Primary prevention – changing lifestyles – what works

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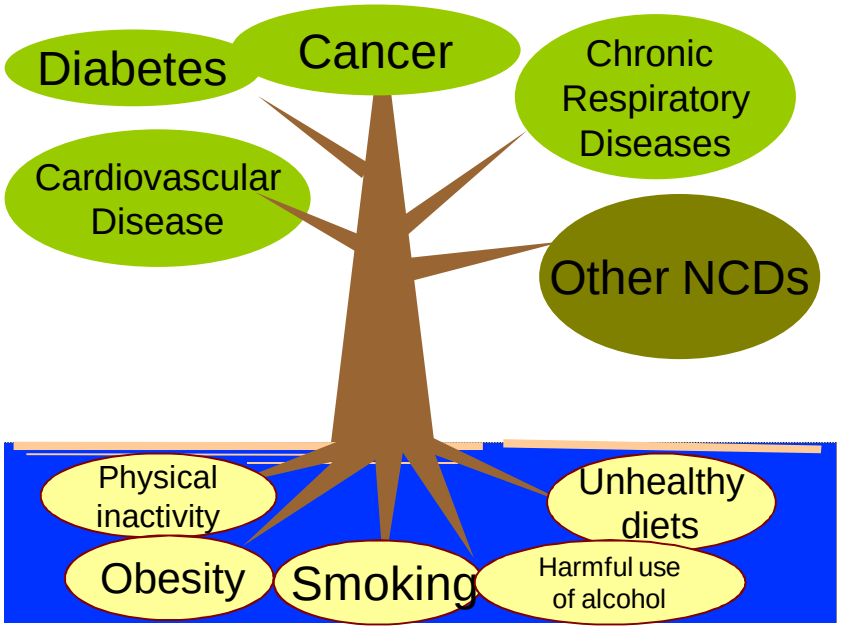
- Impact of lifestyle factors on NCD/CVD
- What is a healthy lifestyle?
- Balancing individual vs. public health interventions
- Public health strategies for improving lifestyles
- Some issues in general and in Africa
- Conclusions

NCD: Huge burden, largely preventable, effective interventions

NCD are responsible for up to 60% of all deaths, 80% in LIC/MIC
>80% of CVD, strokes and DM and >40% of cancers are preventable

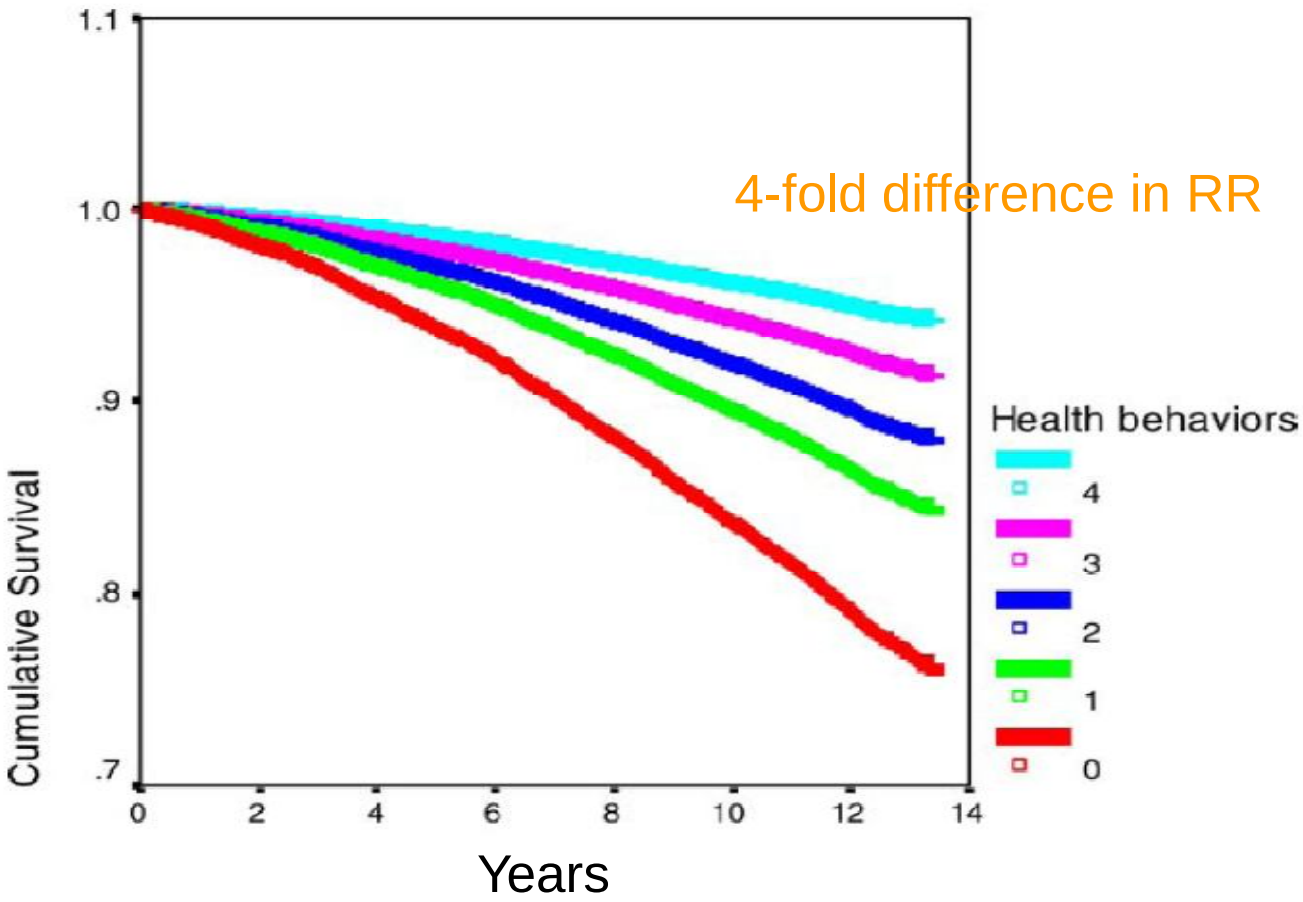
- **Major NCDs**:
  - Cardiovascular disease
  - Cancer
  - Chronic respiratory disease
  - Diabetes

- **Shared preventable risk factors**:
  - Tobacco use
  - Unhealthy diet
  - Physical inactivity
  - Harmful use of alcohol



Survival by number of health behaviours (EPIC-Norfolk)

non-smoking, physically active, moderate OH, plasma vitamin C (>5 portions fruit/veg)



Khaw KT et al. Combined Impact of health behaviours and mortality in men and women: The EPIC-Norfolk Prospective Population Study. PLoS Med 2008;5(1): e12.

Health behaviours and cancer, CVD and total mortality (1)

single components

Variable	All Cause		Cardiovascular		Cancer		Non-CVD Non-Cancer	
	RR (95% CI)	*p*-Value	RR (95% CI)	*p*-Value	RR (95% CI)	*p*-Value	RR (95% CI)	*p*-Value
– All	*n* = 1,977 events	–	*n* = 676 events	–	*n* = 839 events	–	*n* = 462 events	–
Current smoker versus nonsmoker	1.77 (1.55–2.01)	<0.001	1.94 (1.56–2.41)	<0.001	1.77 (1.46–2.15)	<0.001	1.54 (1.15–2.06)	0.004
Physically inactive versus not inactive	1.24 (1.13–1.36)	<0.001	1.28 (1.09–1.50)	0.003	1.08 (0.93–1.25)	0.34	1.50 (1.23–1.82)	<0.001
Alcohol intake <1 or >14 units/wk	1.26 (1.14–1.38)	<0.001	1.29 (1.10–1.51)	0.002	1.28 (1.11–1.49)	<0.001	1.17 ().96–1.42)	0.12
Vitamin C level <50 mmol/l	1.44 (1.31–1.59)	<0.001	1.70 (1.44–2.00)	<0.001	1.36 (1.18–1.58)	<0.001	1.25 (1.03–1.53)	0.02

Khaw KT et al. Combined Impact of Health Behaviours and Mortality in Men and Women: The EPIC-Norfolk Prospective Population Study. PLoS Med 2008;5(1): e12.

Health behaviours and cancer, CVD and total mortality (2)

combination

Mortality	Category	No. of Events/*n*	Number of Health Behaviours				
			4 (*n* = 6,285)	3 (*n* = 7,788)	2 (*n* = 4,568)	1 (*n* = 1,407)	0 (*n* = 196)
Mortality rate (*n*)	—	—	5.1 (318)	8.8 (682)	14.3 (651)	19.7 (277)	25.0 (49)
By cause	All cause	1,977/20,244	1	1.39 (1.21–1.60)	1.95 (1.70–2.25)	2.52 (2.13–3.00)	4.04 (2.95–5.54)
	Cardiovascular	676/20,244	1	1.59 (1.23–2.06)	2.47 (1.91–3.19)	3.36 (2.49–4.51)	5.02 (2.93–8.61)
	Cancer	839/20,244	1	1.21 (0,99–1.48)	1.81 (1.48–2.22)	1.94 (1.48–2.54)	3.74 (2.34–5.98)
	Non-CVD, noncancer	462/20,244	1	1.53 (1.16–2.03)	1.66 (1.23–2.24)	2.70 (1.92–3.82)	3.56 (1.77–7.16)
By sex	Men	1,161/9,181	1	1.42 (1.26–1.61)	1.98 (1.75–2.24)	2.58 (2.22–2.99)	4.11 (3.15–5.37)
	Women	810/11,063	1	1.32 (1.09–1.60)	1.91 (1.55–2.33)	2.49 (1.91–3.25)	5.23 (3.50–7.82)
By age group	<65 y	641/14,358	1	1.32 (1.09–1.60)	1.90 (1.55–2.33)	2.49 (1.91–3.25)	5.23 (3.50–7.81)
	≥65 y	1,336/5,886	1	1.51 (1.29–1.77)	2.06 (1.75–2.41)	2.68 (2.22–3.23)	3.58 (2.51–5.11)
By body mass index	<25 kg/m^2	692/8,095	1	1.26 (1.01–1.55)	1.90 (1.53–2.36)	2.44 (1.85–3.21)	2.87 (1.62–5.08)
	25 to <30 kg/m^2	946/9,205	1	1.44 (1.18–1.76)	2.01 (1.64–2.47)	2.60 (2.03–3.34)	5.03 (3.20–7.92)
	≥30 kg/m^2	335/2,917	1	1.68 (1.12–2.52)	2.06 (1.37–3.08)	2.51 (1.58–4.01)	4.26 (2.06–8.78)
By social class	Nonmanual	1,061/11,933	1	1.29 (1.11–1.51)	1.83 (1.57–2.14)	2.48 (2.04–3.01)	4.63 (3.08–6.72)
	Manual	821/7,897	1	1.70 (1.37–2.09)	2.29 (1.86–2.84)	2.85 (2.23–3.63)	4.04 (2.74–5.96)
Excluding deaths within 2 y		1,818/20,085	1	1.45 (1.26–1.67)	2.01 (1.74–2.32)	2.83 (2.39–3.36)	4.48 (3.27–6.14)

Khaw KT et al. Combined Impact of Health Behaviours and Mortality in Men and Women: The EPIC-Norfolk Prospective Population Study. PLoS Med 2008;5(1): e12.

RR of mortality of individual components of the Mediterranean diet in reducing CVD mortality (EPIC-Greece)

- Mediterranean 9-point scale
- Mortality reduced by 16% for tow-unit change

- Contributions of individual components of Mediterranean diet to this association were:

• moderate ethanol consumption	23.5%
• low consumption of meat and meat products	16.6%
• high vegetable consumption	16.2%
• high fruit and nut consumption	11.2%
• high monounsaturated to saturated lipid ratio	10.6%
• and high legume consumption	9.7%

- High cereal consumption and low dairy consumption were minimal
- High fish and seafood consumption was associated with a non-significant increase in mortality ratio.

Trichopoulou A et al. Anatomy of health effects of Mediterranean diet: Greek EPIC prospective cohort study. BMJ
BMJ 2009;338:b2337

Evidence of a Causal Association From Cohort Studies	Cohort Data Only	Supported by RCTs
Strong		
"Mediterranean" diet[b]		Yes
High-quality diet	✓	
Vegetables	✓	
Nuts	✓	
Trans–fatty acids	✓	
Glycemic index or load	✓	
"Prudent" diet[c,d]	✓	
"Western" diet[d,e]	✓	
Monounsaturated fatty acids[d]	✓	
Moderate		
Fish		No
Marine ω-3 fatty acids		Yes
Dietary folate	✓	
Supplementary folate		RCT data only
Whole grains	✓	
Dietary vitamin E	✓	
Dietary beta carotene	✓	
Supplementary beta carotene		RCT data only
Dietary vitamin C	✓	
Alcohol, light/moderate consumption	✓	
Alcohol, heavy consumption	✓	
Fruits	✓	
Fiber	✓	
Weak		
Supplementary vitamin E		Yes
Supplementary ascorbic acid		Yes
Total fat		Yes
Saturated fatty acids	✓	
Polyunsaturated fatty acids		Yes
ω-3 Fatty acids, total		No[f]
Meat	✓	
Eggs	✓	
Milk	✓	

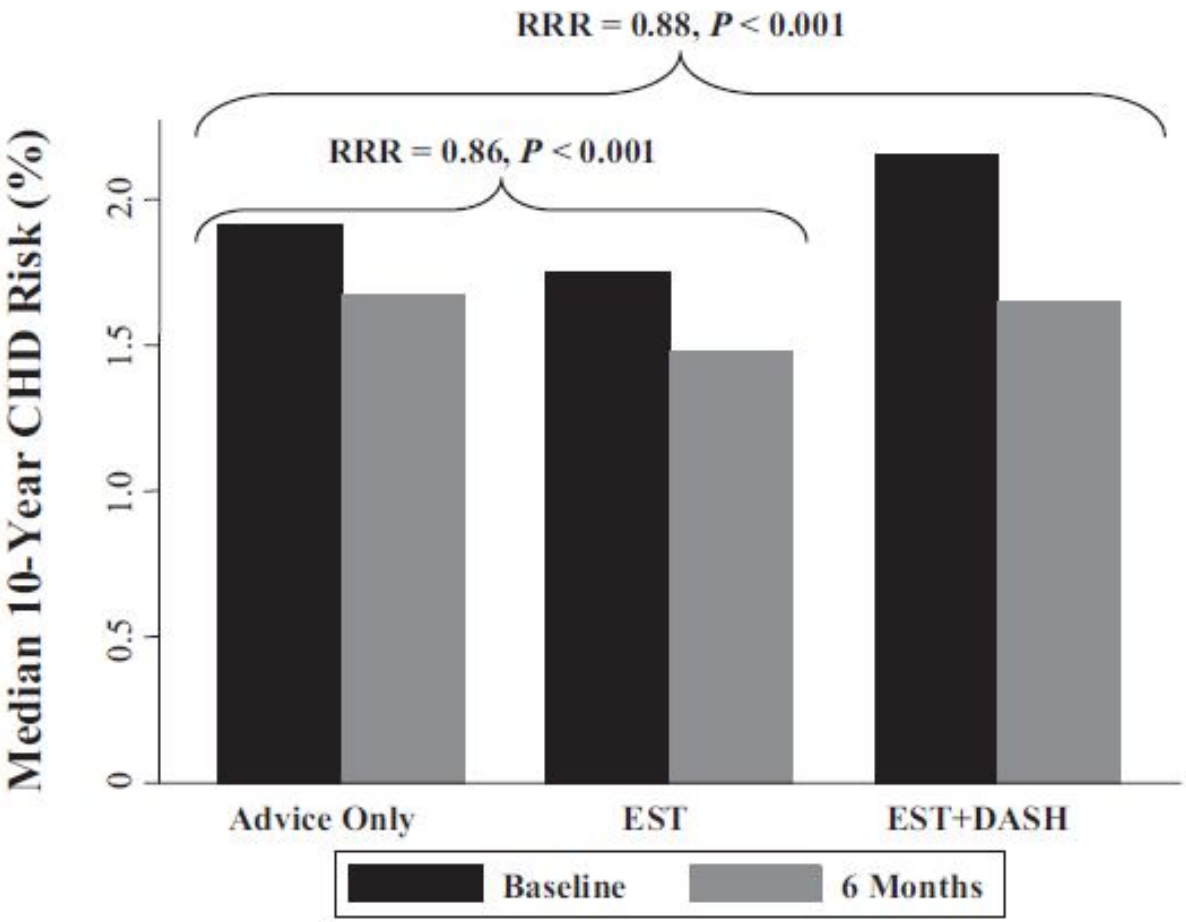
Review of causal association between diet and CHD (cohort & RCT)

The evidence supports a valid association of a limited number of dietary factors and dietary patterns with CHD. Future evaluation of dietary patterns, including their nutrient and food components, in cohort studies and RCT

Mente A, Annand S et al. A Systematic Review of the Evidence Supporting a Causal Link Between Dietary Factors and Coronary Heart Disease. Arch Intern Med. 2009;169(7):659-669

12-14% reduction of CHD risk by lifestyle (PREMIER trial)

"advice-only" vs "established" (Na reduction, weight loss, and increased PA) vs "established-plus-DASH"
1 individual 30-min session vs 4 individual & 14 group sessions



Maruthur NM, Appel et al. Lifestyle interventions to reduce CHD risk: results from the PREMIER trial. Circulation. 2009;119:2026-2031

Can diabetes be prevented ?

Clinical trial of lifestyle modification over 3 years in pre-diabetes

Intervention	Incidence (/100/yr)	Relative reduction (%)	NNP (3 yrs)
1) Placebo	11.0		-
2) Metformin (850 mg twice daily)	7.8	**-29%**	31
3) **Lifestyle-modification program >7% weight loss & >150 min PE/w**	**4.8**	**-56%**	16

- 3234 non-diabetic persons with IFG (5.3-6.9) and IGT (7.8-11)
- mean age: 51 yrs, mean BMI: 34, follow-up: 2.8 yrs.

Knowler et al. Diabetes Prevention Program Research Group. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. NEJM 2002;346:393-403.

Tobacco control

- Several interventions are highly interventions

- High tax on tobacco products
- Ban of smoking in encloses places

- See other lecture

Mortality reduction from lifestyle and dietary changes in primary and secondary prevention

Recommendation	Mortality Risk Reduction Estimated From Studies in CAD Patients	Mortality Risk Reduction Estimated From Cohort Studies in General Population
Smoking cessation	35%	50%
Physical activity	25%	20%–30%
Moderate alcohol	20%	15%
Combined dietary changes	45%	15%–40%

Iestra JA, Kromhout MPH et al. Effect size estimates of lifestyle and dietary changes on all-cause mortality in CAD patients: A systematic review. Circulation. 2005;112:924-934

Mortality reduction from drugs to reduce risk factors

Intervention	Mortality Risk Reduction, Mean (95% CI)
Low-dose aspirin[111]	18% (1%–30%)
Statins[112]	21% (14%–28%)
β-Blockers[113]	23% (15%–31%)
ACE inhibitors[114]	26% (16%–35%)

Iestra JA, Kromhout MPH et al. Effect size estimates of lifestyle and dietary changes on all-cause mortality in CAD patients: A systematic review. Circulation. 2005;112:924-934

RCT to improve lifestyles at individual level

- Very intensive (~20 interventions per year)
- High cost and cost effectiveness not optimal
- Issue: how to apply similar interventions targeting individuals in a less intensive manner to persons of the general public

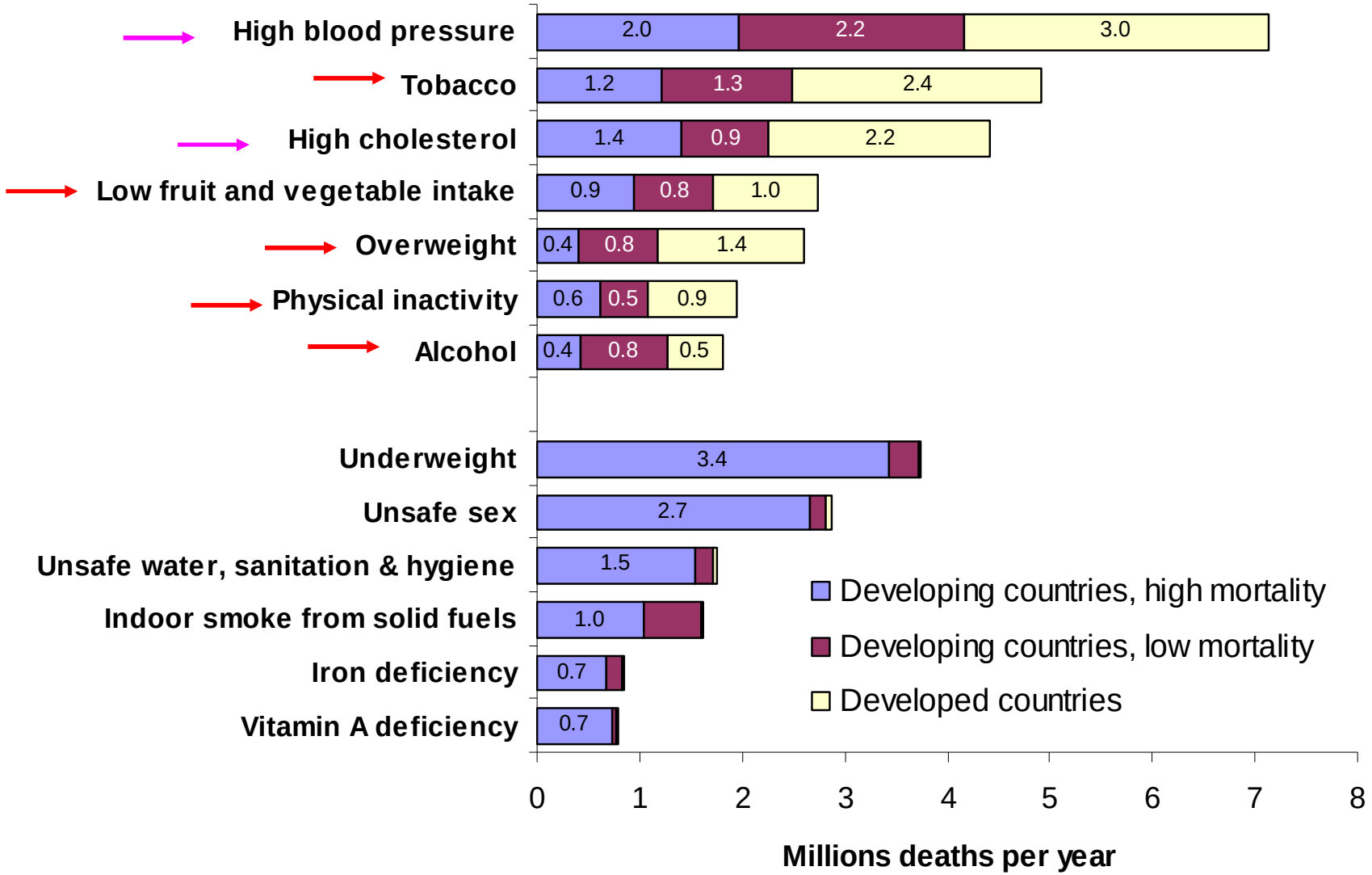
Studies / trials to modify the environment

- Some encouraging results

- Control group?
- Selection bias of persons living in different environment
- Allocate cause for behavioural change?

- See other lecture

Large mortality avoidable with lifestyle and diet: WHR 2002



Communality of RF in relation to NCD: rationale for multifactorial interventions

Dietary and lifestyle factors	CVD	Type 2 diabetes	Cancer	Dental disease	Fracture	Cataract	Birth defects	Obesity	Metabolic syndrome	Depression	Sexual dysfunction
Avoid smoking	↓↓	↓↓	↓↓	↓↓	↓	↓↓		↑↑			↓↓
Pursue physical activity	↓↓	↓↓	↓↓		↓↓			↓↓	↓↓	↓	↓
Avoid overweight	↓↓	↓↓	↓↓		↑↑	↓↓			↓↓		↓
Diet											
Consume healthy types of fats[a]	↓↓	↓↓							↓		
Eat plenty of fruits and vegetables	↓↓		↓		↓	↓	↓	↓			
Replace refined grains with whole grains	↓	↓						↓↓	↓↓		
Limit sugar intake[b]	↓	↓		↓				↓	↓↓		
Limit excessive calories								↓	↓↓		
Limit sodium intake	↓										

Willett et al. Prevention of chronic diseases by means of diet and lifestyles changes. Disease Control Priorities in Developing Countries (DCP2), 2006

- Impact of lifestyle factors on NCD/CVD
- What is a healthy lifestyle?
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AHA 2006 Diet and Lifestyle Recommendations for CVD Risk Reduction

1. Balance calorie intake and PA to achieve or maintain a healthy body weight
2. Consume a diet rich in vegetables and fruits
3. Choose whole-grain, high-fiber foods
4. Consume fish, especially oily fish, at least twice a week
5. Limit your intake of saturated fat to <7% of energy, trans fat to <1% of energy, and cholesterol to <300 mg/d by
6. Choosing lean meats and vegetable alternatives
7. Selecting fat-free (skim), 1% fat, and low-fat dairy products
8. Minimizing intake of partially hydrogenated fats
9. Minimize intake of beverages and foods with added sugars
10. Choose and prepare foods with little or no salt
11. If you consume alcohol, do so in moderation
12. When eating food prepared outside of home, follow AHA recommended diet

Gidding SS, Popkin et al. Implementing AHA Pediatric and Adult Nutrition Guidelines: A Scientific Statement From the AHA, Nutrition Committee of the Council on Nutrition, Physical Activity and Metabolism, Council on CVD in the Young, Council on ATVB, Council on CVD Nursing, Council on Epidemiology and Prevention, and Council for HBP Research. Circulation 2009;119 1161-1175

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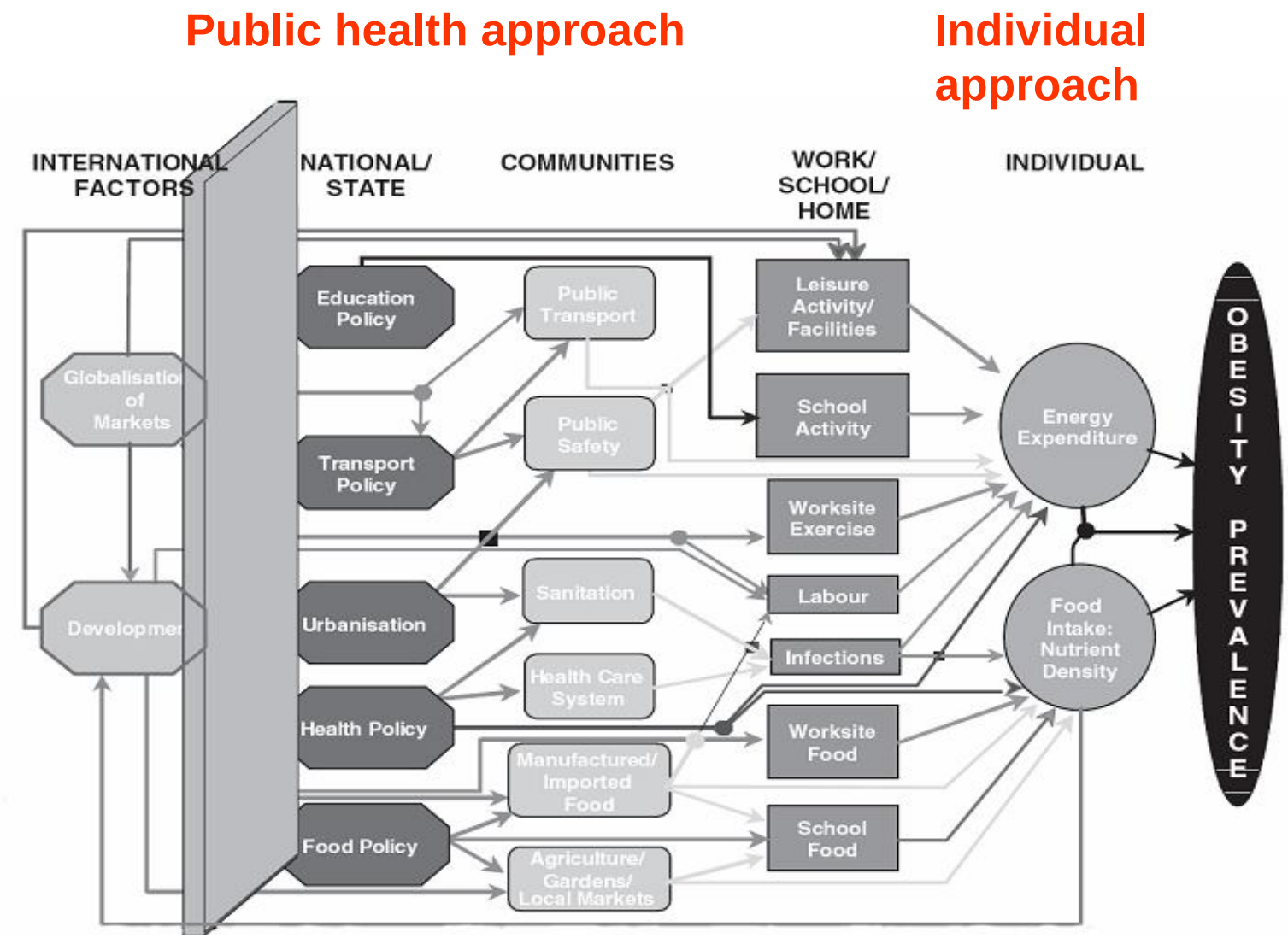
Complex nature of societal determinant of lifestyles/nutrition



Kumanyika et al. Public health approaches to the prevention of obesity. Working Group of the International Obesity Task Force. Obesity prevention: the case for action. Int J Obes 2002; 26: 425–36.

Health education only vs. policy response

There is little point in highlighting healthy messages in schools if kids are exposed to junk foods at school or elsewhere and/or are bombarded with confusing messages on billboards when they go home or on TV when they are at home

Health-related lifestyles, whose responsibility is it? individual or societal

Clearly, both individual responsibility and societal responsibility are needed. Thus, while we must always remind ourselves of the individual's own responsibility, we should emphasize the strong environmental influences on people's lifestyles.

There is public responsibility that should lead to policy initiatives. To promote people's physical activity —active living— a whole range of policy issues should be considered, from urban and transport planning to policies for parks, recreation, sports, and schools.

The experience in implementing successful health promotion, along with the economic issues, confirms the importance of policy interventions in promoting physical activity. It is through policy change that we can have the greatest impact.

Puska P. Commentary on Active Living- From Research to Practice. Am J Prev Med 2009;36(2S)

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Interventions to improve lifestyles

Disease Control Priorities in Developing Countries (DCP DC2), 2006

1. Educate individuals
2. Change the environment
3. Modify the food supply
4. Implementing economic policies
5. Undertake community interventions

- *Behavior changes related to lifestyle and diet require sustained efforts: need for sufficient dose and time*
- *However there are opportunities that do not require individual behavior change: more rapid changes (policies, food supply)*

Prevention of chronic diseases by means of diet and lifestyles changes. Disease Control Priorities in Developing Countries (DCP2), 2006

(1) Educational interventions

- *Efforts to change diet and lifestyle have traditionally attempted to educate individuals through*:
- **Schools**
  - Curriculum, healthy meals demonstration, environment change
- **Worksites** (people spend much time and eat large percent of their food)
  - Education programs, screening, environment change
- **Health care providers**
  - Physician counseling on tobacco cessation, PE, diet can be cost effective
  - Few physicians are trained and/or provide advice
- **Media**
  - Large target audience, proper format, social norms, acceptance of policy

➢ *These efforts will continue to play an important role but they can be strongly reinforced by policy and environmental changes*

(2) Transportation policies

- **Limit the role of automobiles and promote walking and bicycle riding**
  - Urban design: sidewalks, bike lanes, proximity of services, pedestrian zones, good public transportation, road pricing system, parking costs, good bus transportation systems, safe & well lit environment

- **Design cities that promote health** ("smart growth movement")
  - Walk-friendly environment: impact on social involvement/mental health
  - Mix of urban design (distinctive sense of place), land-use patterns (open and green spaces), and rail/bus transportation systems
  - Examples: Bogota, Seoul, "Agita São Paulo"

(3) Improve food supply

- **Improve process and manufacturing**
  - Rapid effect since does not require behavior change
  - e.g. eliminate partial hydrogenation of oils (trans), reduce salt, sugar (“diet”)
- **Fortifying foods if some nutrient intake is low**
  - Extremely inexpensive, e.g. products (flour, rice, pasta)
  - Folic acid, B6, B12 (witch contribute to elevation of serum homocysteine)
- **Increasing availability and reducing cost of healthy foods**
  - Policies regarding production, importation, distribution of specific foods
  - Policies often promote grains, dairy products, sugar and beef (≠ veg/fruit)
- **Promoting healthy food choices and limiting marketing to children**
  - Need for social marketing
  - Limit advertising targeting children (“big four”: pre-sugared breakfast cereals, soft drinks, confectionary, and savory snacks)

(4) Economic policies: incentives and disincentives

- Smoking: taxes
- Subsidies to farmers
  - often support production of unhealthy foods (i.e. low price to consumers), e.g. production of corn (fructose), beef, soybean (trans fat), dairy products and
- Use of cars is often indirectly subsidized
  - Inexpensive parking, free highways, low tax on petroleum
- Use of bikes, walking is rarely encouraged
  - Need for better infrastructures, discounts on transportation, reduction on insurance premiums, etc

Key ingredients for successful public health efforts

- Highly credible scientific evidence
- Passionate advocates, “doers” and leaders
- Media campaigns (using skilled social marketing)
- Use of law and regulations for sustained change

- Broad involvement of individuals and organizations
- Likely to be most effective when multifaceted
- Dose of intervention and duration must be large enough

Isaacs SL, Schroeder SA. Where the public good prevailed: lessons from success stories in public health. The American Prospect. June 4, 2001:26. (Also available at http://www.prospect.org/print/ V12/10/isaacs-s.html.) Cited in paper on MSA in Schroeder SA NEJM 2004 (15jan)

Examples of countries that used fiscal policies, taxation, and regulation to advance PH (1)

- When Mauritius substituted soya oil for palm oil as the subsidised ration oil in the public distribution system, mean population level of blood cholesterol declined.
- Withdrawal of subsidies for animal foods and increased import of vegetable oils and fruit led to a sharp decline in CVD mortality in Poland in mid 1990s.
- The UK food and health agencies have prevailed upon the food industry to progressively lower salt in processed foods.
- Denmark has removed trans-fats from manufactured food products, while New York has banned their use in restaurants, bakeries, and hotels.
- Soft drink manufacturers are responding to pressure from PH advocates by promising to remove sugar-rich beverages from schools around the world.
- The U.K. and the European Union are placing restrictions on advertising of junk foods to children.
- Increased tobacco taxes in many countries to raise prices & reduce consumption.
- New York initiative to reduce salt through working with food industry

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Selected issues related to healthy lifestyles in Africa

- Cultural particularities
  - Diversity
  - Focus on family vs. individual: less attention to leisure exercise or body weight
  - Gender issues (PA among women, walking as a status issue, etc, lean “HIV”)
  - Body build, status of foods, overriding infant appetite control
- Safety issues in urban centers not conducive to PE
- New urbanism: little attention to premises for common transports or leisure time
- Adoption of modern commodities : sedentary, energy dense food
  - Techno-urban chic: no sweat, no smell, neat hair, button down clothes
- Economic inequities are widening rapidly
- Globalized markets, WTO – prescription: threatens local agriculture
- Lack of regulations: aggressive food/tobacco marketing

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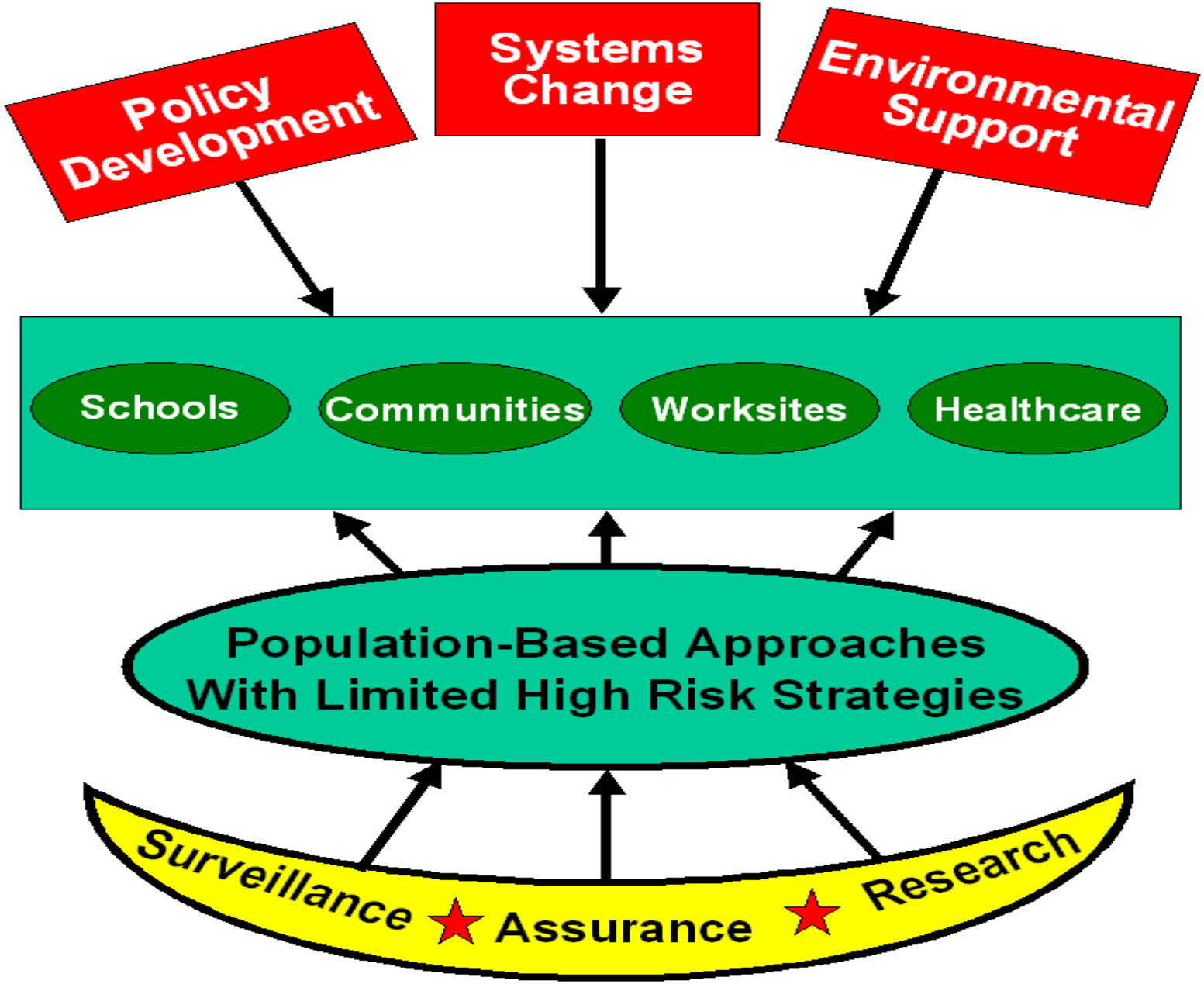


Mensah. Ethn Dis. 2003;13[suppl2]:4-12)

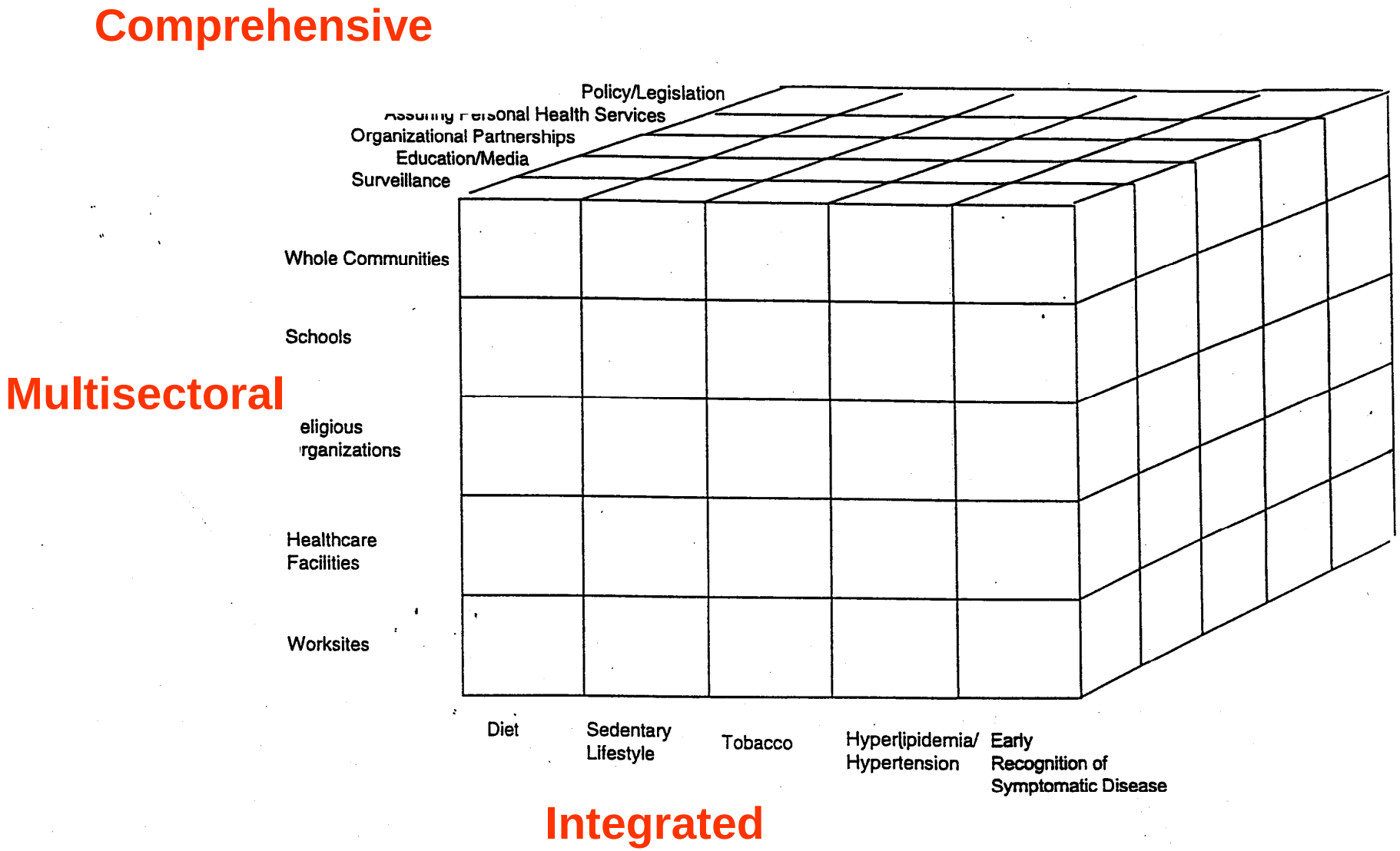
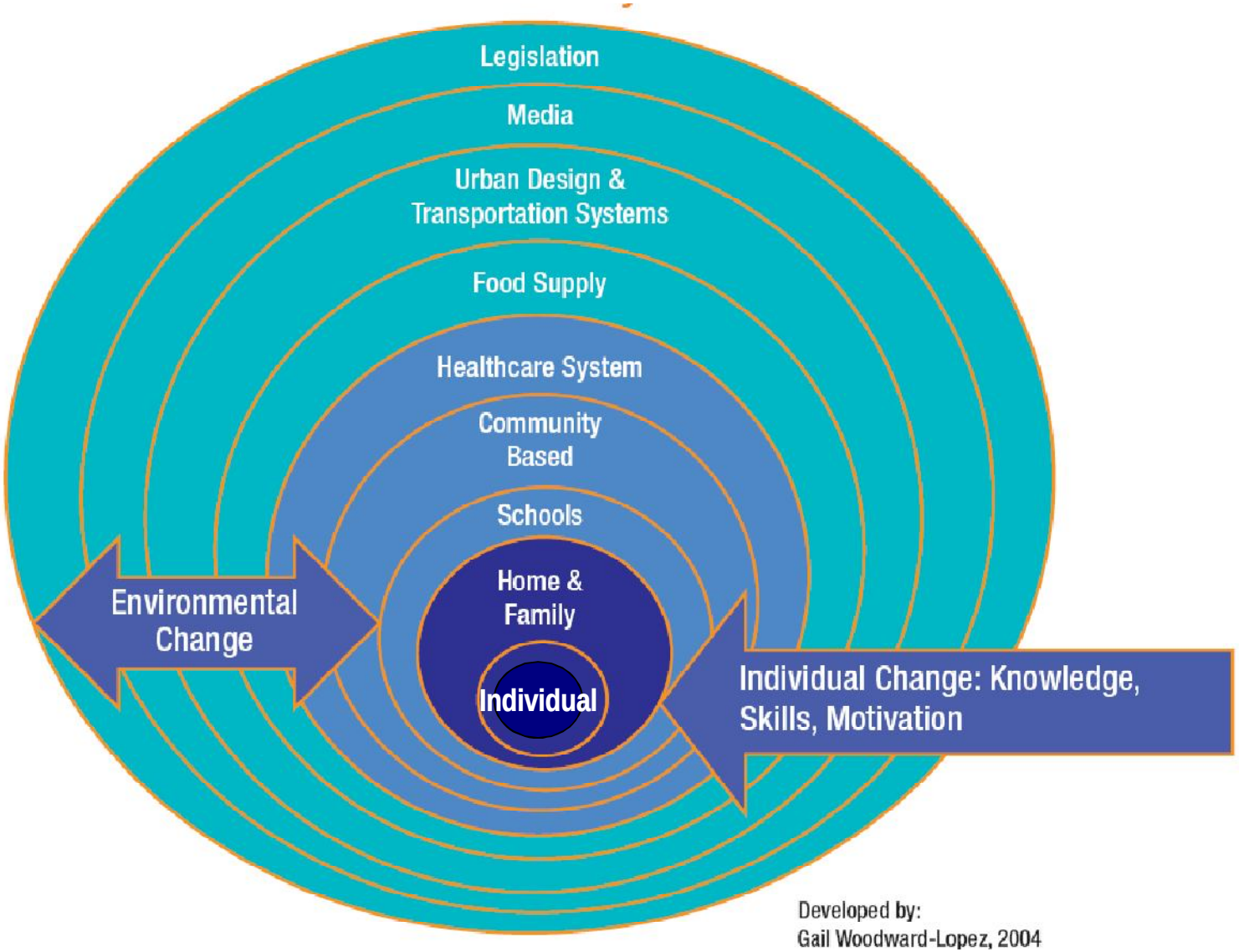


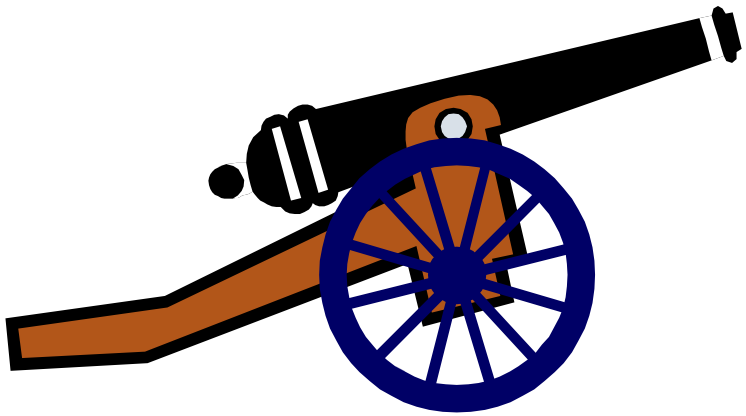
Figure 1. A Conceptual Framework for Public Health Practice in Cardiovascular Disease Prevention

Framework for policy for the prevention of NCD: integrated, comprehensive, multisectoral



Conclusions

- Detrimental lifestyles account for large proportion of NCD: several lifestyle measures have large prevention potential
- Educational effort should be supported by policy changes
- Some policy/fiscal/environmental changes do not require individual behavioral change, and can be effective quickly and can be particularly cost-effective
- Interventions must be sensitive to local situation and culture
- Interventions often requires motivated health professionals for initiation but then extends to sectors beyond health
- Several ingredients needed for success: funding, advocacy, lobbying, leadership, partnership (including industry)

“Genes load the gun.
Lifestyle pulls the trigger”

Dr. Elliot Joslin