Primary prevention of CVD

Pascal Bovet

Ministry of Health, Seychelles
University of Lausanne, Switzerland
pascal.bovet@chuv.ch; bovet.pascal@gmail.com

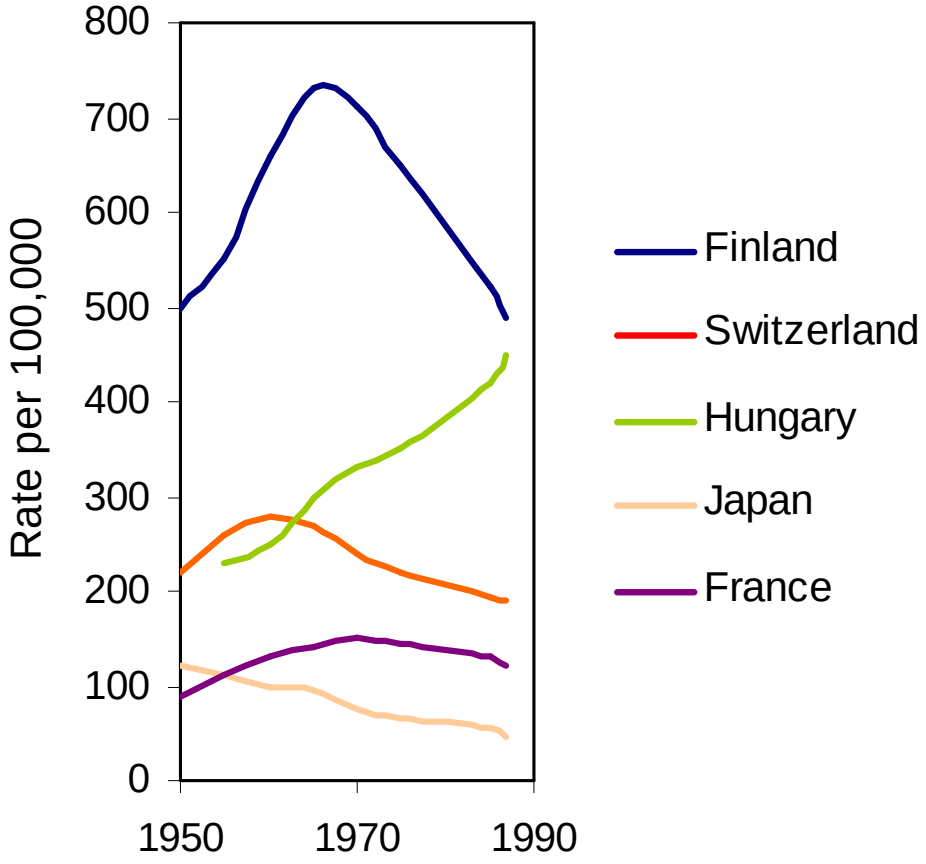
Building Capacity for CVD Health Promotion and Chronic Disease Prevention and Control in Africa, Entebbe, 8-18 July 2009

- To understand the meaning of primary vs. secondary prevention
- To describe the main risk factors of NCD and their main characteristics
- To understand the principles of “individual-based high-risk strategy” and “population-based strategy”
- To understand why a population-based approach should be emphasized for NCD, particularly in case of limited resources

- **Is CVD preventable, to which extent?**
- Risk factors of CVD and their characteristics
- ‘Population’ strategies and ‘high risk’ strategies
- Limitations and opportunities for CVD prevention
- Conceptual framework for planning CVD prevention

Extremely different CVD rates over place and time underlie large potential for prevention

Trends in IHD, 1950-1987, age 45-64



Thom et al. NIH Publication 92-3988

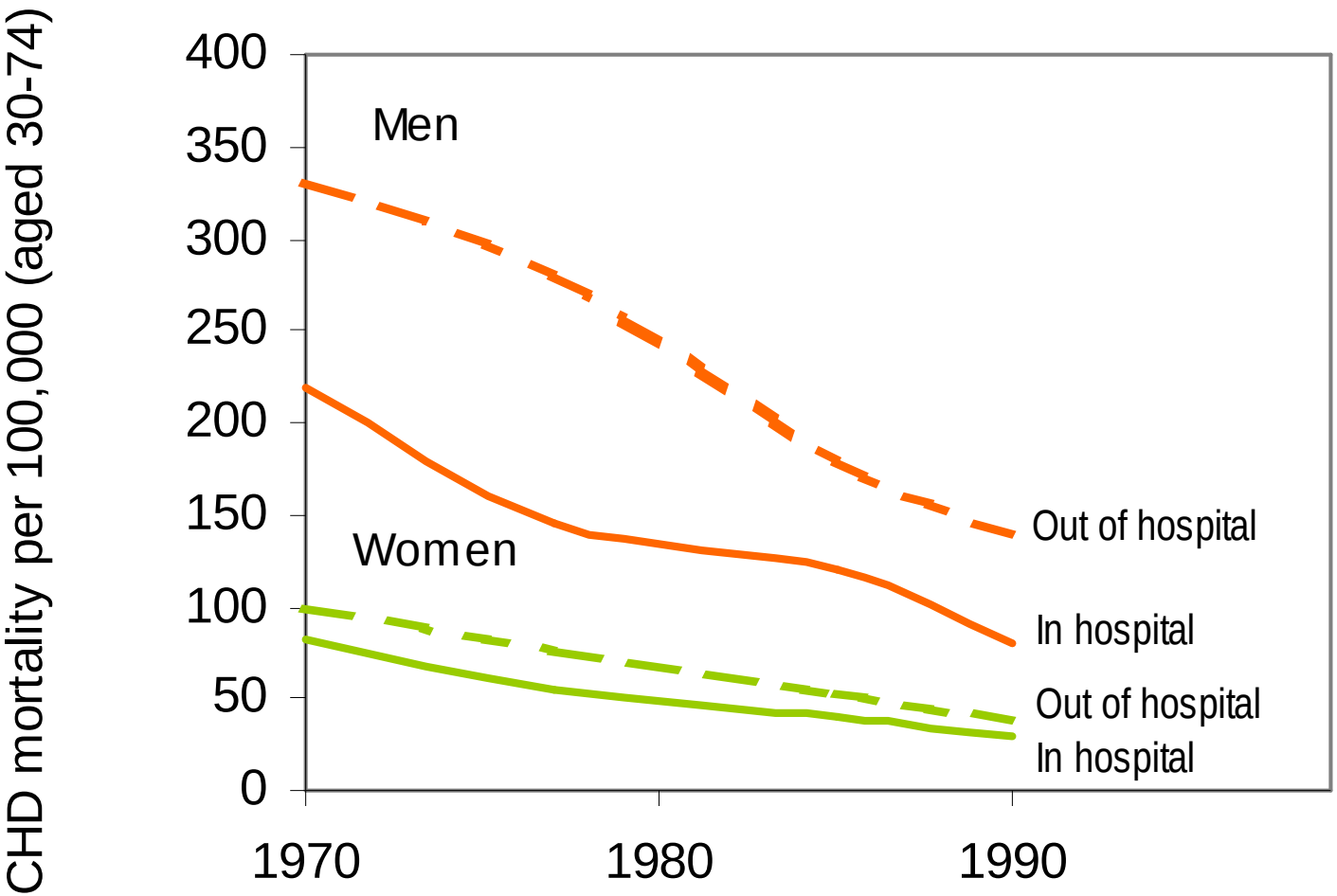
Much lower CVD risk in individuals with healthy lifestyles

Liefstyle characteristics			
Diet score upper 2 quintiles	x	x	x
Non smoking	x	x	x
Regular exercise (>30 min/d)	x	x	x
Body mass index <25 kg/m2		x	x
Alcohol >5 g/d			x
Prevalence women	13%	7%	3%
Relative risk of CVD major events	0.46	0.38	0.25
Population Attributable Risk* (%)	**51**	**60**	**74**

* Proportion of all CVD events that could have been prevented if all women were in low risk group

Stampfer et al. N Engl J Med 2000;343:16-22.
(Primary prevention of IHD through diet and lifestyle - Nurses' Health Study, 89141 women)

Large proportion of CVD deaths occur out of hospital and escape any possible case management



McGovern PG et al. Minnesota Heart Survey Inv. Recent trends in acute CHD. NEJM 1996;334:884

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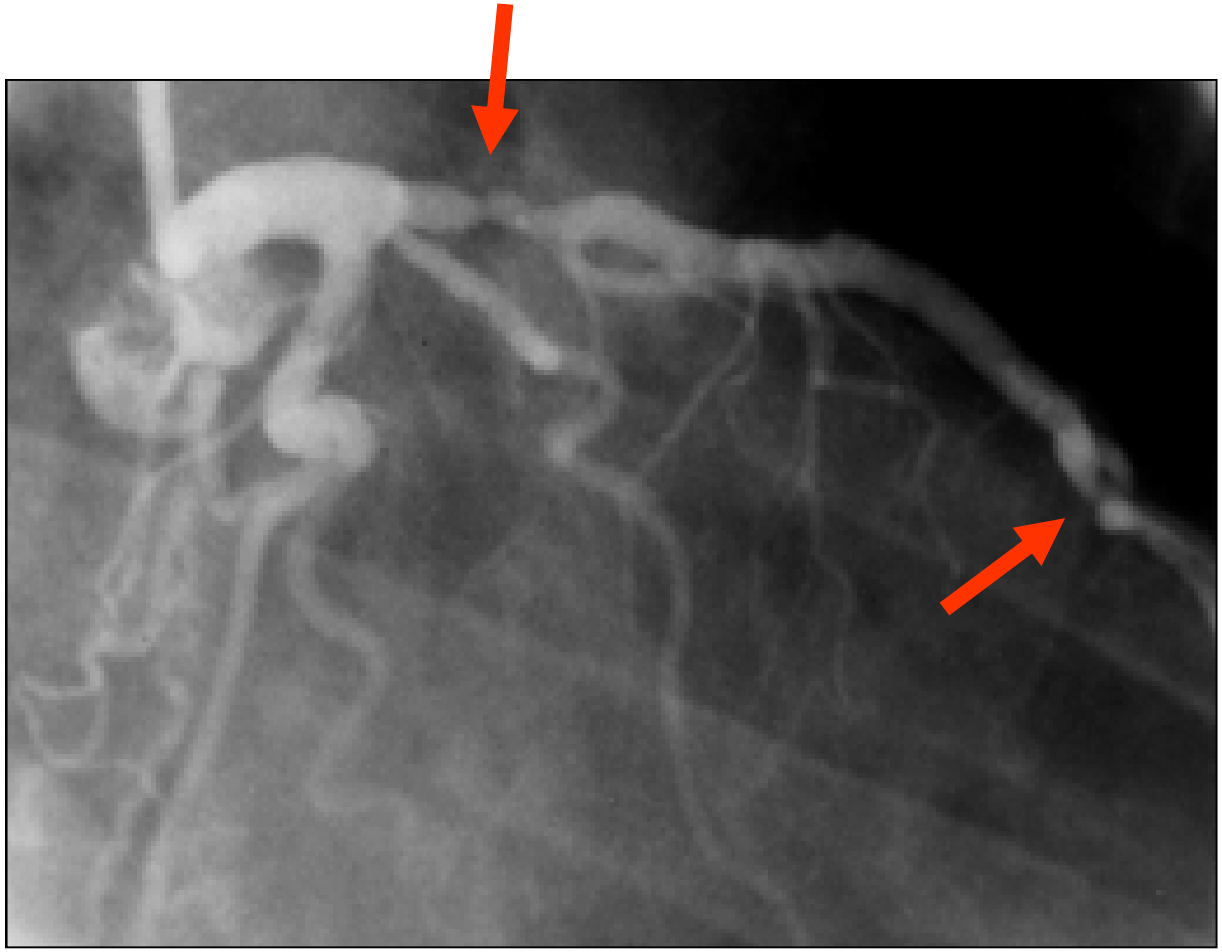
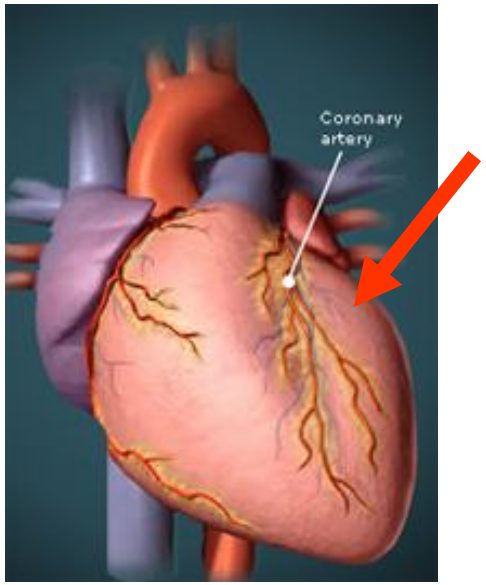
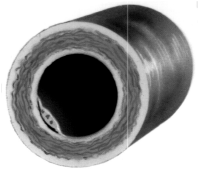
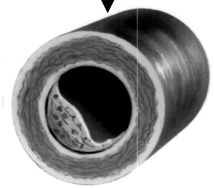
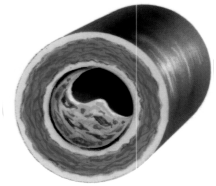
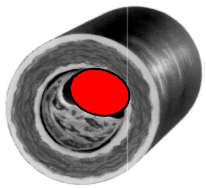
Narrowing (“stenosis”) of arteries (“atherosclerosis”): the common characteristic of all cardiovascular diseases





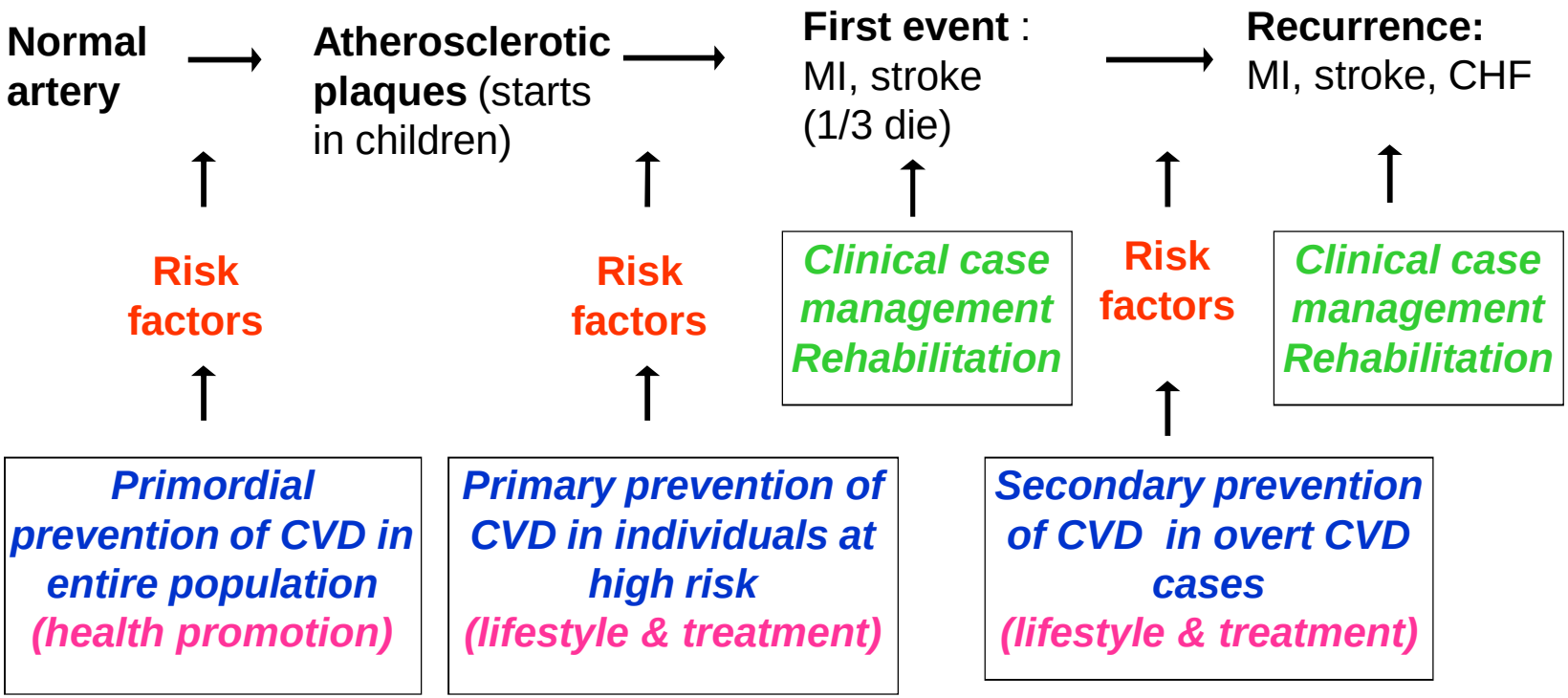
Natural history of cardiovascular disease: long evolution without symptoms

Risk factors →

Age	Artery atherosclerosis	Symptoms /signs
20 y		None
40 y		None
50 y		None
50 y + **+ 1 sec**		**Stroke** **Heart attack**

MI: 1/3 sudden †

Continuum between health promotion, primary prevention, clinical management and secondary prevention



= primary prevention of risk factors, e.g. HBP, diabetes, etc

Main risk factors for CVD and other NCS

(Underlies rationale for prevention strategies)

Non-modifiable RF:
- age, sex, history

Socio-economic & cultural determinants

Early life characteristics

Behavioral RF (modifiable):
- Smoking
- Unhealthy diet (salt, sat. fat, lack fruit&veg)
- Sedentary lifestyle

→

Physiological RF:
- Hypertension
- High cholesterol
- Diabetes
- Obesity

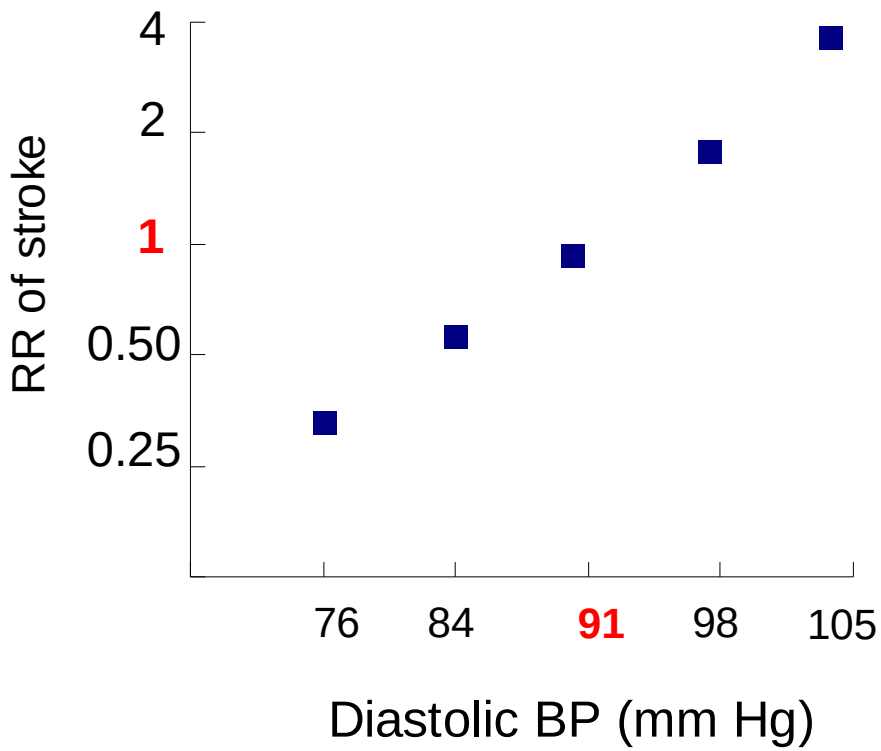
→

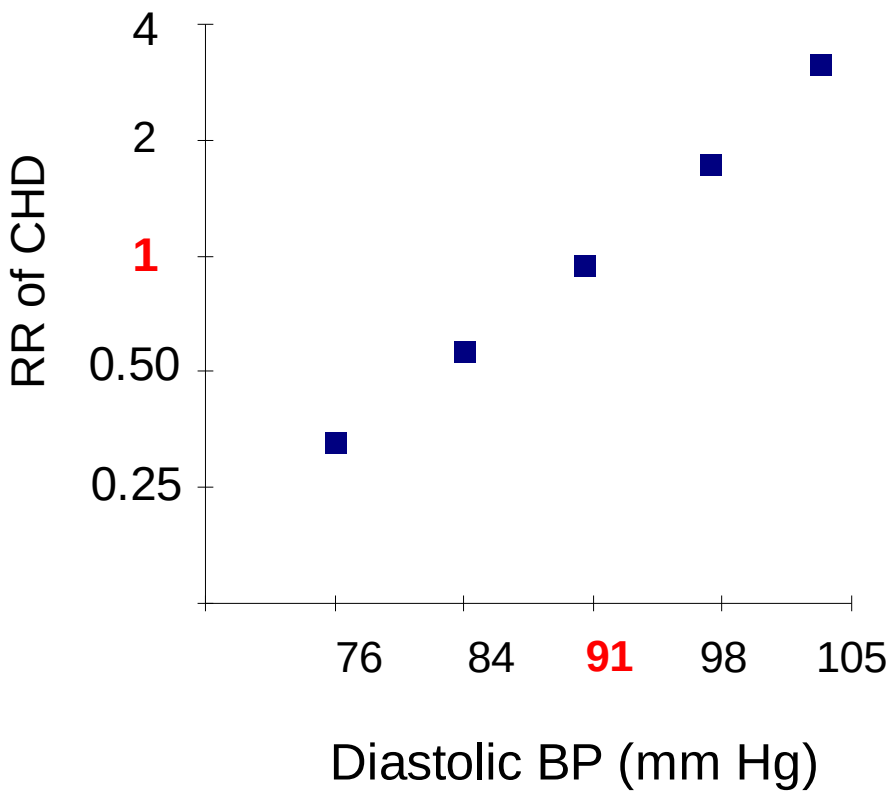
CVD endpoints:
- Isch. heart disease
- Stroke
- Vascular disease
- Heart failure

NCD endpoints:
- Some cancers
- Respirat. diseases
- Renal disease

Not RHD, endocarditis, cardiomyopathies

Graded relationship between RF and CVD
« The lower the better »





Ann Intern Med.1998;128:81-88.

Relative risk, RF prevalence and attributable fraction:

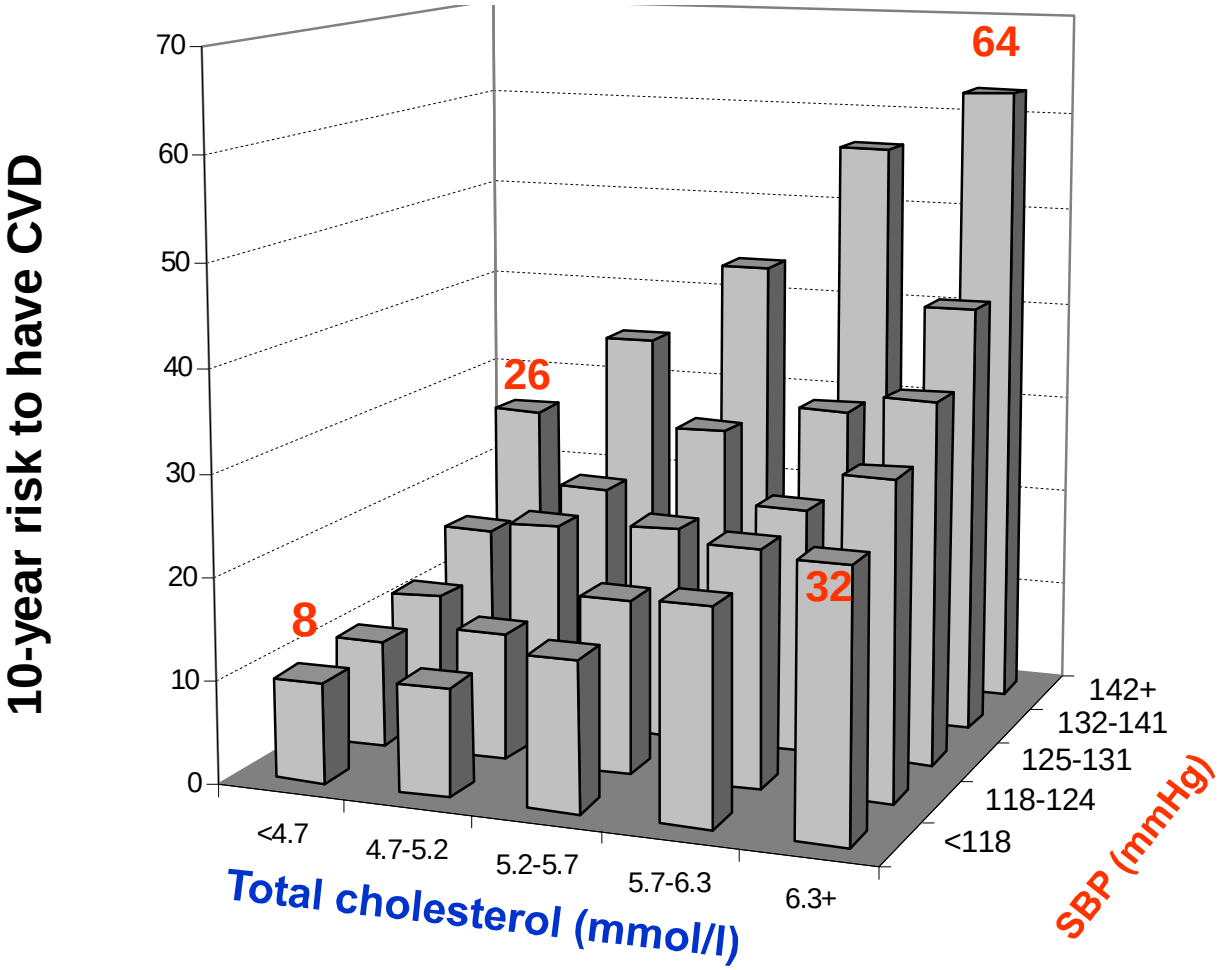
Low impact of strategies limited to high-risk patients

SBP	No men	Deaths	Rate per 1000	Relative risk	Excess risk	% CHD attributable to high BP	
<110	21,379	202	10.5	**1.00**	0	0	
110-119	66,080	658	11.0	1.05	33	1.0	**35.1**
120-129	98,834	1,324	14.3	**1.36**	376	11.5	
130-139	79,308	1,576	19.8	1.89	738	22.6	
140-149	44,388	1,310	27.3	**2.60**	748	22.8	**41.0**
150-159	21,477	946	38.1	3.63	593	18.2	
160-169	9,308	488	44.8	4.27	319	9.8	**23.9**
170-179	4,013	302	65.5	6.24	221	6.8	
180+	3,191	335	85.5	**8.14**	239	7.3	

Men free of CVD at baseline; excess deaths: difference between observed and expected at lower rate (<110)

Stamler R. The BP problem: risks and their reduction. Cardiovasc Risk Fact, 1:71-9

Multiplicative effect of risk factors



MRFIT Screenees' Cohort (figures among smokers)

Risk factors: main characteristics

- **Continuum** relation between RF and CVD over a wide range (rather than across arbitrary thresholds)
- **Multiplicative** risk arising from combination of RF
- **Clustering** of CVD RF is common due to similar lifestyle associations
- In any community, **largest number of CVD events arises from persons with modest RF elevations** (not eligible to treatment):

➢ >80% of CVD could be averted if RF were very low
➢ All people have some level of RF: emphasis on population strategies
➢ Clustering: integrated strategies aimed at multifactorial risk reduction

- Is CVD preventable, to which extent?
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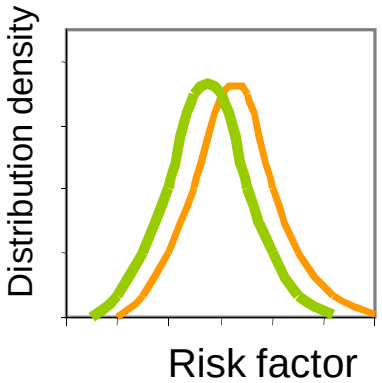
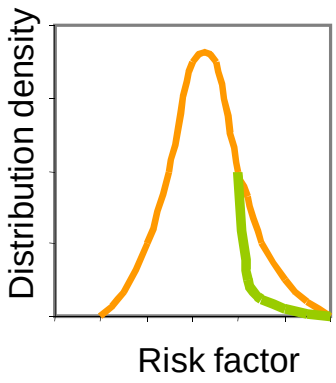
Approaches to CVD primary prevention
(i.e. avoid development of new cases)





« Population strategy »

- Public health approach
- Targets entire population

- Seeks small changes in highly prevalent RF
- **Radical attempt** to deal with underlying causes

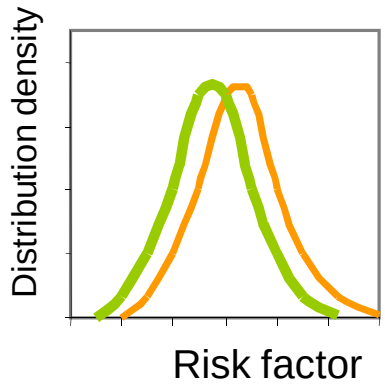
« High-risk strategy »

- Screening & treatment of RF
- Targets selected individuals

- Seeks to identify people with high risk and treat them
- **Rescue operation** (delays consequences)

Examples of population strategies for primary prevention of CVD (and other NCD)

- **Environment shaping**
  - Sidewalks, safe public green areas, cycling lanes, pedestrian zones
- **Improving available diet**
  - Alter food content (salt, sugar, trans-fatty acids)
- **Regulations**
  - Labeling food content
  - Fiscal incentives/disincentives for production/trade of healthy/unhealthy foods
  - Advertising of junk foods on TV, vending machines in schools
  - Tobacco: increasing taxes, smoke free areas, ban on advertising



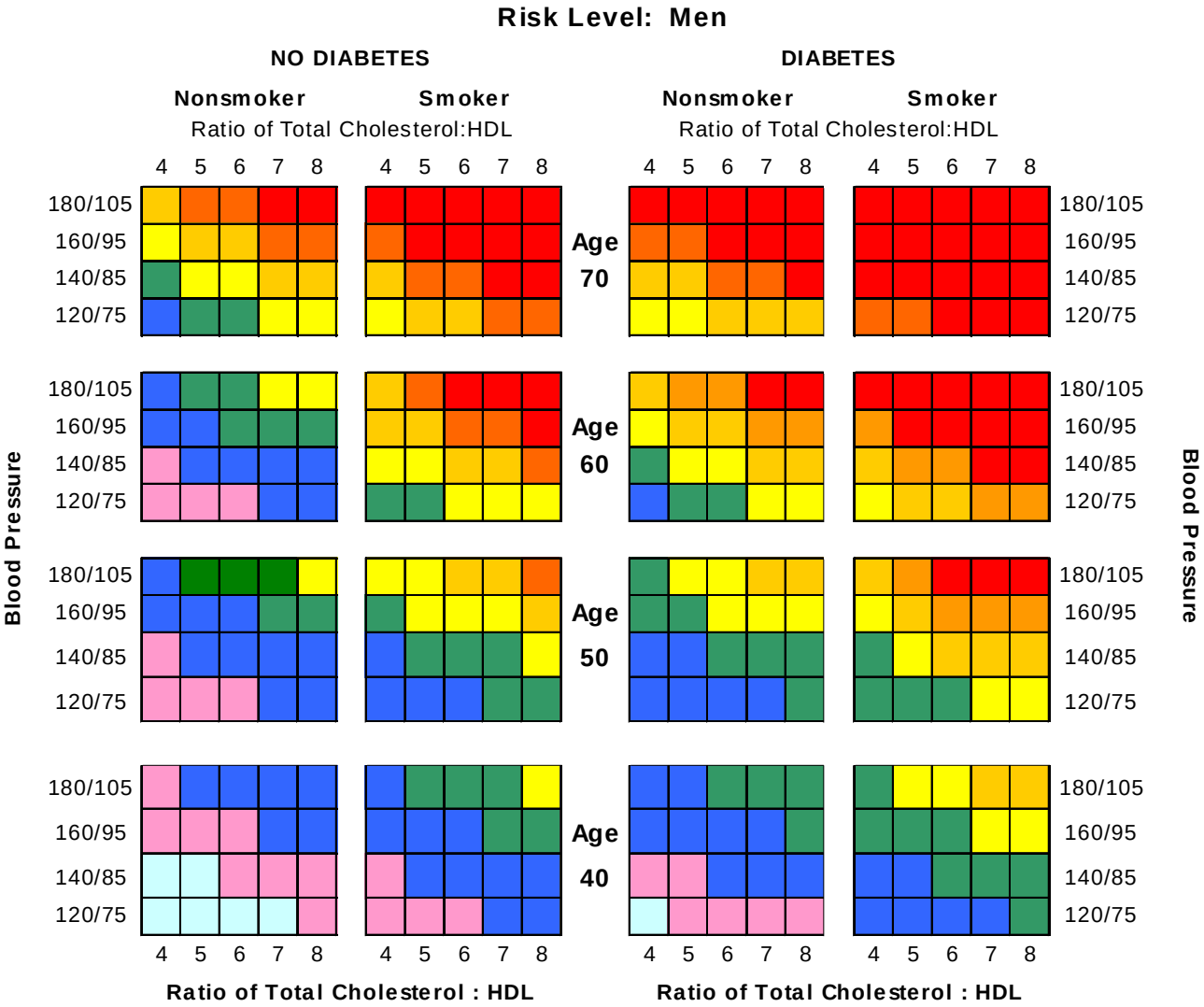
High risk strategies (who to screen and treat ?) : Multiplicative effect of concomitant RF on IHD incidence

	Systolic blood pressure		
Cholesterol	<118	125-131	142+
Non smokers			
<182	**3.1**	5.1	**13.0**
203-220	5.2	5.6	17.8
245+	**12.4**	16.3	**33.4**
Smokers			
<182	**10.4**	13.2	**21.1**
203-220	14.9	21.1	42.9
245+	**25.5**	35.3	**62.1**

MRFIT, 342'815 men free of CVD at baseline, FU: 11.6 y, mid 1970s

Stamler J. Established major coronary risk factors. In Marmot et al. CHD epidemiology from etiology to public health. OUP, 1992

Assessing absolute CVD risk: the New Zealand guidelines



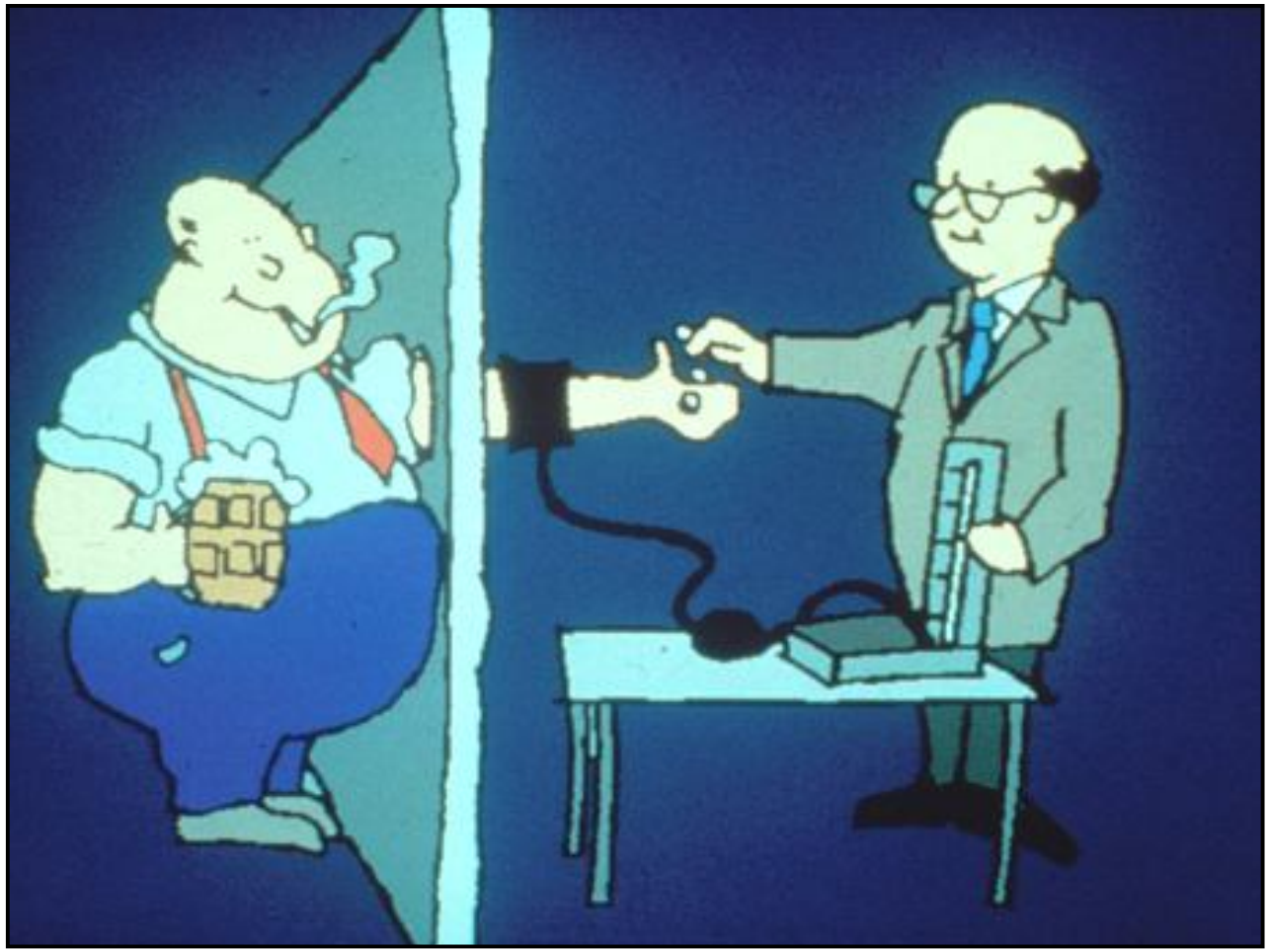
Stratification of CV risk related to hypertension

Refers to 10 year risk of a CV fatal or non-fatal event.

	Blood pressure (mmHg)				
Other risk factors, OD or Disease	Normal SBP 120–129 or DBP 80–84	High normal SBP 130–139 or DBP 85–89	Grade 1 HT SBP 140–159 or DBP 90–99	Grade 2 HT SBP 160–179 or DBP 100–109	Grade 3 HT SBP ≥180 or DBP ≥110
No other risk factors	Average risk	Average risk	Low added risk	Moderate added risk	High added risk
1–2 risk factors	Low added risk	Low added risk	Moderate added risk	Moderate added risk	Very high added risk
3 or more risk factors, MS, OD or Diabetes	Moderate added risk	High added risk	High added risk	High added risk	Very high added risk
Established CV or renal disease	Very high added risk	Very high added risk	Very high added risk	Very high added risk	Very high added risk

Backer G. 2007 Guidelines for the Management of Arterial Hypertension. The Task Force for the Management of Arterial Hypertension of the ESH and the ESC. J Hypertens 2007, 25:1105–1187,

Prescribing treatment is no guarantee of result…



Potential benefit for population vs. high-risk interventions

Variable	Population strategy	High-risk strategy
Blood pressure	↓ 2-3 mm Hg in entire population	~treatment to *all* hypertensives
Blood cholesterol	↓ 10% in entire population	~treatment in *all* persons in top blood cholesterol decile
Alcohol	↓ 30% in average consumption	~ elimination of *all* heavy drinking

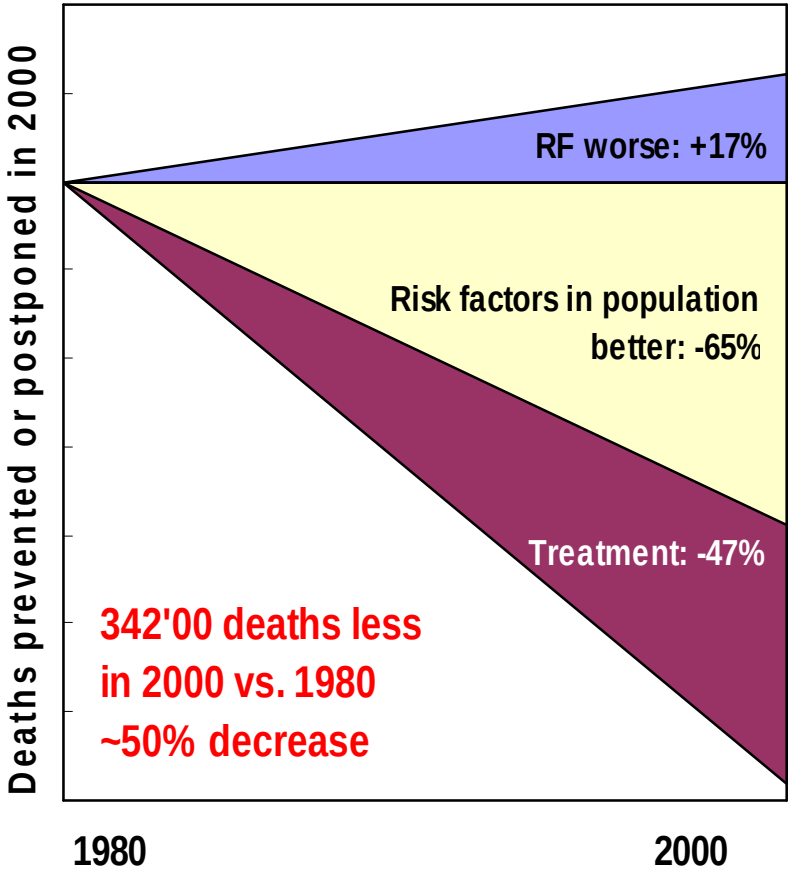
Rose G. CHD epidemiology. Oxf . Med Pub 1995

High-risk and population strategies

	High risk (individual)	Population
Need to identify individuals	+	-
Benefit for individual	Large	Small
Benefit for population	Small	Large
Cooperation required (understanding, motivation)	Large	Little
Cost	High	Potentially low

What explains sharp decline in CVD in Western countries?

USA, 1980-2000



Risk Factors worse		***+17%***
Obesity (increase)	+7%	
Diabetes (increase)	+10%	
Risk Factors better		***-65%***
Population BP fall	-20%	
Smoking	-12%	
Cholesterol (diet)	-24%	
Physical activity	-5%	
Treatments		***-47%***
AMI treatments	-10%	
Secondary prevention	-11%	
Heart failure	-9%	
Angina: CABG & PTCA	-5%	
HBP therapies	-7%	
Statins (prim. prev.)	-5%	
Unexplained		**-9%**

Ford et al. NEJM 2007; 356: 2388.
Capewell S, O'Flaherty M. What explains declining coronary mortality? Lessons and warnings. Heart 2008;94 1105-8.

Population vs. high-risk approaches: need for both

- High-risk and population interventions are mutually supportive
- High-risk counseling extends to relatives, friends, work colleagues
- Population strategy is essential if attempts of individuals to change their lifestyles are not to turn them into social outcasts
- High-risk individuals are quantitatively but not qualitatively different people: tail of a continuous distribution of RF

Rose G. CHD epidemiology. Oxford Med Pub 1995

- Is CVD preventable, to which extent?
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- **Limitations and opportunities for CVD prevention**
- Conceptual framework for planning CVD prevention

Important issues in CVD prevention

- Cumulative lifelong exposure to RF: start interventions early
- Importance of different settings
- Most causes of CVD (“causes of the causes”) beyond the health sector: need multisectoral interventions (partnerships)
- Interventions: need for enough dose & multiple strategies
- Individual behaviour change vs. structural changes

CVD control through primary prevention: Some limitations in developing countries

- Limited recognition of magnitude of CVD epidemic - scarcity of data
- Myths that CVD are diseases of the old, the rich and personal choices
- Double burden of disease: “finish infectious diseases agenda first”?
- Prevention not given priority (market pressure favors therapy)
- Powerful vested interests (tobacco, food industry, car, agriculture)
- (pop strat) Failure to influence policy of non-health departments
- (HR strat) Stroke/CHD/HBP/DM considered diseases for the specialist
- High costs of CVD management & dwindling resources
- Lack of global funding for CVD (vs CD): need to build the case

CVD prevention in developing countries

Good news

- Levels of some risk factors are still low in some countries
- Knowledge for effective primary prevention is available
  - ≠ to western countries: CVD epidemics understood at its peak and addressed mainly through clinical management
- Prevention of CVD is likely to be less costly than case-management

Bad news

- Levels of RF often higher and rise steeper than in HIC
- Rapid demographic transition (aging populations)
- Global epidemic of overweight and diabetes

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- Limitations and opportunities for CVD prevention
- **Conceptual framework for planning CVD prevention**

Prevention of CVD: a simple framework

Modifiable FR (lifestyles and environment):
- Tobacco
- Physical inactivity
- Unhealthy diet
  (↑salt, ↑fats& sugar, ↓fruits/veg)

→

Patho-physiological RF
- Hypertension
- High cholesterol
- Diabetes
- Obesity

→

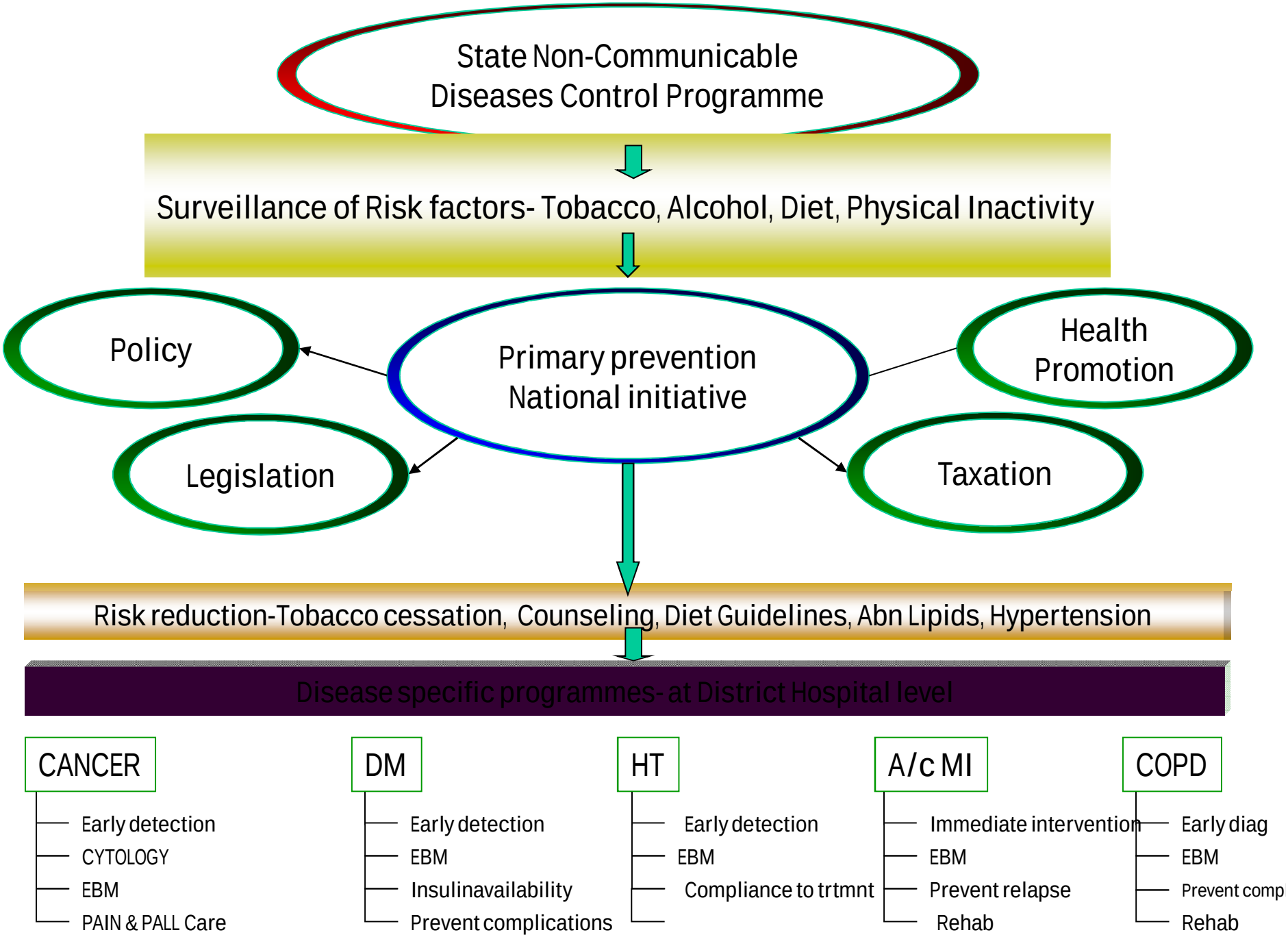
CVD
- IHD
- Stroke
- Peripheral artery dis.
- Heart failure
- (some cancers)

Population strategy:
- Environment
- Policy
- Education

High-risk strategy:
- Screening and treatment of high-risk individuals

+ Surveillance
- Guide & evaluate intervention

Primary prevention (decrease incidence of new cases)

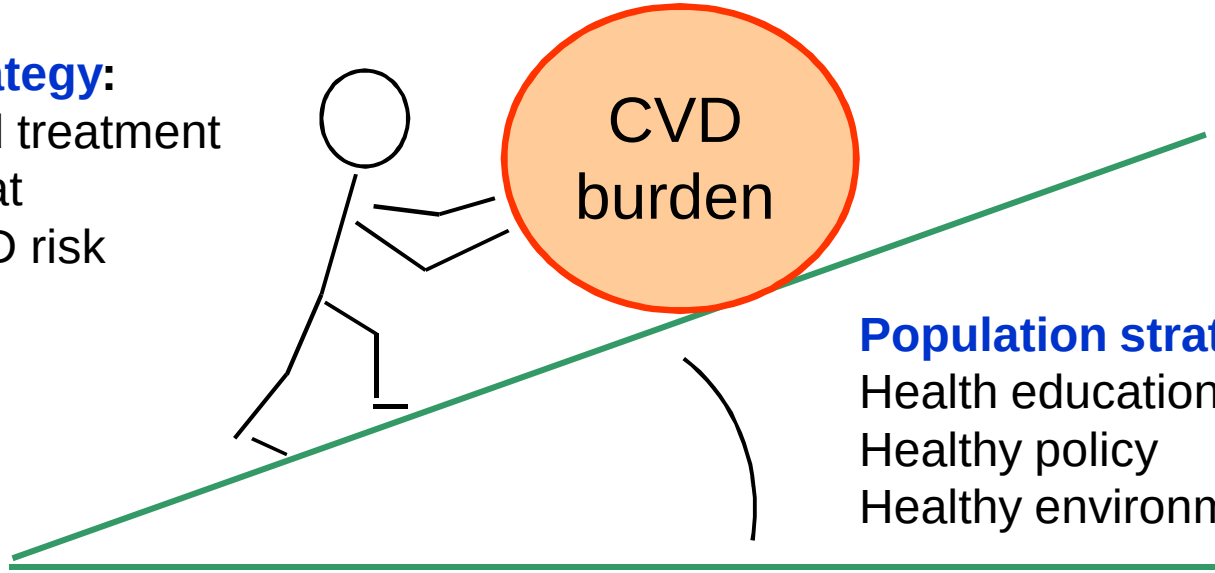

State Non-Communicable Diseases Control Programme
Surveillance of Risk factors- Tobacco, Alcohol, Diet, Physical Inactivity
Policy
Primary prevention National initiative
Health Promotion
Legislation
Taxation
Risk reduction-Tobacco cessation, Counseling, Diet Guidelines, Abn Lipids, Hypertension
Disease specific programmes- at District Hospital level
CANCER
Early detection
CYTOLOGY
EBM
PAIN & PALL Care
DM
Early detection
EBM
Insulinavailability
Prevent complications
HT
Early detection
EBM
Compliance to trtmnt
A/c MI
Immediate intervention
EBM
Prevent relapse
Rehab
COPD
Early diag
EBM
Prevent comp
Rehab

Prevention of CVD: outline of Seychelles National Program

Intervention	Objective	Policy instruments	Activities
Public health interventions targeting the entire population	Change of personal behavior for primary and secondary prevention	Education (IEC)	• Logo for CVD prevention program • Intensive use of mass media with several hours of heart health programs on TV and radio every year • Heart health education program integrated in curriculum of primary schools • Health messages in all public buses • Nation-wide high-profile events organized for World No Tobacco Days, World Diabetes Day and WHD • Production of various leaflets & billboards on CVD related conditions
		Taxes & subsidies	• Several increases in taxes on cigarettes • Various fiscal measures to favor production and trade of health foods
		Regulation & legislation	• Legislation on tobacco, including: • No smoking policy in all premises of Ministry of Health and Min Education • Ban (well implemented) on advertising tobacco products in all local mass media and billboards • Warning labels on cigarette packs • Ban on sponsorship by tobacco companies • National policy on food and nutrition (ongoing)
	To adjust and expand the range of interventions	Research, surveillance	• Population based surveys of CVD risk factors in adults 1989, 1994, 2004 • Screening program of weight and BP in 4 levels in all schools since 1998 • Interaction with international networks and academic institutions
	To supply resources that facilitate the provision of interventions	Direct expenditures	• Installation of a Unit for Prevention of CVD within Ministry of Health as focal point to stimulate and coordinate multisectoral and community-based activities for heart health • This Unit also conducts surveillance and research on CVD
Public health interventions targeting high risk subjects	Screening of cases and referral for secondary prevention	Direct expenditures	• Frequent risk factor screening in public places • Frequent risk factor screening in work places • Routine risk factor screening in children in school health program • PHC-based 'Heart Health Clubs' (interactive education sessions) for high-risk patients • National register of hypertension & diabetes patients • NHS (free health care), availability of at least 1 drug in each of all major medication classes
Clinical interventions targeting patients with disease	To improve case management for effective secondary prevention	Education of patients & service providers	• Heart heath training to health professionals (e.g. nursing schools, PHC doctors, etc) • Elaboration of guidelines on blood pressure, dyslipidemia and diabetes management (2002) • NHS (free health care), availability of at least 1 drug in each of all major medication classes

Relation between population strategies and high-risk strategies for CVD prevention

High-risk strategy:
Screening and treatment in individuals at increased CVD risk



Population strategy:
Health education
Healthy policy
Healthy environment

+ surveillance of RF for guiding & monitoring interventions

Conlusions

- The burden of NCD is high in MIC and LIC and likely to increase if not addressed
- NCD occur at earlier age (vs HIC) and among the poor
- Double burden of disease
- Low resources preclude emphasis on individual treatment
- Prevention strategy must focus on prevention, particularly policy (multisectoral) addressing roots of NCD (diet, tobacco, exercise) apply the knowledge (Q: not what, but how)
- Need for cost effective based case-management for high risk individuals
- Need to monitor trends in CVD risk factors (surveillance)

STATUS QUO

INVEST NOW

THE CAUSES ARE KNOWN.
THE WAY FORWARD IS CLEAR.
IT'S YOUR TURN TO TAKE ACTION.

World Health Organization

Preventing
CHRONIC DISEASES
a vital investment

Thank you