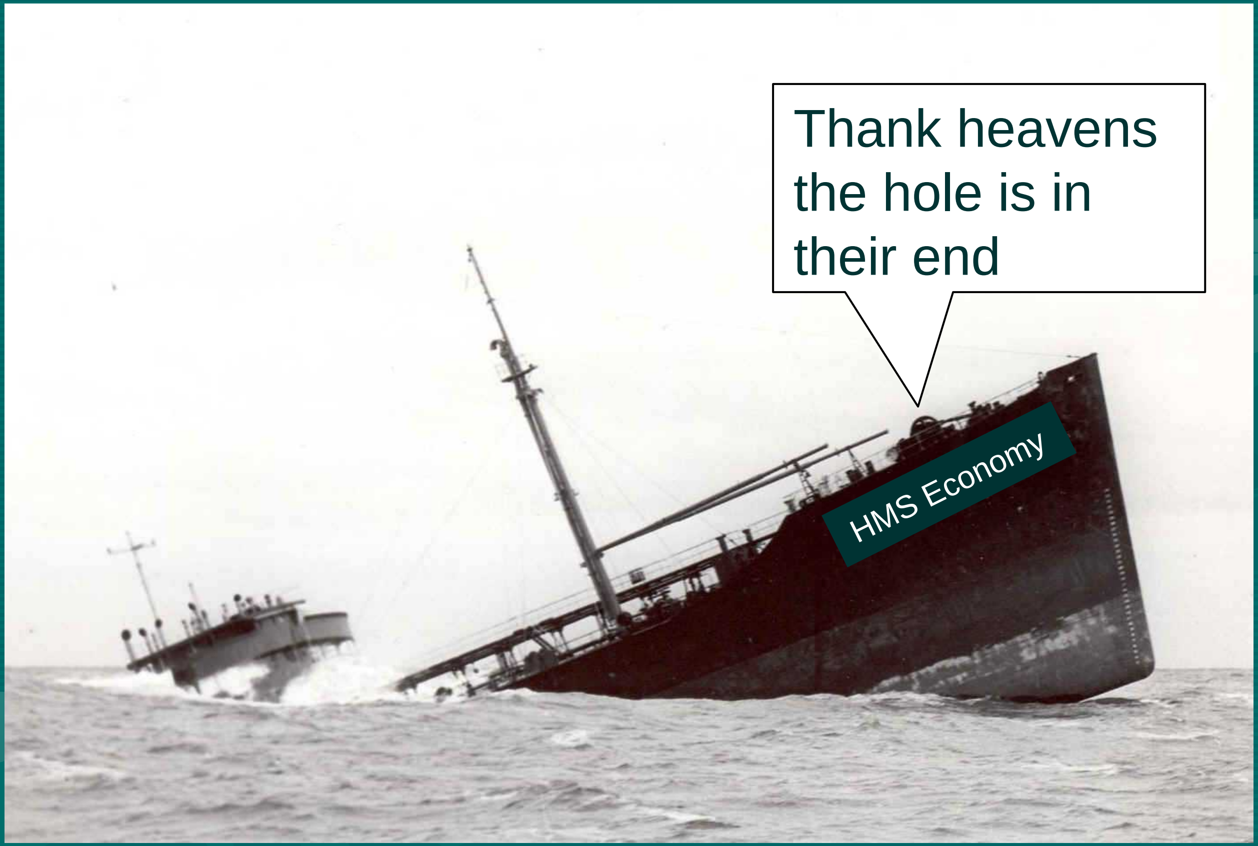
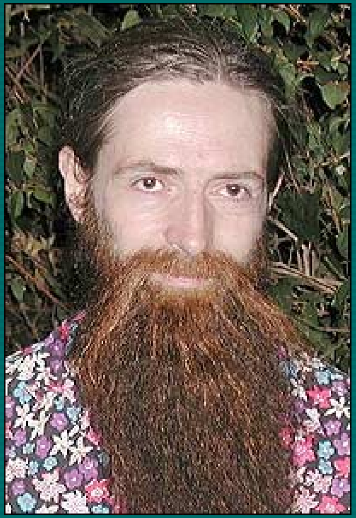
# How much can health promotion benefit a city?

Professor Malcolm Whitfield
Director of The Centre for Health & Social Care Research
Sheffield Hallam University, UK

# Drivers of change



# Drivers of change



"I think the first person to live to 1,000 years old might be 60 years old already"

Professor Aubrey de Grey leads the SENS (Strategies for Engineered Negligible Senescence) project at Cambridge University UK and also runs the Methuselah Mouse prize for extending age in mice.

# Drivers of change

What do the ancient purveyors of physical immortality all have in common?

They are all dead.

**Dr S Jay Olshansky is a professor at the School of Public Health, UIC and author of The Quest for Immortality.**

# Changing health agenda

"In the last century the main concerns were infectious diseases, acute medical and surgical illness, and the long struggle against cancer. Much of what the NHS delivered consisted of brief episodes of increasingly successful acute care. But today, with the ageing population and a rise in so-called 'lifestyle diseases', the NHS finds itself with new challenges in supporting and caring for patients with long-term conditions".

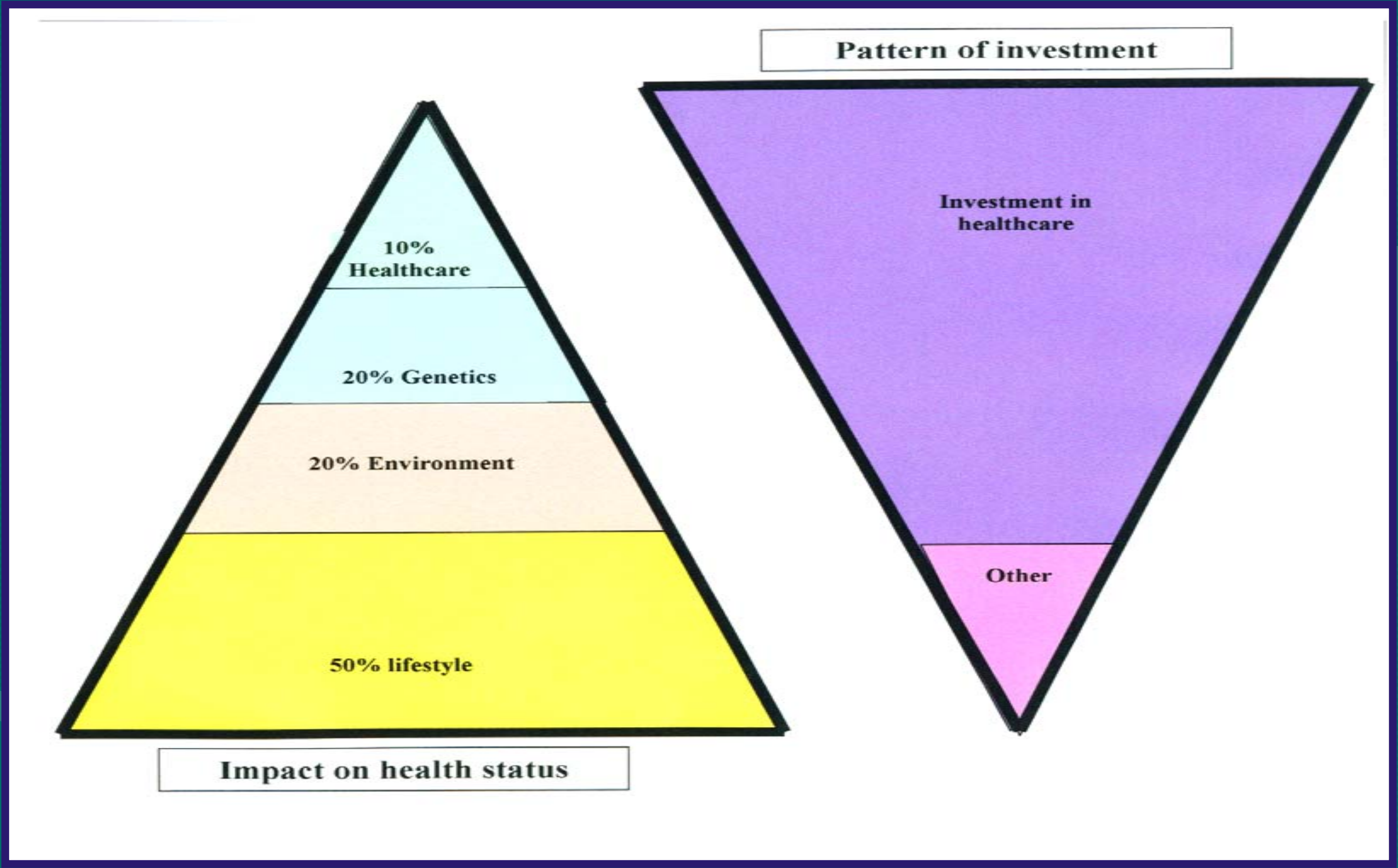
Gordon Brown, 7 January 2008

"By placing greater emphasis on assessing local needs, and prioritising investments to deliver long-term improvements in health outcomes, world class commissioning will be pivotal in reducing health inequalities.

Furthermore, world class commissioning will support the shift from treatment and diagnosis to prevention and promotion of well-being. This is crucial for delivering a fair health service as lifestyle choices are responsible for as much as half of the gap in health outcomes".

World class commissioning and the Darzi review: 12 March 2008

# The economic problem




Source: Professor Vilus Grabauskas, Professor, Chancellor of Kaunus Medical University, Lithuania.

# Industrial level change?

Healthcare: How do we release resource –

Technical efficiency?
Allocative efficiency?
Rationing?

Health: What should we invest in?

Education?
Primary prevention?
Secondary prevention?

# Clinical pathways (example) - Diabetes

| | | | | | |
|---|---|---|---|---|---|
| TE | TE | TE | TE | TE | TE |
| Prevention | Diagnosis & Treatment | Blood Sugar Control | Cardio-vascular events | Heart Surgery<br>Cataracts<br>Amputations<br>Foot ulcers<br>Etc. | Chronic Kidney Disease<br>Blindness<br>Immobility |
| Public Health | Primary Care | Out Patients | Acute / Secondary Care | | Long term Care |

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# A focus on risk factors

"These are dangerous times for the well-being of the world. In many regions, some of the most formidable enemies of health are joining forces with the allies of poverty to impose a double burden of disease, disability and premature death on many millions of people".

Population level risk reduction – "has been a preoccupation of people and their physicians and politicians throughout history. It can be traced back at least 5000 years to some of the world's earliest civilizations. But it has never been more relevant than it is today."

**Gro Harlem Brundtland**
**Director General WHO**
**Geneva: October 2002**

# The health problem

"In the most industrialized countries of North America, Europe and the Asian Pacific, at least one-third of all disease burden is caused by tobacco, alcohol, blood pressure, cholesterol and obesity".

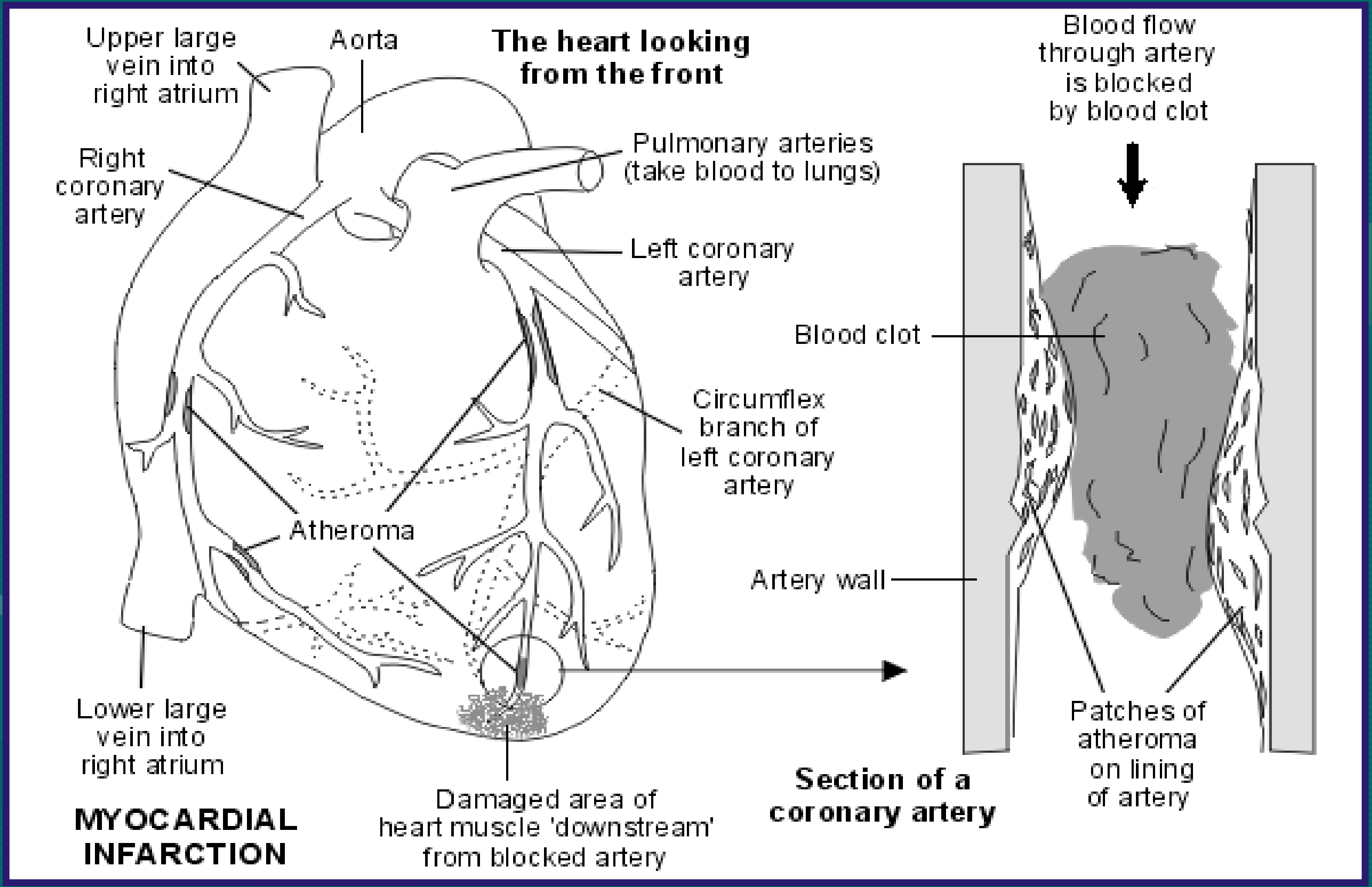
WHO 2002

# The health problem

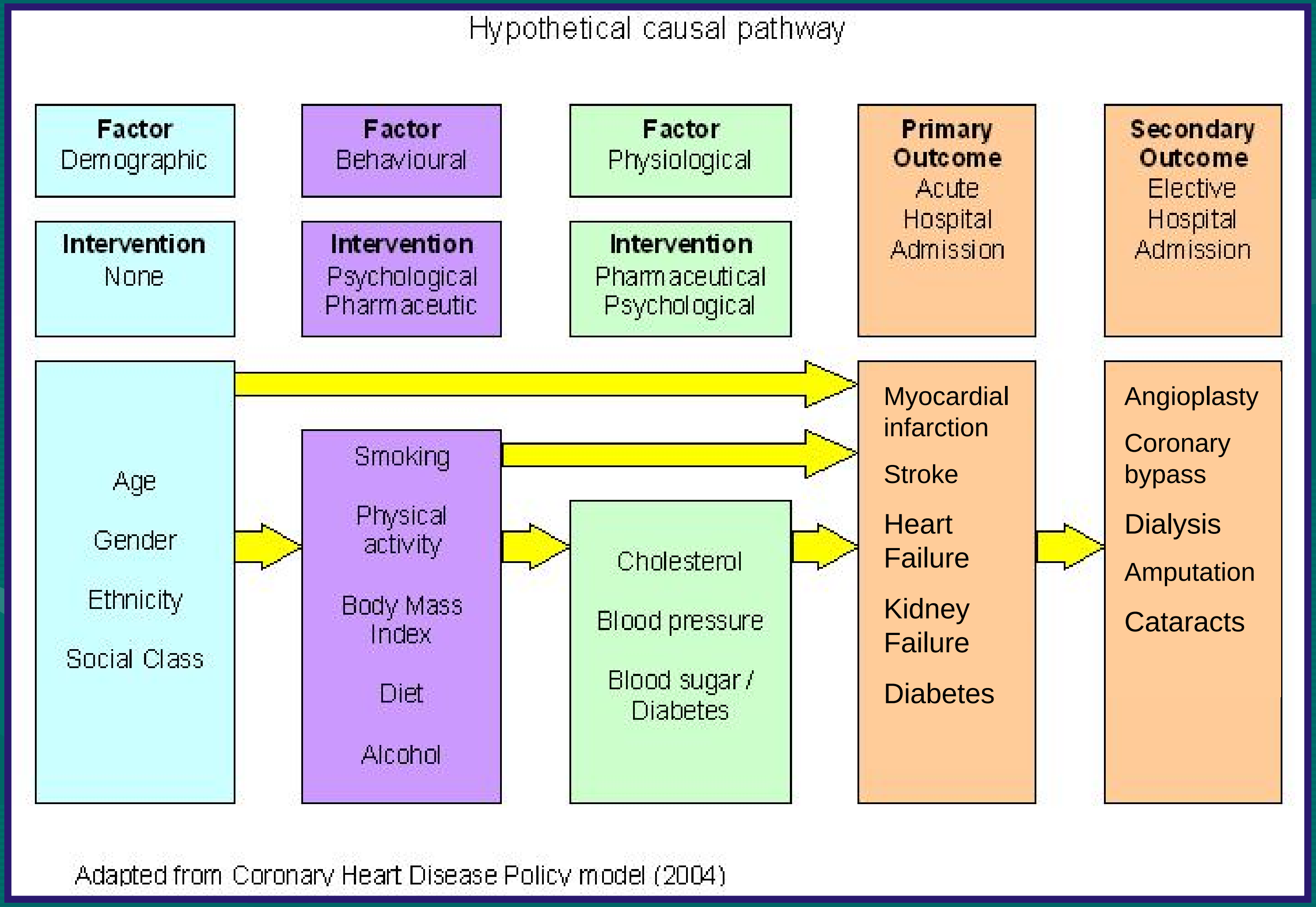
"More than three-quarters of cardiovascular disease (the world's leading cause of death) results from tobacco use, high blood pressure or cholesterol, or their combination".

"Overall, cholesterol causes more than 4 million premature deaths a year, tobacco causes almost 5 million, and blood pressure causes 7 million"

# Is this avoidable?



# The proximal risk factors



# An example from Sheffield (UK)

The aim of the project was to test the "economic case" for investment in Enhanced Public Health Programs aimed at reducing:

- The five main health risk factors in higher risk populations across the City
- Inequality in health outcomes across the city by targeting the most at risk
- Premature death rates in the more deprived areas of the City
- Inequality in access to preventative services

# The study objectives

1. To explore the possibility of using individual level multivariate risk prediction equations, derived from Framingham and other studies, to estimate how many people in a population are likely to be admitted to hospital in the next five to ten years with CVD related events such as heart attacks, strokes, heart failure and kidney disease
2. To estimate the potential financial impact of reductions in hospital admissions, on an “invest to save” basis, if enhanced public health programmes were able to to reduce cardiovascular risk at a population level.

# Can it work?

- In the 1970's North Karelia here in Finland, had the highest mortality rate from CHD in the world
- The Finnish focus at the time was very much on the treatment and hospitalisation of patients <u>with</u> coronary heart disease.
- Despite extreme skepticism from the Cardiology community, Dr Pekka Puska, a public health doctor instigated a community public health / primary care based programme aimed at people <u>at risk of</u> coronary heart disease.

- Between 1972 and 1997 when the project ended CHD mortality had been reduced by 73%
- Life expectancy in men  increased by 7 years and in women by six years.
- Mean blood cholesterol levels in the population reduced by <u>20%.</u>
- Consumption of fruit and vegetables went from the lowest in Europe to the highest

NB The key idea was that heart disease, was not so such a problem for a  few high risk individuals, but rather the lifestyle of the entire community.

# Can events be predicted?

**Researchers in France adapted a model, based on the the Framingham study to predict CHD in France for both sexes over a large age range.Calculations were based on data from the French PCV-METRA study.**

**It was concluded that with an appropriate change of "the intercept" the Framingham model could be used to estimate CHD risk in populations (Brindle).**

D. Laurier, NP. Chau, B. Cazelles, P. Segond, PCV-METRA Group. J *Clin Epidemiol* 1994; (47)12: 1353-64.

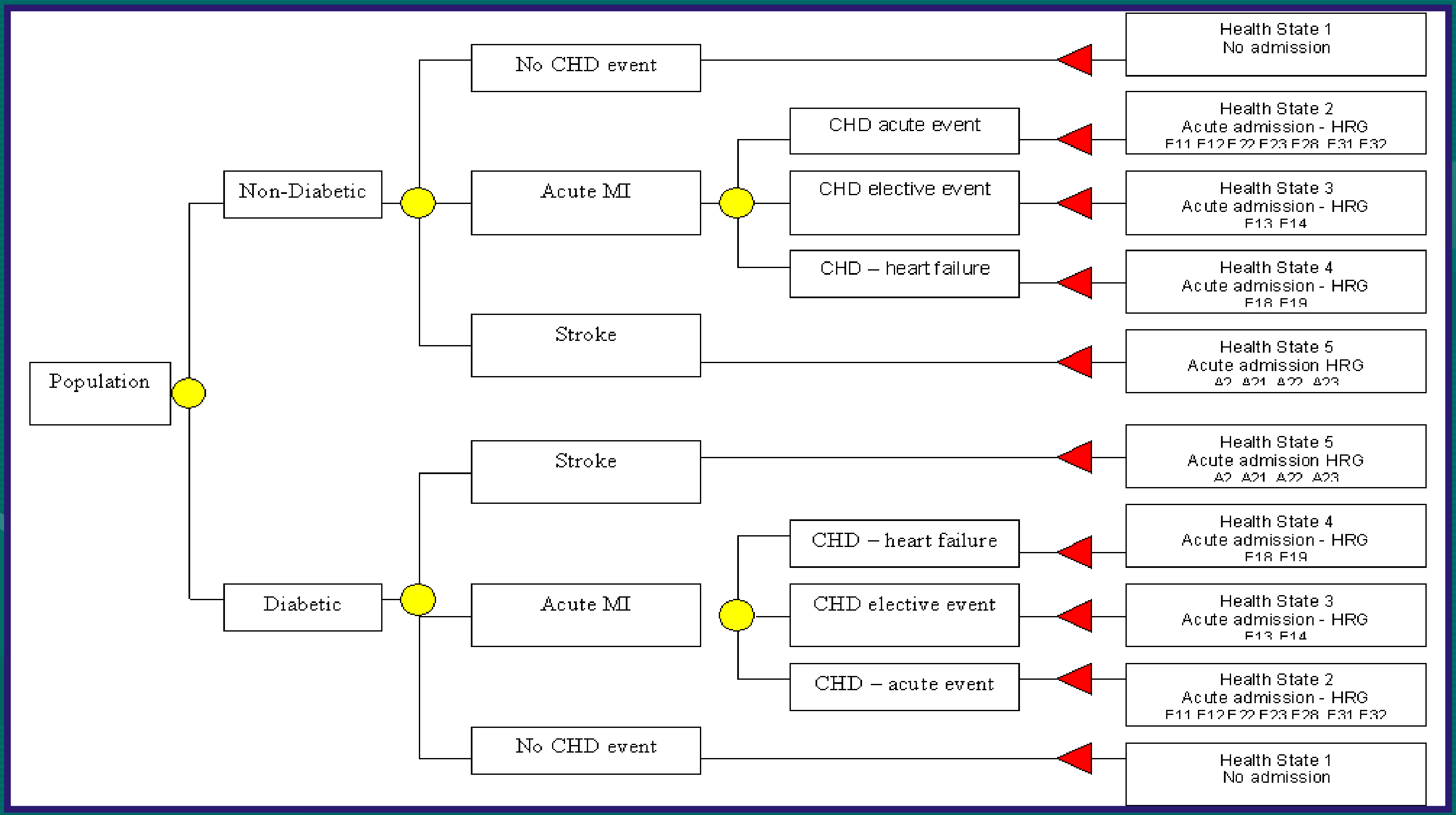
**A UK study concluded that without adjustment (recommended) the Framingham equation under-estimates CHD risk in high risk populations. With adjustment predictions are both accurate and sensitive. Framingham overestimates in low risk populations.**

*R. N. Guzder, W. Gatling, M. A. Mullee*, R. L. Mehta* and C. D. Byrne' Poole Hospital NHS Trust, Poole, **

**A review of four major studies that have compared the relative accuracy of various risk assessment tools using the Framingham risk equations concluded that all the tools generally performed well in terms of sensitivity and specificity for the detection of patients with increased CHD risk**.

Sheridan S, Pignone M, Mulrow, C. Framingham based tools to calculate the global risk of coronary heart disease. JGIM. 2003;18:1039-1052

# The model



Population
Non-Diabetic
No CHD event
Acute MI
CHD acute event
CHD elective event
CHD – heart failure
Stroke
Health State 1
No admission
Health State 2
Acute admission - HRG
F11 F12 F22 F23 F28 F31 F32
Health State 3
Acute admission - HRG
F13 F14
Health State 4
Acute admission - HRG
F18 F19
Health State 5
Acute admission HRG
A2 A21 A22 A23
Diabetic
Stroke
Acute MI
CHD – heart failure
CHD elective event
CHD – acute event
No CHD event
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F18 F19
Health State 3
Acute admission - HRG
F13 F14
Health State 2
Acute admission - HRG
F11 F12 F22 F23 F28 F31 F32
Health State 1
No admission

# How does it work?

- The demographic profile of the population i.e. age and sex along with the current population (NB populations can be at PCT, Consortia, EHPH or GP practice level)
- The model uses national risk data as a default. The national mean risk factors are then adjusted at a GP population level for cardio-vascular risk using deprivation formulae.
- The model uses an adaptation of the Framingham multi-variate risk equation to estimate how many people are likely to have a heart attack or a stroke in the next five or ten years
- It then calculates the additional numbers (using the UKPD formulae) from people with Diabetes
- It goes on to calculate how many of the people who have a heart attack or stroke will go on to receive cardiac catheterisation or an angiograph

# How does it work?

- It subtracts the number of people who are likely to die before reaching hospital and compares the number of people likely to be admitted on current risk factors with the actual number admitted.
- It calculates the likely number of hypo-glycaemic attacks in diabetics based upon the population and risk factor data
- It also calculates the incidence of end stage renal disease and heart failure admissions
- The user can then enter risk factor reduction targets to estimate the potential impact on future admissions

**NB** The model does not currently account for the death rate of renal patients from heart disease

# The risk factors

| | |
|---|---|
| Demographic profile | Framingham |
| Population smoking rates | Framingham |
| Mean total and HDL Cholesterol (mmol/l) | Framingham |
| Mean systolic blood pressure | Framingham |
| Mean Body Mass Index (BMI) | Diabetes / Heart Failure |
| Mean HBA1c levels | UKPDS |
| Measures of CKD prevalence eGFR etc | Nanes II |

# The events - Acute

Based upon the population data and the average risk factor values the model estimates how many people will have the following acute events over a five year period:

- Myocardial infarction – heart attack
- Ischaemic attack – stroke
- Hypo-glycaemic attack – diabetes
- End stage renal failure – kidney disease

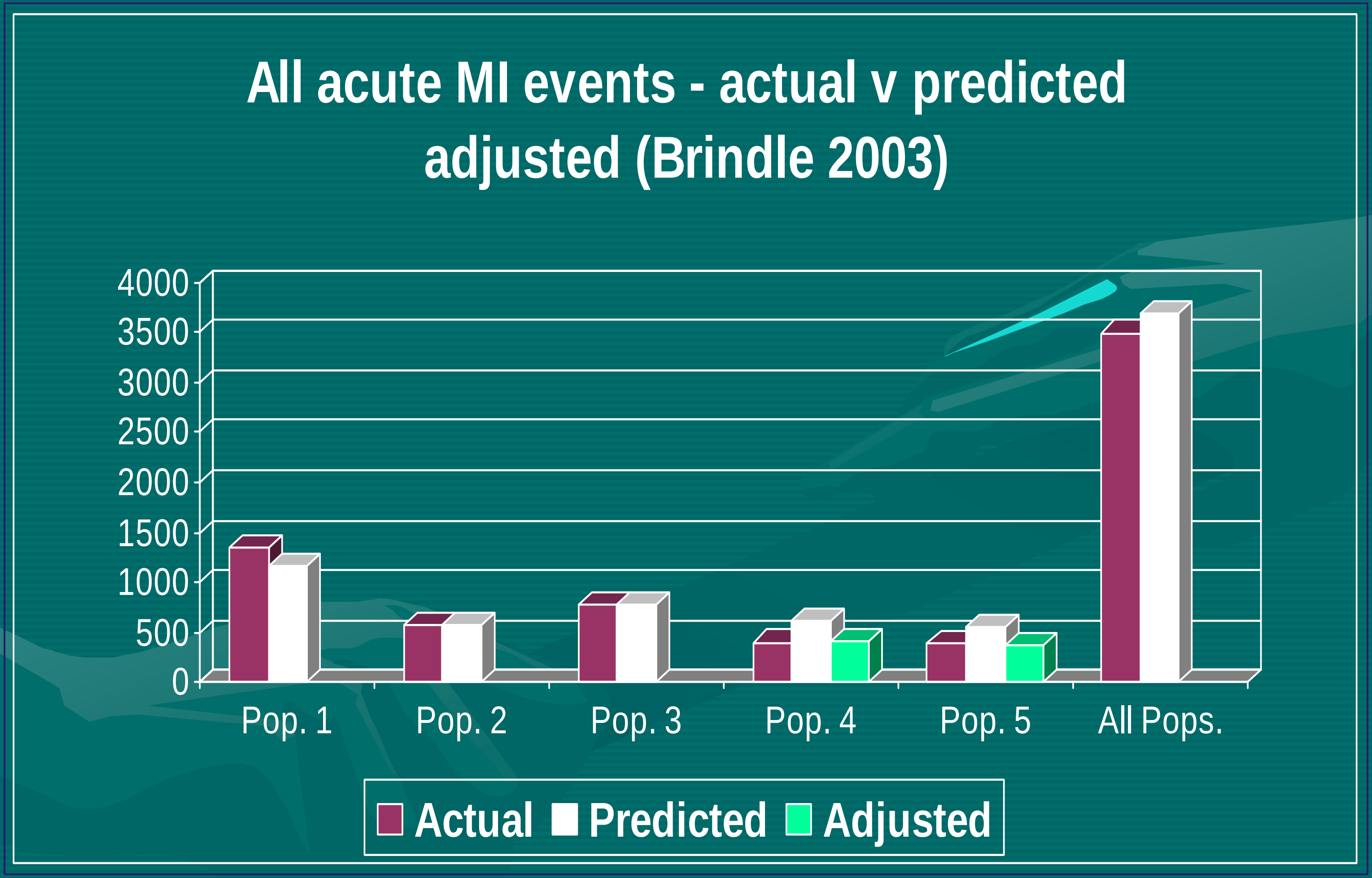
# The events - Elective

Having estimated how many people will have a heart attack the model calculates how many will then need cardiac surgery

# Does it work?

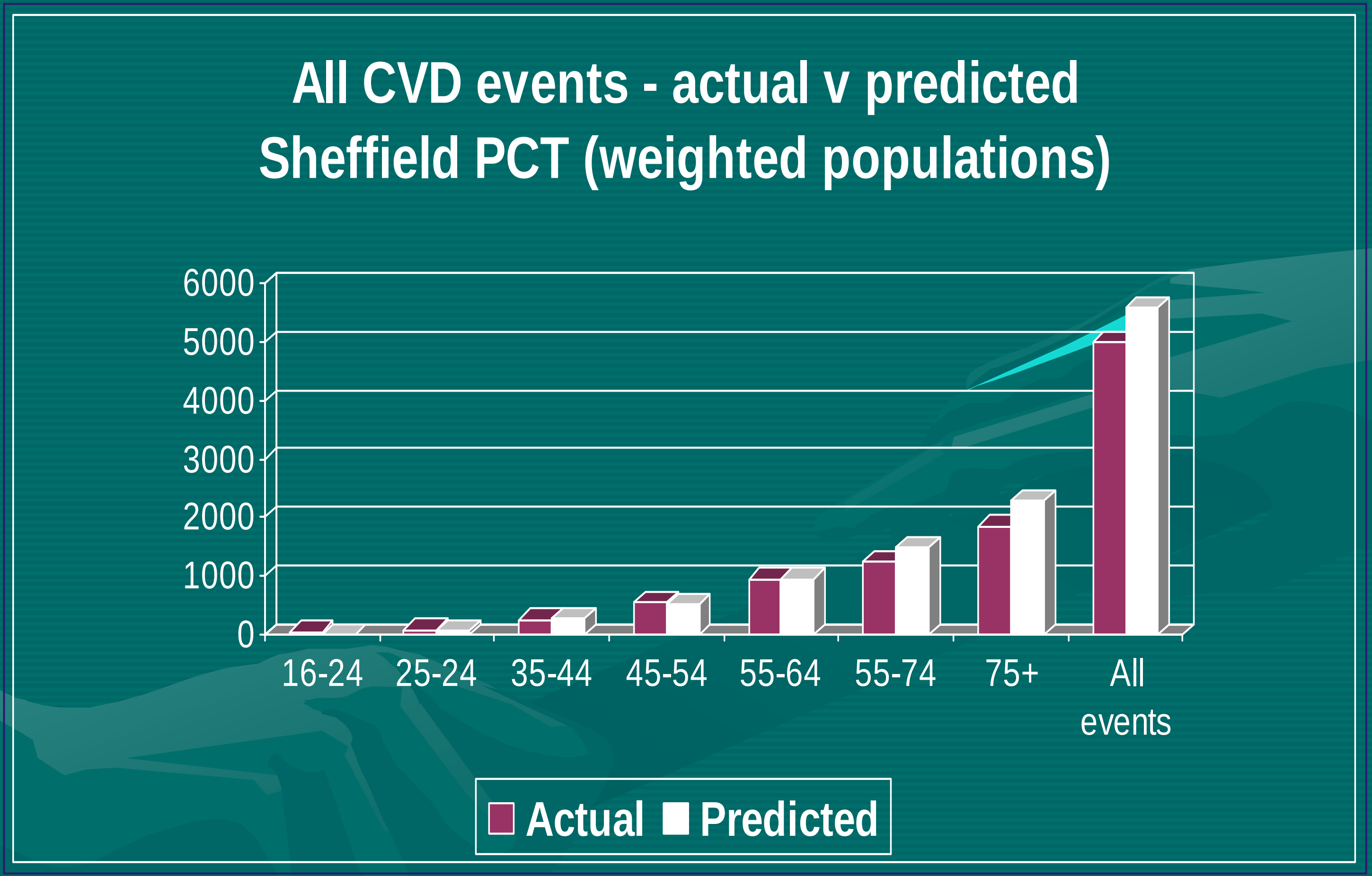
To validate the model, we estimated how many people in five Primary Care Trusts (n=620,000 population)
would have a heart attack, stroke, heart failure, kidney failure and heart surgery. We then compared the predicted number with the actual number

# The validation



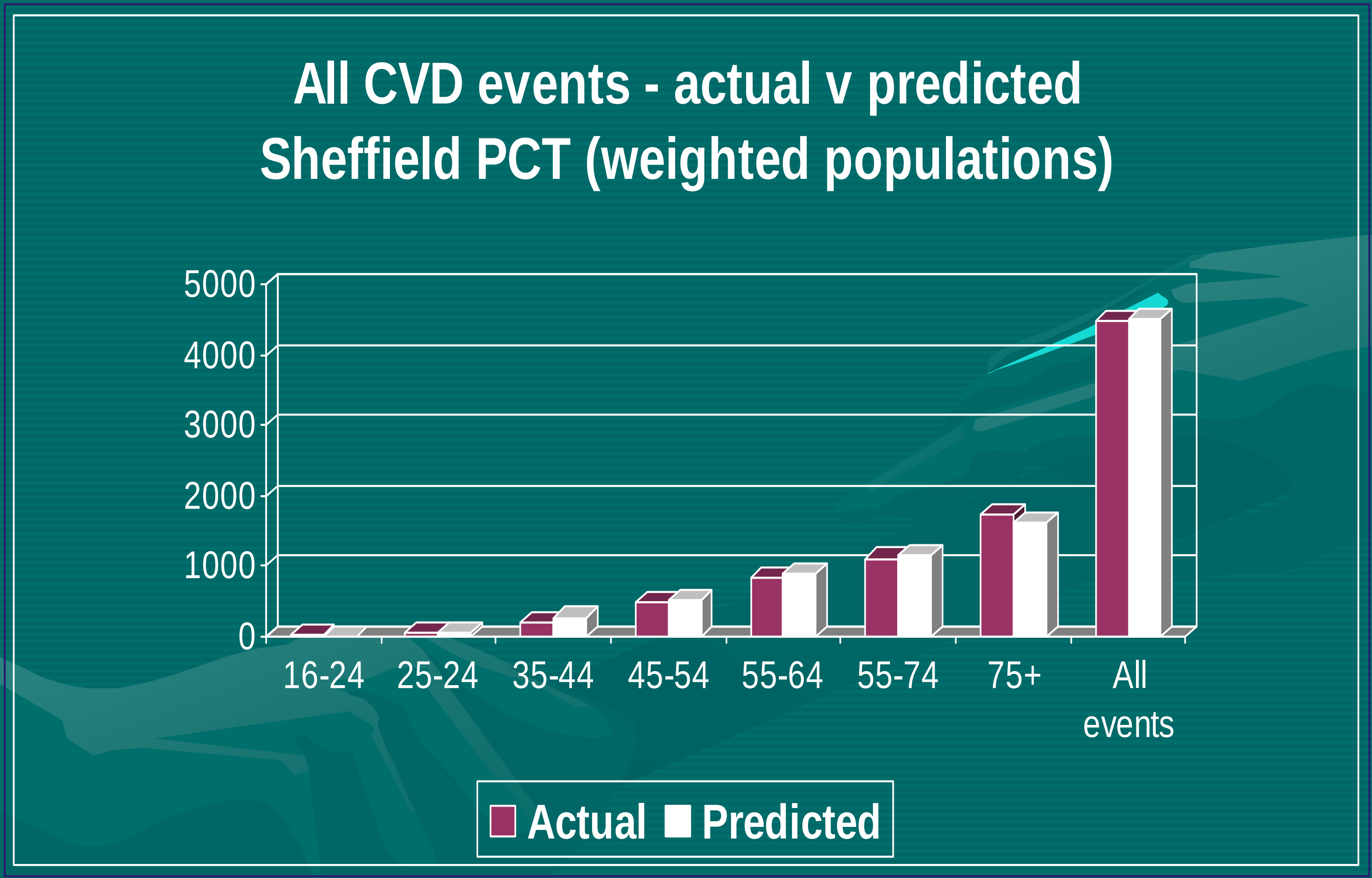

Admission data 2005/06 for 5 PCTs

# The validation - Sheffield




Including renal failure patients

# The validation - Sheffield

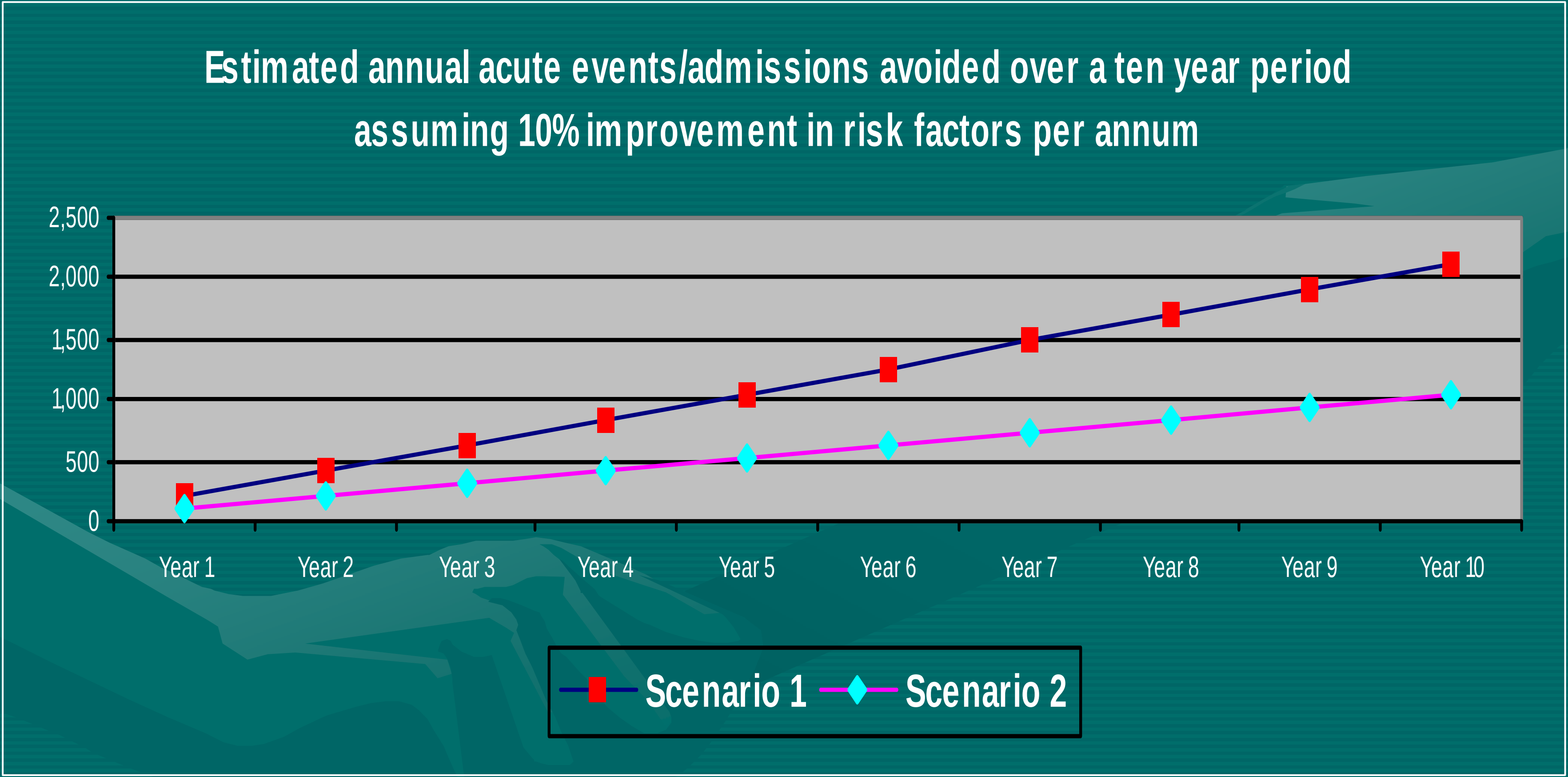



Excluding Renal failure patients

# Reduction targets-10 years

| Risk factor | Scenario 1 | Scenario 2 | 2003/06 |
|---|---|---|---|
| | | | |
| Mean BMI | - 5% | - 2% | + 0.67% |
| Mean HBA1c | - 2% | - 2% | +3.77% |
| Smoking prevalence | - 13% | - 10% | - 17.03% |
| Mean total Cholesterol | - 6% | - 2% | - 4.15% |
| HDL Cholesterol | + 6% | + 2% | + 2.9% |
| Mean systolic BP | - 5% | - 2% | -4.36% |

# Admissions avoided (475,498 pop)



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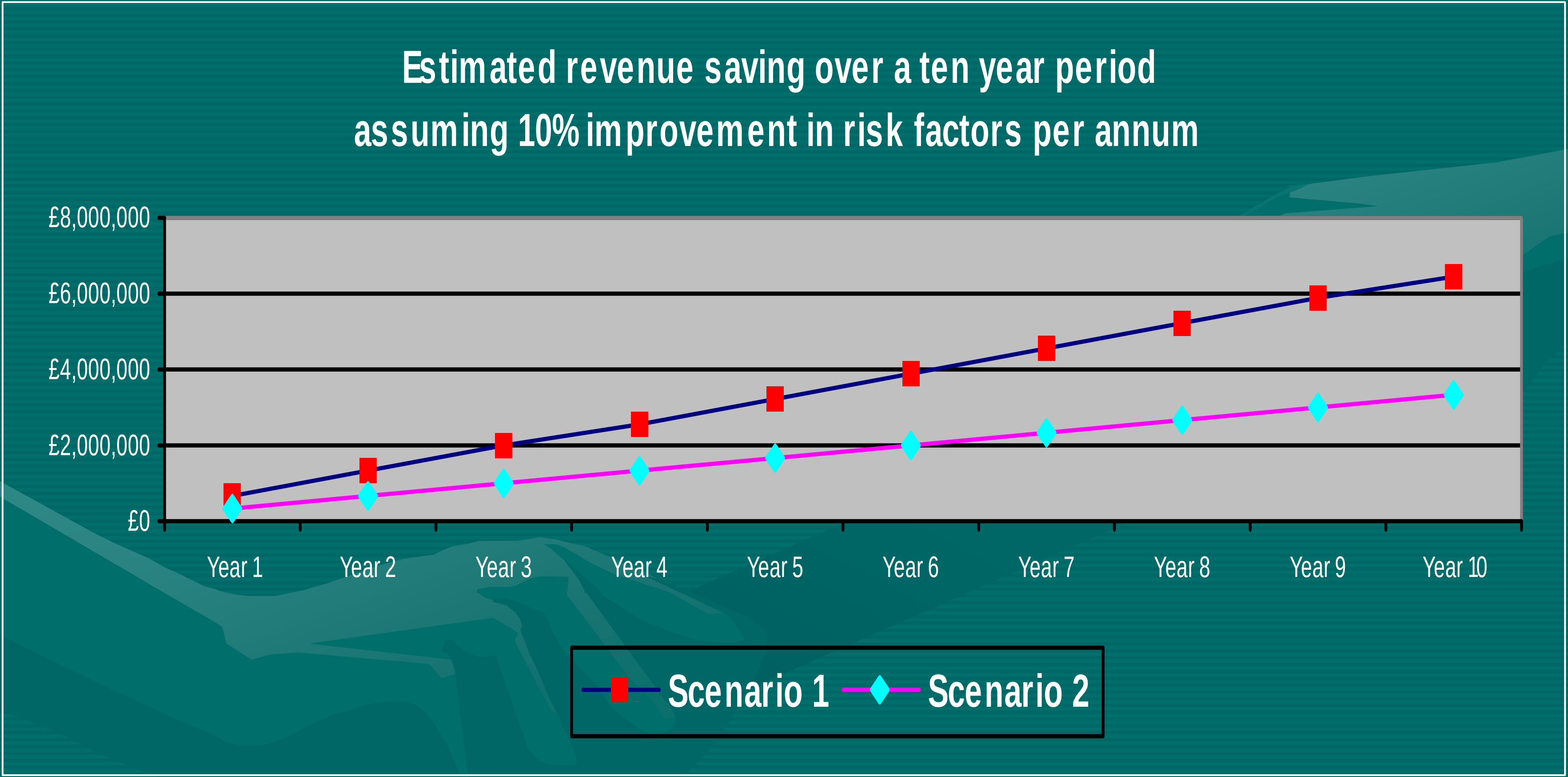
# Admissions avoided (475,498 pop)

| Scenario | 5 year accumulative acute admission/ events avoided | 10 accumulative acute admission/ events avoided |
|---|---|---|
| | | |
| Current risk | 0 | 0 |
| | | |
| Scenario 1 | 2,718 | 13,000 |
| | | |
| Scenario 2 | 1,265 | 5,728 |
| | | |
| | | |

NB assumes 10% of risk target is achieved each year in 10 year program and 20% in five year program

# Revenue savings (475,498 pop)

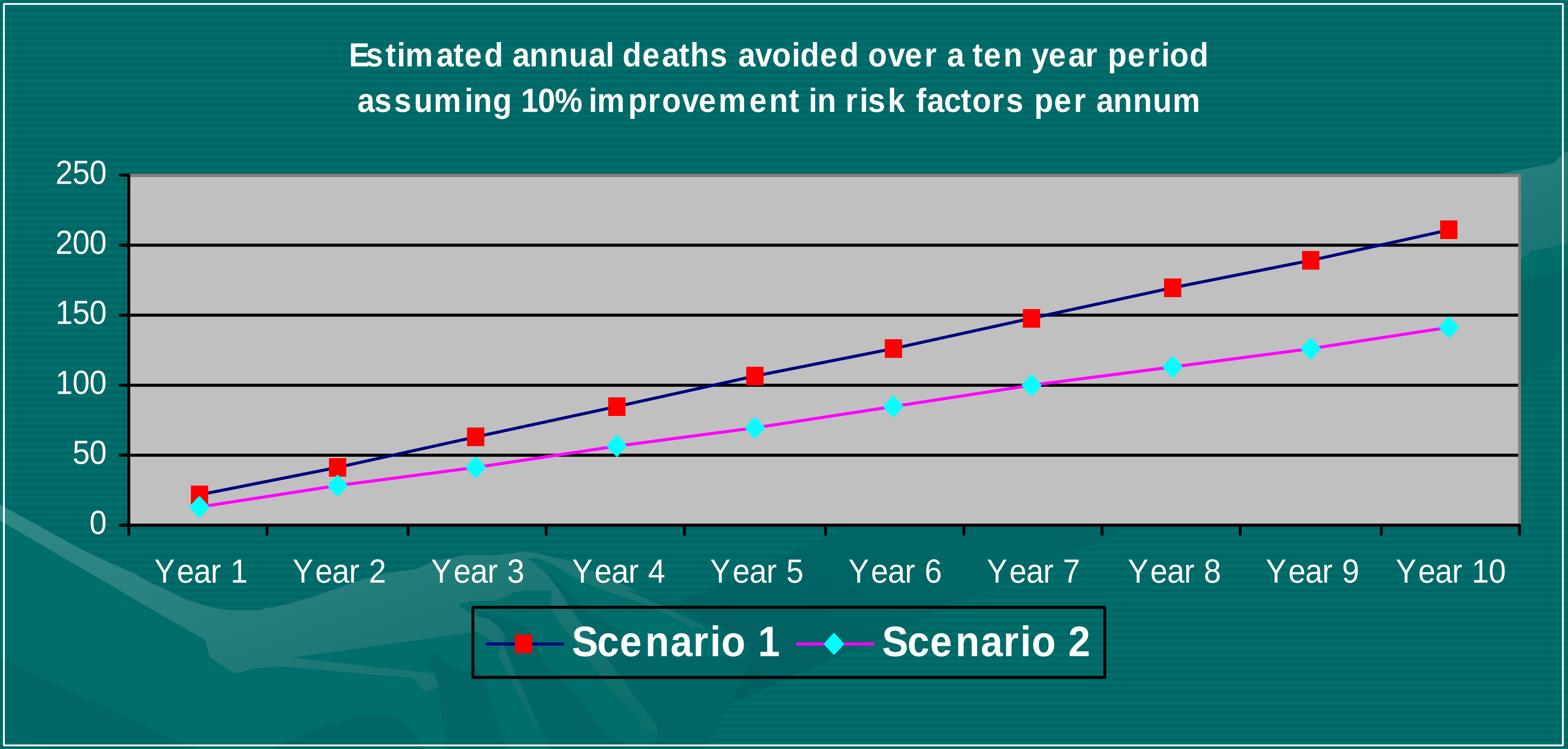


# Revenue savings (475,498 pop)

| Scenario | 5 year accumulative saving | 10 accumulative saving |
|---|---|---|
| | | |
| Current risk | £0 | £0 |
| | | |
| Scenario 1 | £20,129,878 | £39,305,913 |
| | | |
| Scenario 2 | £9,639,782 | £18,160,374 |
| | | |
| | | |

**NB assumes 10% of risk target is achieved each year in 10 year program and 20% in five year program**

# Deaths avoided (475,498 pop)



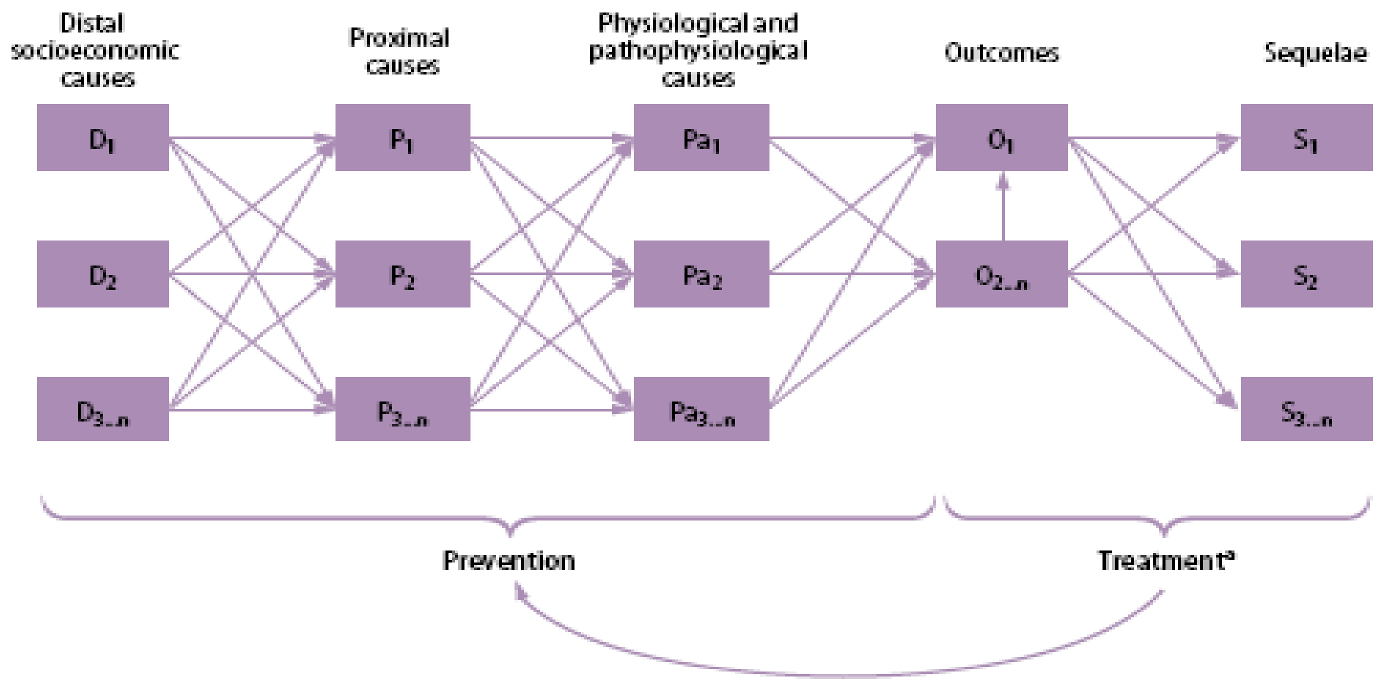
# Deaths avoided (475,498 pop)

| Scenario | 5 year accumulative deaths avoided | 10 accumulative deaths avoided |
|---|---|---|
| | | |
| Current risk | 0 | 0 |
| | | |
| Scenario 1 | 234 | 1,161 |
| | | |
| Scenario 2 | 156 | 774 |
| | | |
| | | |

NB assumes 10% of risk target is achieved each year in 10 year program and 20% in five year program

# Linkage to Decipher

**Figure 2.2 Causal chains of exposure leading to disease**

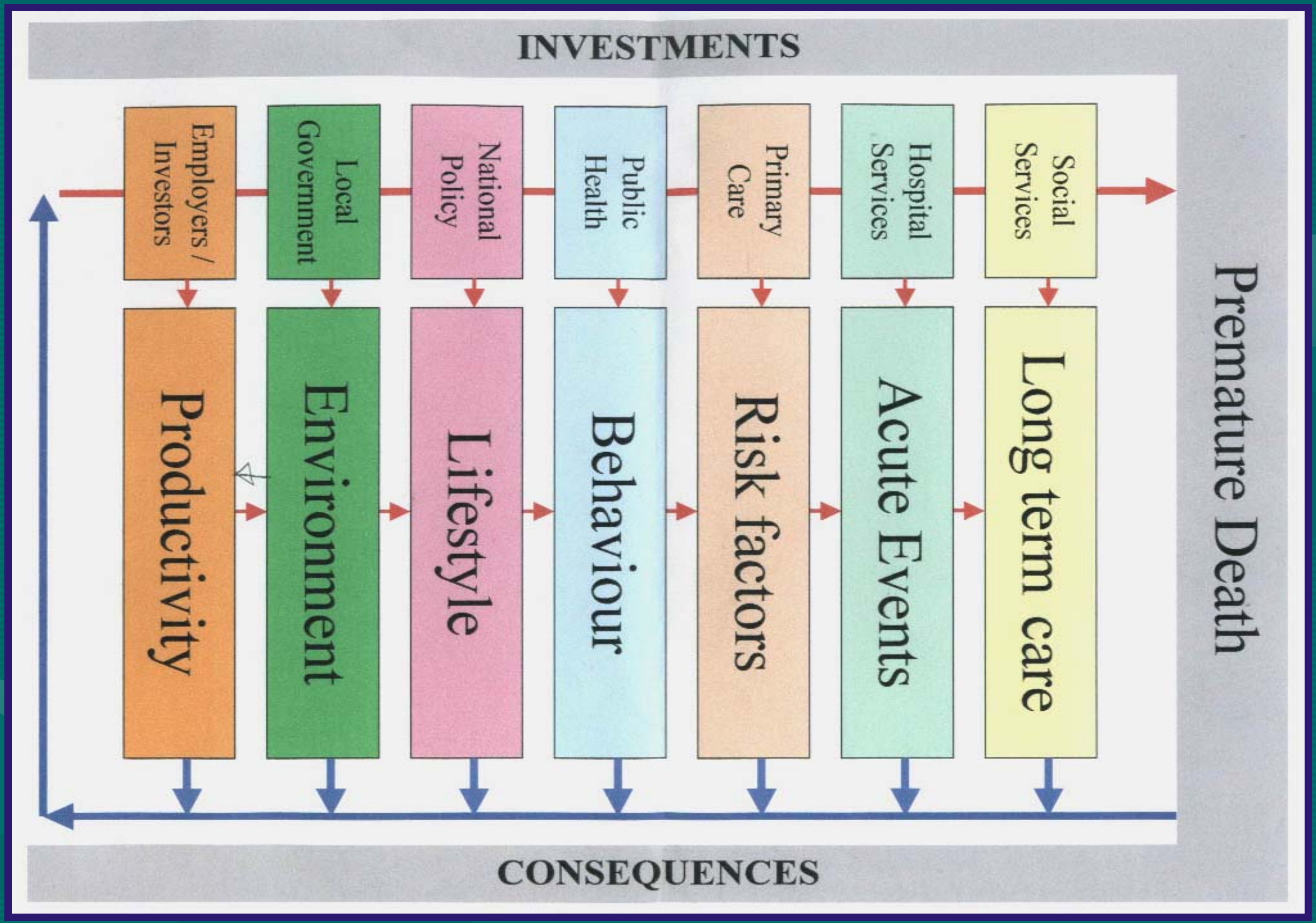



[a]Treatment of infectious disease can lead to prevention of further cases if it interrupts transmission.

An example:
Distal socioeconomic causes include income, education and occupation, all of which affect levels of proximal factors such as inactivity, diet, tobacco use and alcohol intake; these interact with physiological and pathophysiological causes, such as blood pressure, cholesterol levels and glucose metabolism, to cause cardiovascular disease such as stroke or coronary heart disease. The sequelae include death and disability, such as angina or hemiplegia.

Source 2002 WHO Report

# Linkage to Decipher



# The role of the City

- Our risk factors are shaped by our lifestyle
- Our lifestyle is shaped by our environment
- Our environment is shaped by City level decision makers

# Areas of influence

- Housing
- Environment
- Security
- Education
- Economy
- Healthcare