SURVEILLANCE AND THE ARROW OF TIME

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Heraclitus and the "River fragment"

Heraclitus, **Ηράκλειτος (Herakleitos) of Ephesus** (c.535 BC - 475 BC)
Greek philosopher, postulated a model of nature that created the foundation for all later speculation on physics and metaphysics. The idea that the universe is in **constant change** and that there is an **underlying order or reason to this change**

"On those who step in the same river, different and different waters flow"

The Arrow of Time

Time glides by with constant movement, not unlike a stream. For neither can a stream stay its course, nor can the fleeting hour.

Ovid, Metamorphoses XV, 180.

Past   Present   Future

From: *The Arrow of Time A Voyage Through Science to Solve Time's Greatest Mystery.* Peter Coveney & Roger Highfield, W H Allen, London, 1990.

The evolution of humans

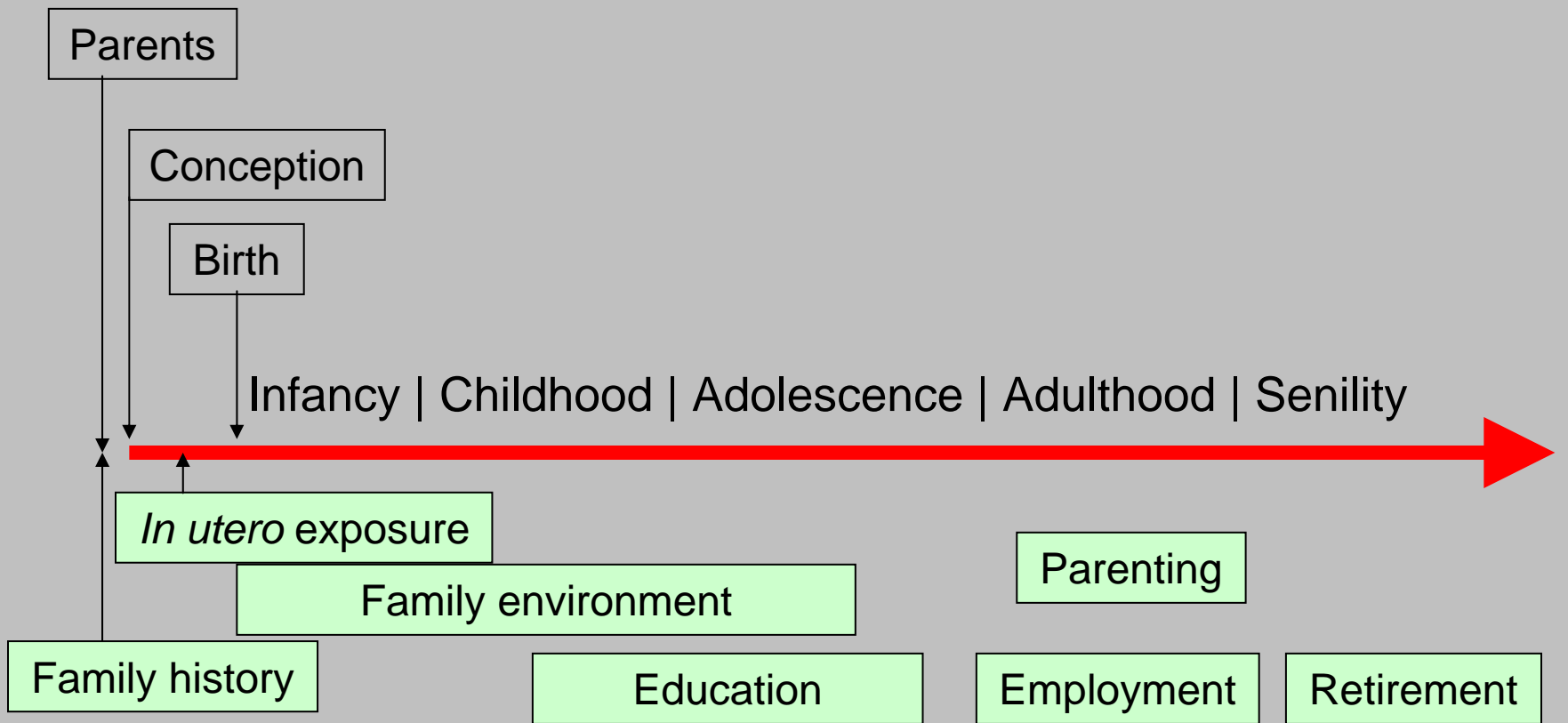Hunter-gatherers Agrarian   Industrial   Electronic

| The agrarian revolution | The industrial revolution | The electronic revolution |

The Decline and Fall of Civilizations

- Babylonia
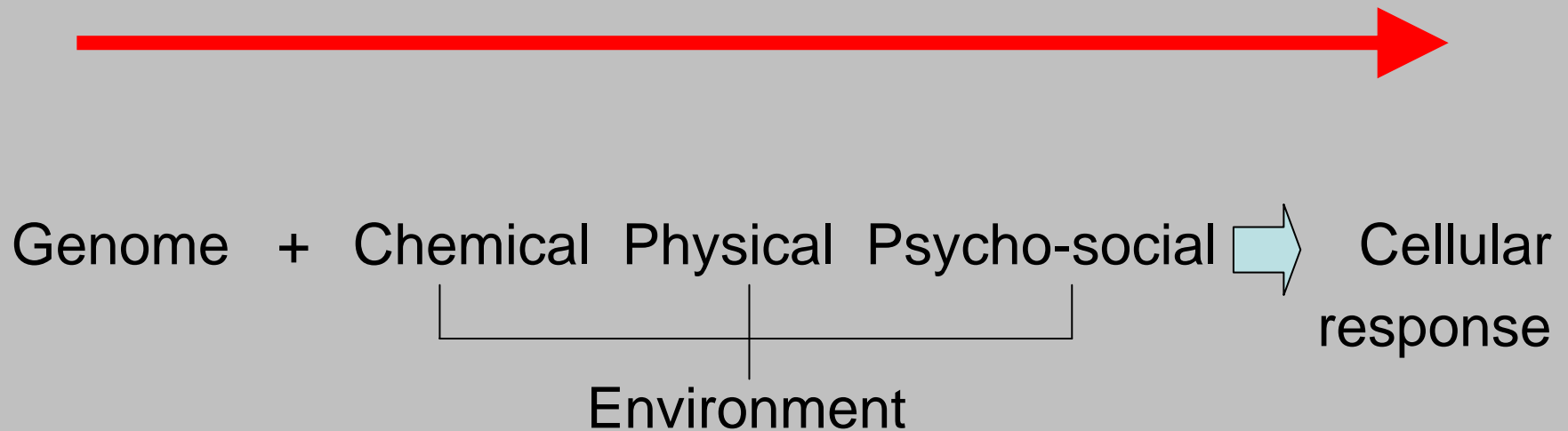- Ancient Egypt
- The Roman Empire
- The British Empire
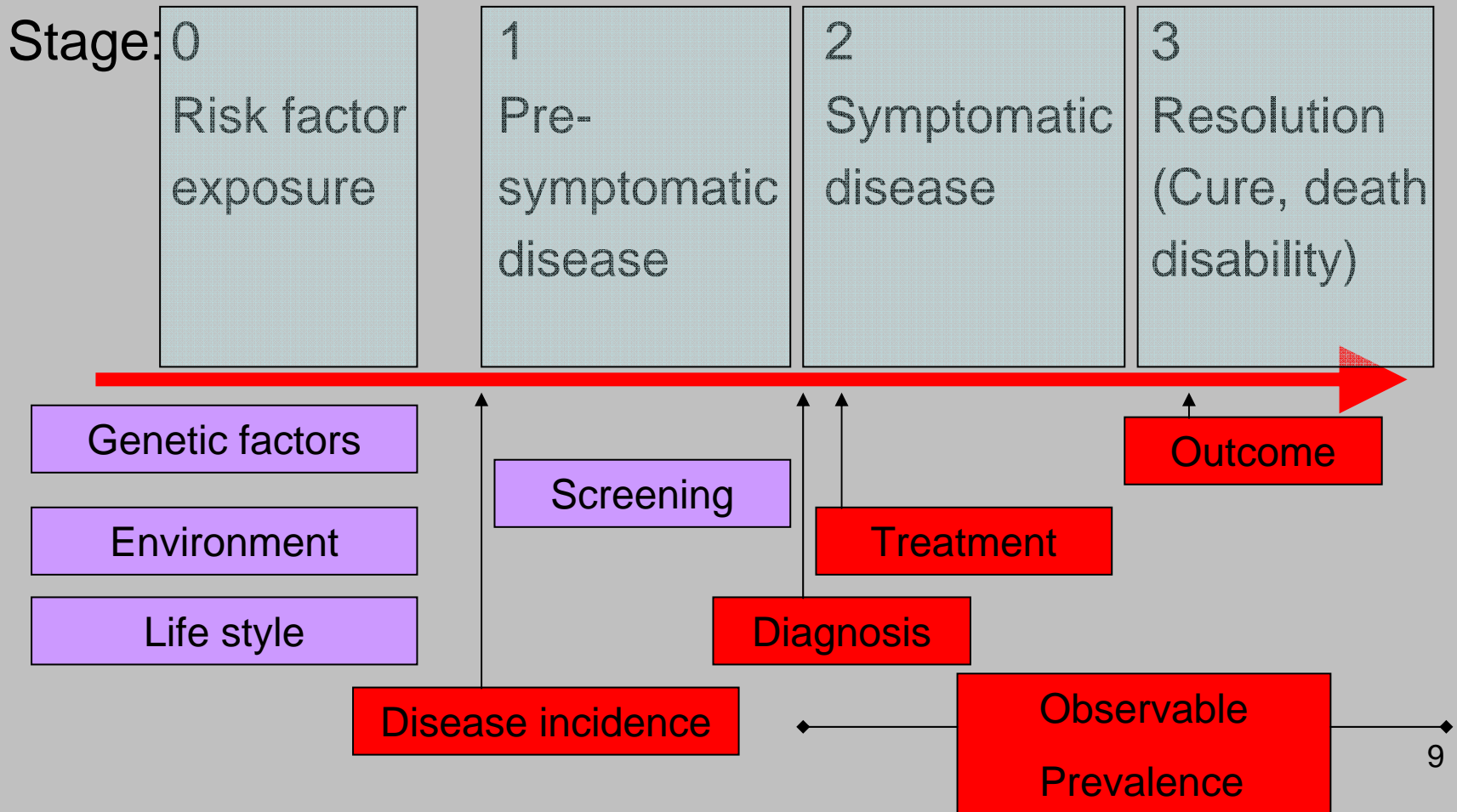- Next?

The general life-course for humans

Parents

Conception

Birth

Infancy | Childhood | Adolescence | Adulthood | Senility

In utero exposure

Family environment

Parenting

Family history

Education

Employment

Retirement

---------Social-cultural determinants---------------

… but sometimes things go wrong.

The socio-biological basis of disease:

Genome + Chemical Physical Psycho-social ⟹ Cellular response

Environment

… but sometimes things go wrong.

The natural history of disease:

Stage:

0	1	2	3
Risk factor exposure	Pre-symptomatic disease	Symptomatic disease	Resolution (Cure, death disability)

Genetic factors

Environment

Life style

Screening

Treatment

Diagnosis

Outcome

Disease incidence

Observable Prevalence

Surveillance: the windows of opportunity (1)

Infancy | Childhood | Adolescence | Adulthood | Old Age

Parents

Conception

Birth

In utero exposure

Family environment

Parenting

Family history

Education

Employment

Retirement
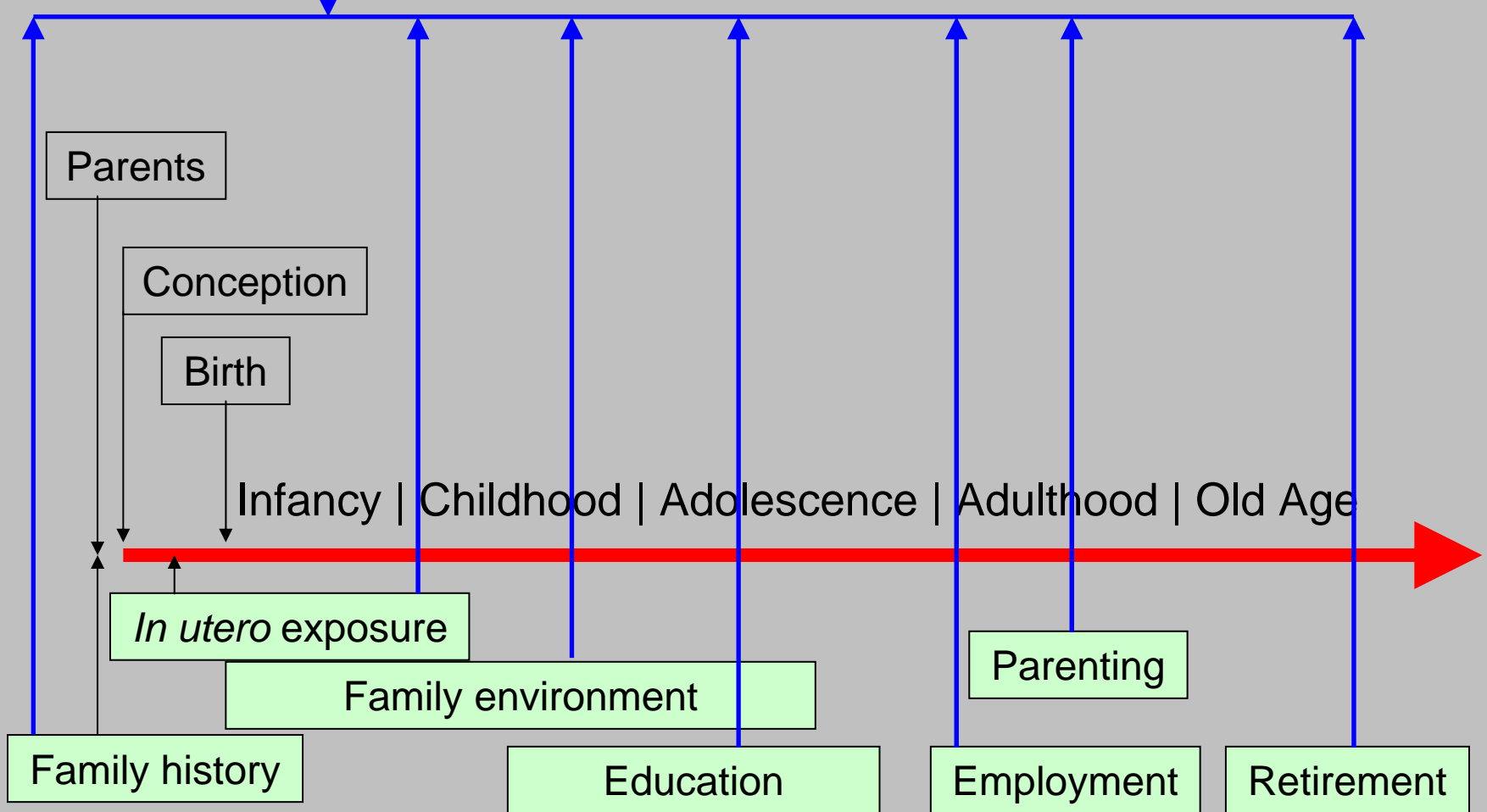
Surveillance: the windows of opportunity (2)

The natural history of disease:

Stage:

0 Risk factor exposure	1 Pre-symptomatic disease	2 Symptomatic disease	3 Resolution (Cure, death disability)

Genetic factors

Environment

Life style

Screening

Treatment

Diagnosis

Outcome

Disease incidence

Observable Prevalence
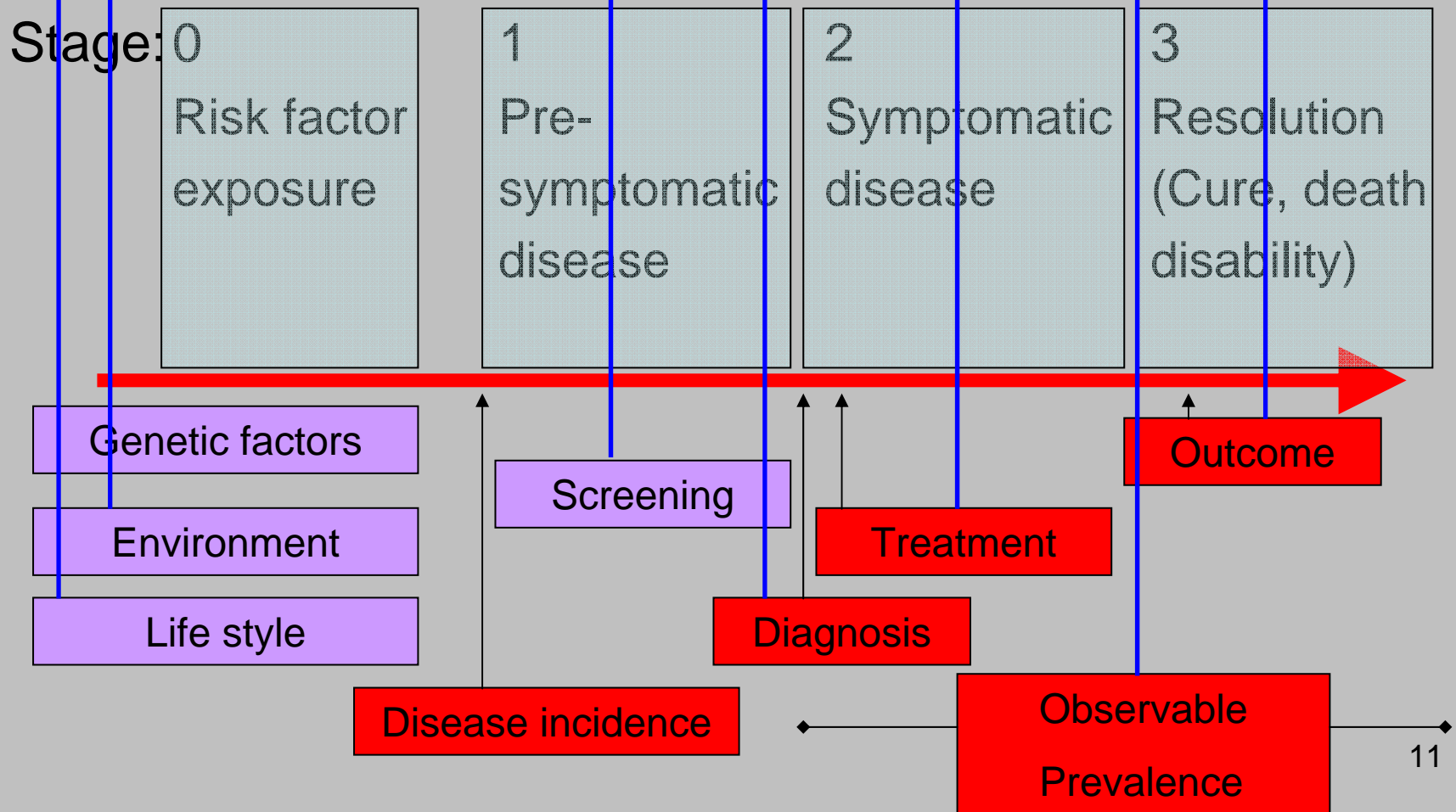
The surveillance family tree
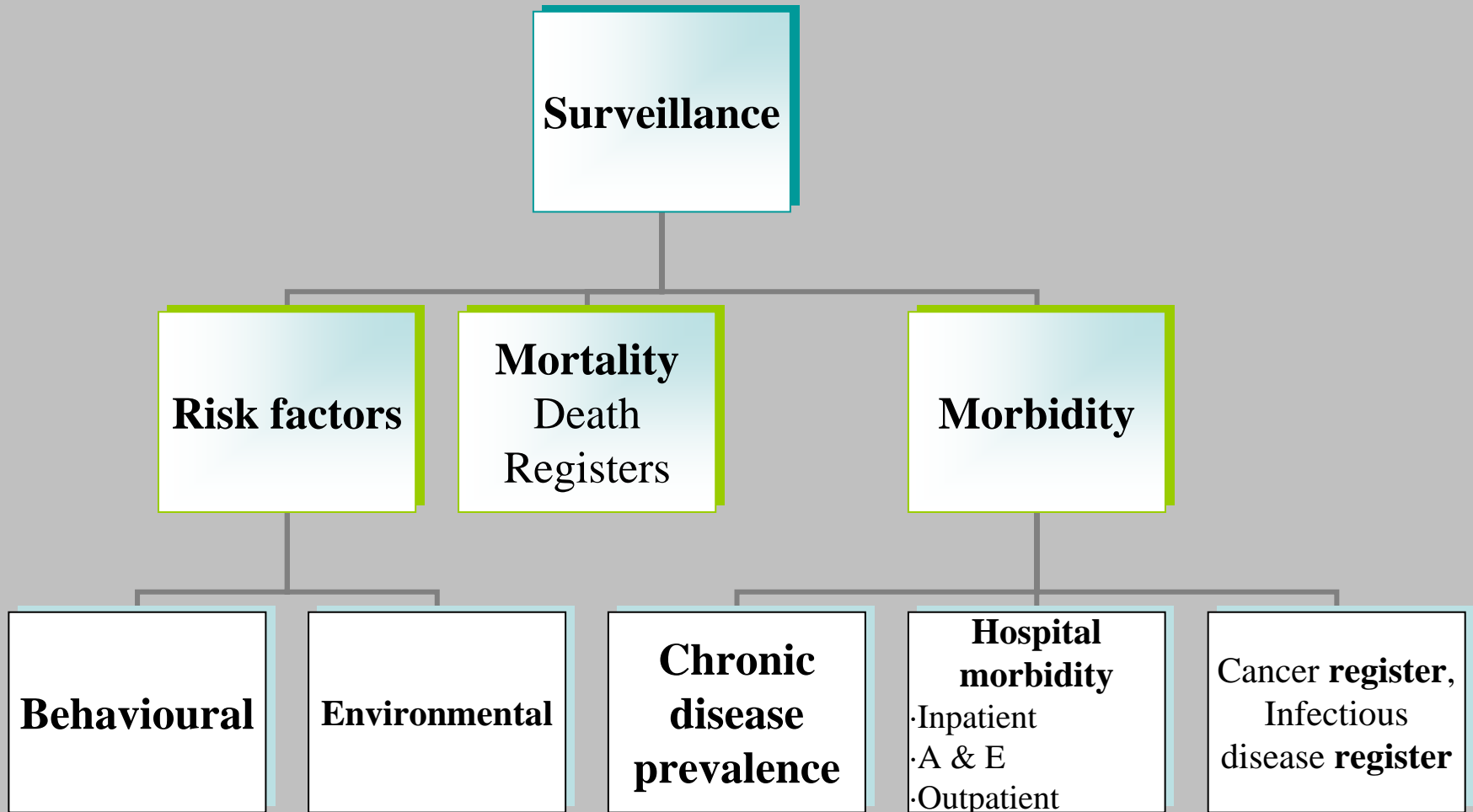
The family of surveillance

All surveillance systems have three common, inter-connected properties:

1. To describe the present (and, over time, the past).

2. To explain the present, particularly with respect to the past.

3. To forecast the future.

This results in an understanding of the TREND.

Why do surveillance?

To know the health status of the population in respect to:

- Disease prevalence;
- Risk factor exposure.

Why do we want to know this?

- To plan for the future;
- To allocate resources;
- To assess public health interventions
- To influence policy.

So we are interested in TIME.

LET US LOOK AT A TYPICAL SITUATION WHERE SURVEILLANCE DATA CAN HELP US UNDERSTAND, PREDICT, TRACK AND EVALUATE TRENDS OVER TIME.
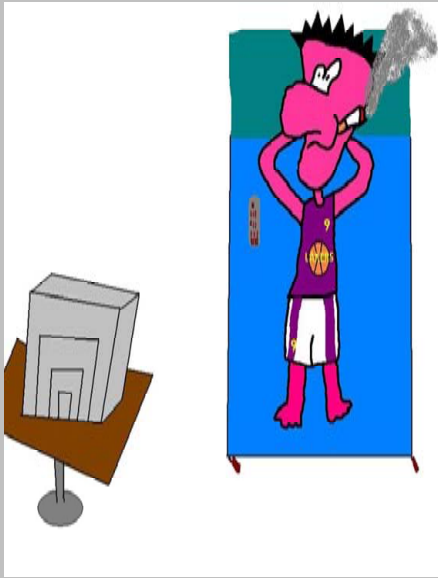
Mr Orazio Magoo

Mr Augusto McFarland

Mr Michael Romano (and his dog)

A1

These men are friends since childhood. They have much in common because of their love of sport which they watch on the TV. They hate any physical activity more than operating the remote control, opening the fridge or using the microwave oven.   Although the three have much in common you can see that they are very different.

A1 With thanks for the illustrations to Prof. Giovanni Campostrini.
Administrator; 01/10/2007
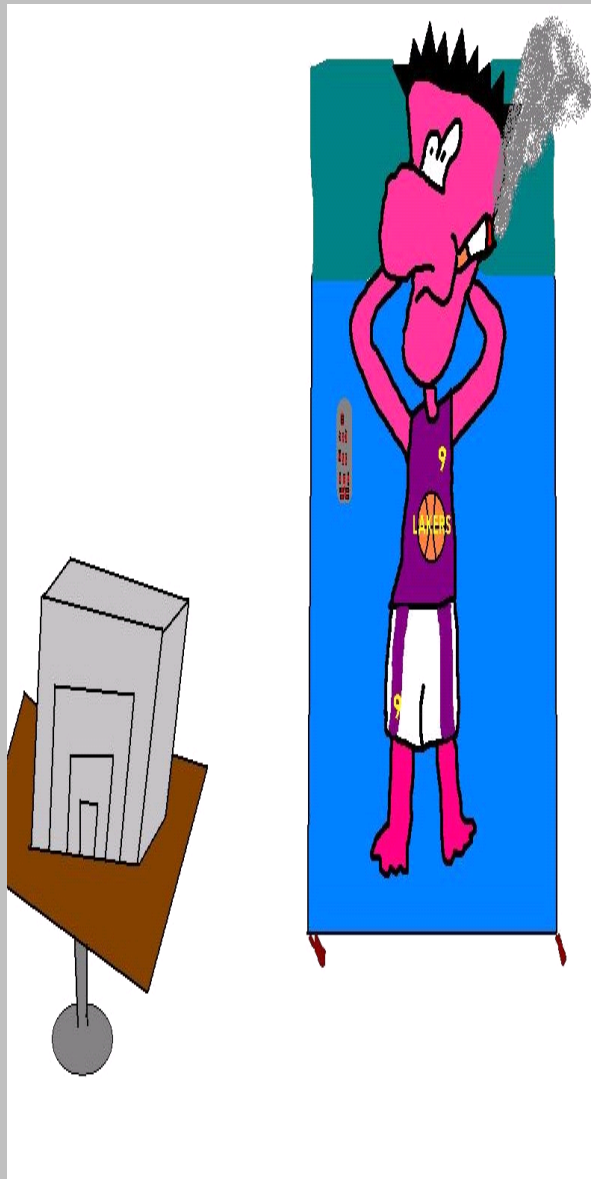
Mother Nature gave Mr. Orazio Magoo a fast metabolism. Since childhood he can eat an enormous amount and remains as skinny as a greyhound (but with a different attitude to running). He is a heavy smoker and doesn't care that many of his relatives have died from cardiovascular disease.

Poor Mr. Augusto McFarland also loves food, especially junk food that he loves to wash down with a large amount of beer (perhaps he wishes to keep his Scottish roots moist).
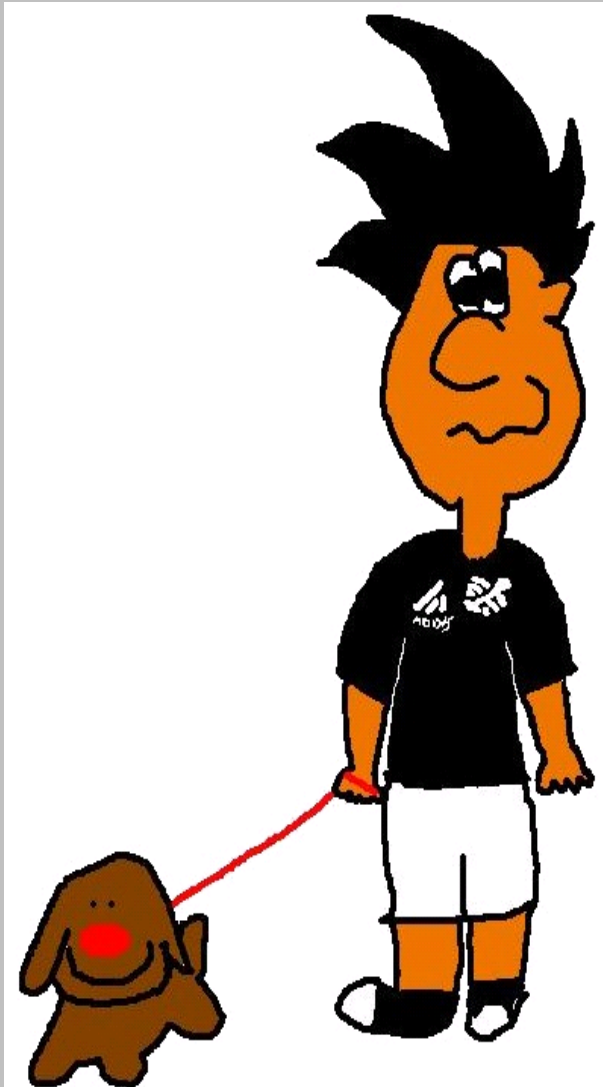
Mr. Michael Romano enjoys food, moderately, a perfect example of ideal nutrition. Although he does not care too much for healthy habits, he loves vegetables and fruits. Moderation has always been his choice. He has no health problems, no history of disease, as "strong as marble" as his ancestors were known. Although not happy about it he lives in a "walking town": he has used public transport since childhood to get to school and then work. Most of all he must get up from his armchair to walk his dog.

So what do their doctors have to say about these three friends?
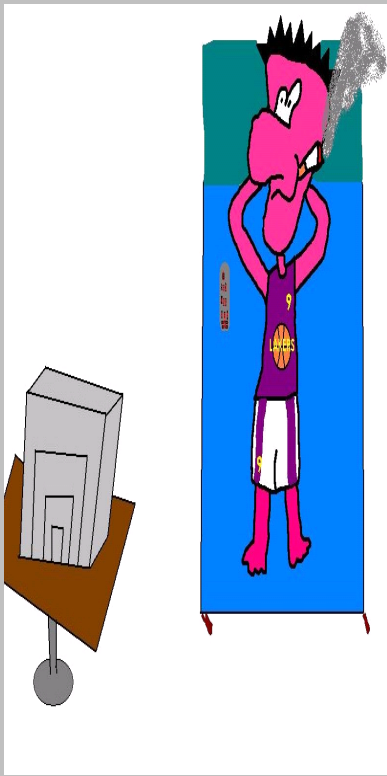
"Mr Magoo has a worrying hypertension and, given his general condition and family history he is at severe risk for cardio-vascular disease. I should tell him..."

"There is no way to control Mr McFarland's obesity. I keep telling him that he will face serious health problems (he has already experienced some), but there is no way to convince him to change his bad habits..."
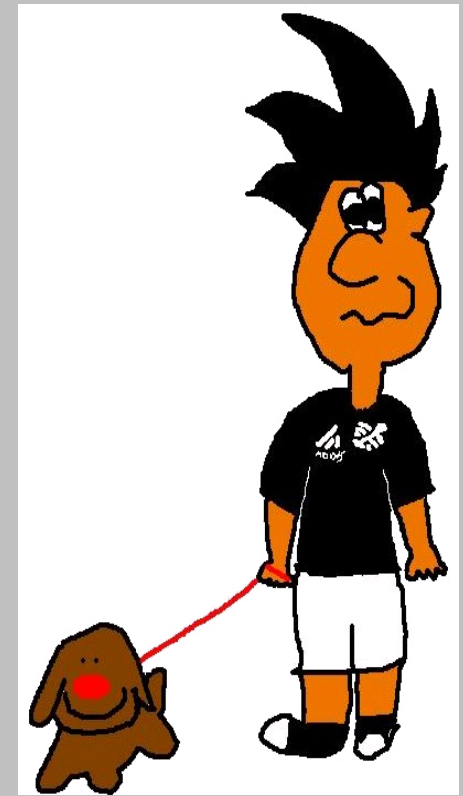
"Mr Romano? Ah, yes. I don't see him too much: he is the classical example of a healthy person. Never worrying problems. He comes here only for his regular check-up."

Let's try to track the three men in the "arrow of time" perspective.

- In all three cases the health outcome depends upon a combination of several factors, from genetic to cultural characteristics that emerge as a combination of attitudes and behaviours.

- From a public health point of view, our men's needs are absolutely different, and sharing one risk factor has little to do with how public health messages and interventions will be perceived by each of them.

So, what is the role of surveillance in all this.

Perhaps the best way is to try to answer the question. *"What do we want to know from surveillance?" Some suggestions are:*

? How many Mr Magoos, Mr McFarlans and Mr Romanos do we have in our target population.

?How do we differentiate among them, i.e., knowledge about risk factor clustering and their possible effects.

?What information do we have about their evolution, about the history of health risk factors, of the subgroups of the population sharing their characteristics, i.e. answers to the questions, are they increasing? Are they changing? Etc.;

? What information is useful in developing strategies to communicate with them.

? How successful have been our attempts to change their health and disease patterns.

22