lifetime

Treatment threshold (5y risk)	Cost per event averted	Cost per death averted	Cost per LYG	Cost per QALY
15%	\$10,459	\$37,269	\$4,083	\$3,295
10%	\$16,263	\$61,303	\$6,452	\$5,043

BUDGET IMPACT over 5y (\$NZ 2003)

	Govt.	Copays	Hospital cost offset	Net cost
15%	\$81M	\$29M	-\$40M	\$70M
10%	\$140M	\$55M	-\$53M	\$142M

Conclusions

- Targeted screening for cardiovascular risk, linked to targeted statin therapy, is at least as cost effective as recently funded novel drug therapies in New Zealand*
- At a clinically reasonable treatment threshold (5y risk 15%) it costs \$70M over 5 years
- Half the programme cost to Govt is recouped in hospital admissions avoided

* generally <\$20,000/QALY

Details: www.nzgg.org.nz/guidelines/0035/CVD_Economic2.pdf

Conclusions

- The updated clinical guideline on screening and drug therapy is cost effective and (probably) affordable
- Economic evaluation is an essential element of guideline development

Some issues for discussion

- Starting age for global risk screening
- Opportunistic risk factor screening
- Relative risk reduction (related to dosage)
- Threshold lipid ratio: 4.5 or lower?
- Risk threshold 15% or 10%? (resources)
- Maori and Pacific starting age
- Adjustment for those already screened
 - Screen again?
- Adjustment for those already on statins
 - Very few pre 2001
- Pharmac's threshold
 - Slide

Benchmarking the Cost per QALY

- Analysts review options; the MOH decides
- There are no official Govt. benchmarks
- Unofficially
 - *UK* *£30,000* [*=\$NZ85,000*]
 - *US* *\$US50,000* [*=\$NZ77,500*]
 - *MOH: none*
 - *NZ Treasury: does not use QALYs*
 - *PHARMAC: ??*

Investment decisions with economic analyses		Number	Cost to	NPV cost to	Cost
<i>Source: NZMJ 116 (1170), March 2003</i>		patients pa	Schedule	health sector	per QALY
Beta-interferon for multiple sclerosis	List	156	\$250,000	\$139,253	\$80,700
Quetiapine for schizophrenia	List	208	\$108,419	-\$182,775	\$74,995
Atypical antipsychotics for schizophrenia	List	5900	\$22,500,000	\$4,920,563	\$43,138
Eformoterol for asthma symptom control	List	2117	\$265,891	\$205,402	\$40,000
Olanzapine for schizophrenia	Extend	87	\$172,132	\$91,585	\$27,467
Topiramate for epilepsy (refractory)	List	284	\$320,209	\$320,209	\$18,500
Gabapentin for refractory epilepsy	List	42	\$35,870	\$35,870	\$15,000
Alendronate for osteoporosis	Extend	502	\$464,246	\$421,457	\$12,426
Tolcapone for parkinsonism	List	270	\$600,000	\$258,000	\$10,084
Anastrozole for oncology t/t	List	50	\$15,000	\$13,500	\$8,500
Letrozole for breast cancer	List	50	\$15,000	\$15,000	\$8,500
Statins for dyslipidaemia	Extend	2500	\$1,900,000	\$1,320,902	\$6,559
Dorzolamide for glaucoma	List	200	\$391,000	\$391,000	\$4,638
Alendronate for severe osteoporosis	List	341	\$98,333	\$88,418	\$3,545
Tacrolimus for renal transplant	List	10	\$7,500	\$3,750	\$2,500
Lamivudine for chronic Hep B infection	List	72	\$11,400	\$3,300	\$1,500
Olanzapine for schizophrenia	Access	2282	\$4,494,352	-\$479,250	-\$5,748

Investment decisions without economic analyses		Patients pa	Cost to
<i>Source: NZMJ 116 (1170), March 2003</i>			Schedule
Budesonide with eformoterol for asthma	List	1237	\$547,927
Brimonidine for refractory glaucoma	List	800	\$287,462
Latanoprost for glaucoma	List	502	\$153,750
Leflunomide for rheumatoid arthritis	List	380	\$147,257
Efavirenz for HIV/AIDS	List	79	\$134,465
Erythropoetin beta for anaemia [WHY NO ECON ANALYSIS??]	List	205	\$102,184
Cosopt(combination dorzolamide & timolol) for glaucoma (refractory)	List	895	\$50,866
Abacavir for HIV/AIDS	List	28	\$48,334
Latanaprost for glaucoma (refractory)	Extend	641	\$41,385
Carvedilol for hypertension /heart failure	List	253	\$27,691
Dorzolamide for glaucoma (refractory)	Extend	363	\$13,026
Losartan for []	Extend	182	\$5,381
Ranitidine for []	Extend	2254	\$5,336
Monogen for special food	Extend	13	\$4,482
Coal tar with salicylic acid & sulphur	List	191	\$2,067
Alendronate for severe osteoporosis	Extend	770	\$59
Timoptol XE& Timpilo for gluacoma	Extend	450	-\$2,022
Quetiapine for schizophrenia	Extend	-322	-\$27,264