The Environment and Human Health

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The Environment and Human Health

- Who are we trying to protect?
- What are we trying to protect them from?
- What are the implications for sustainable management of the environment?

Who are we trying to protect?

- Individual members of the public?
- Groups of individuals, or populations?
- All age groups?

Different types of detrimental effects

- (a) **Deterministic** effects
  - seen in individuals
  - threshold for the effect
- (b) **Stochastic** effects
  - statistical increase in occurrence within a population
  - possibly no threshold

Stochastic effects

Risk per individual per year	Number of individuals likely to be exposed	Estimated future 'detriment' per year
1in 10,000	50,000	5
1 in 100,000	5 million	50

Moral and ethical views on human protection in an environmental context

- **Deontological** (ethics of ‘duty’)
  - individuals are most important
- **Utilitarian** (ethics of ‘ends’)
  - impact on society is more important

Stochastic effects

Risk per individual per year	Number of individuals likely to be exposed	Estimated future 'detriment'
1in 100,000	50,000	**5**
1 in 1 million	5 million	50

What are we trying to protect them from?

- Managing exposures to risks that affect physical well-being
- Improving general quality of life, by way of interaction with the environment

Management of risks to human physical well-being

- **Reducing risks that already exist**
  - exposure to UV
  - radon gas
- **Minimising risks added because of human activity**
  - physical (road accidents)
  - chemical (industrial discharges)
  - biological (GMOs)

Reducing existing risks: eg skin cancer in UK

- 57000 new case per year (1 million in USA)
- Doubled in last 20 years
- 15% malignant melanoma (80% of deaths)
- 2500 deaths per year
- 80% of exposure to sun occurs in childhood

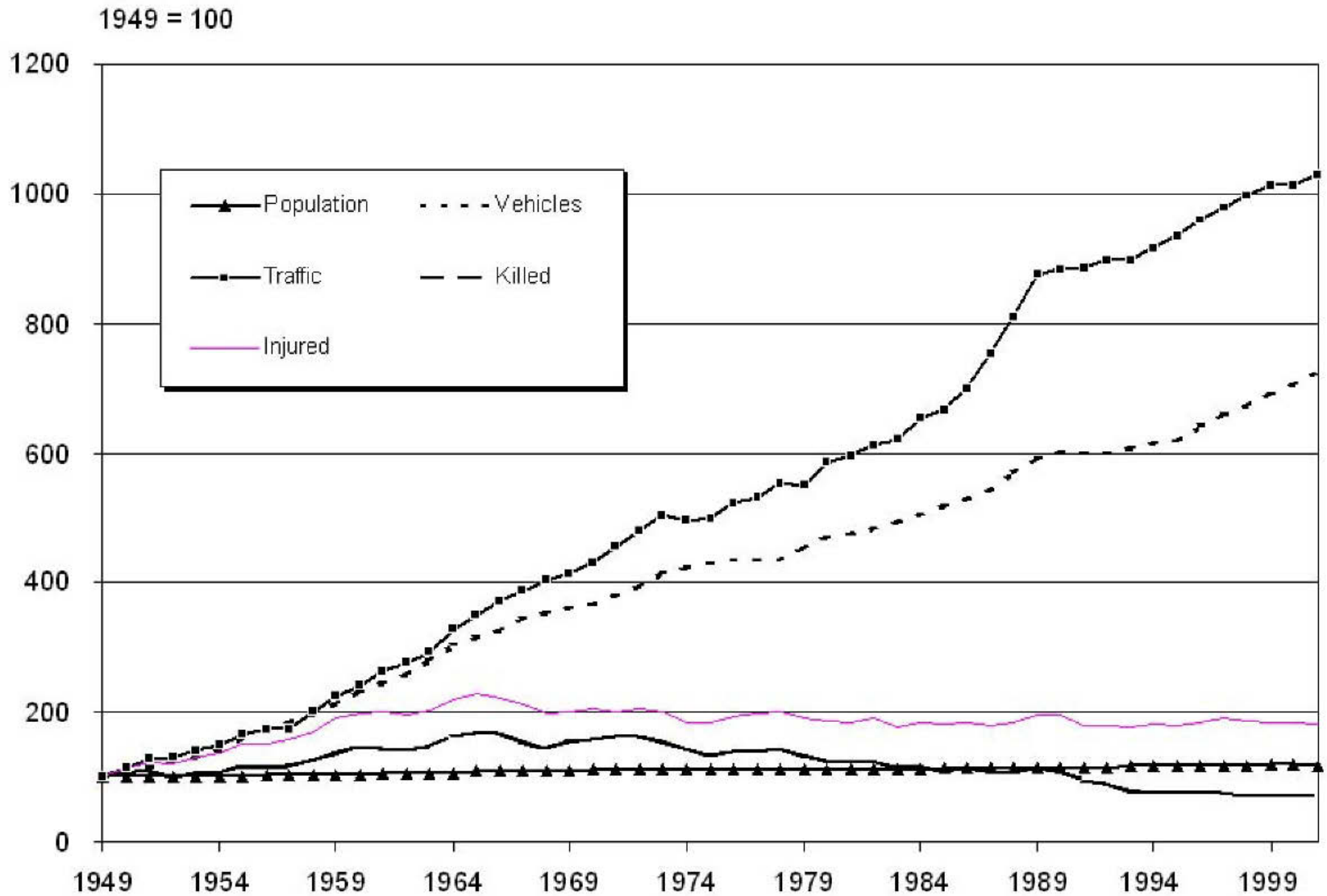
Reducing existing risks: skin cancer in UK

- Ozone layer
- CFC gases
- **Human behaviour**
- Education
- Preventive chemicals (sun blocks)

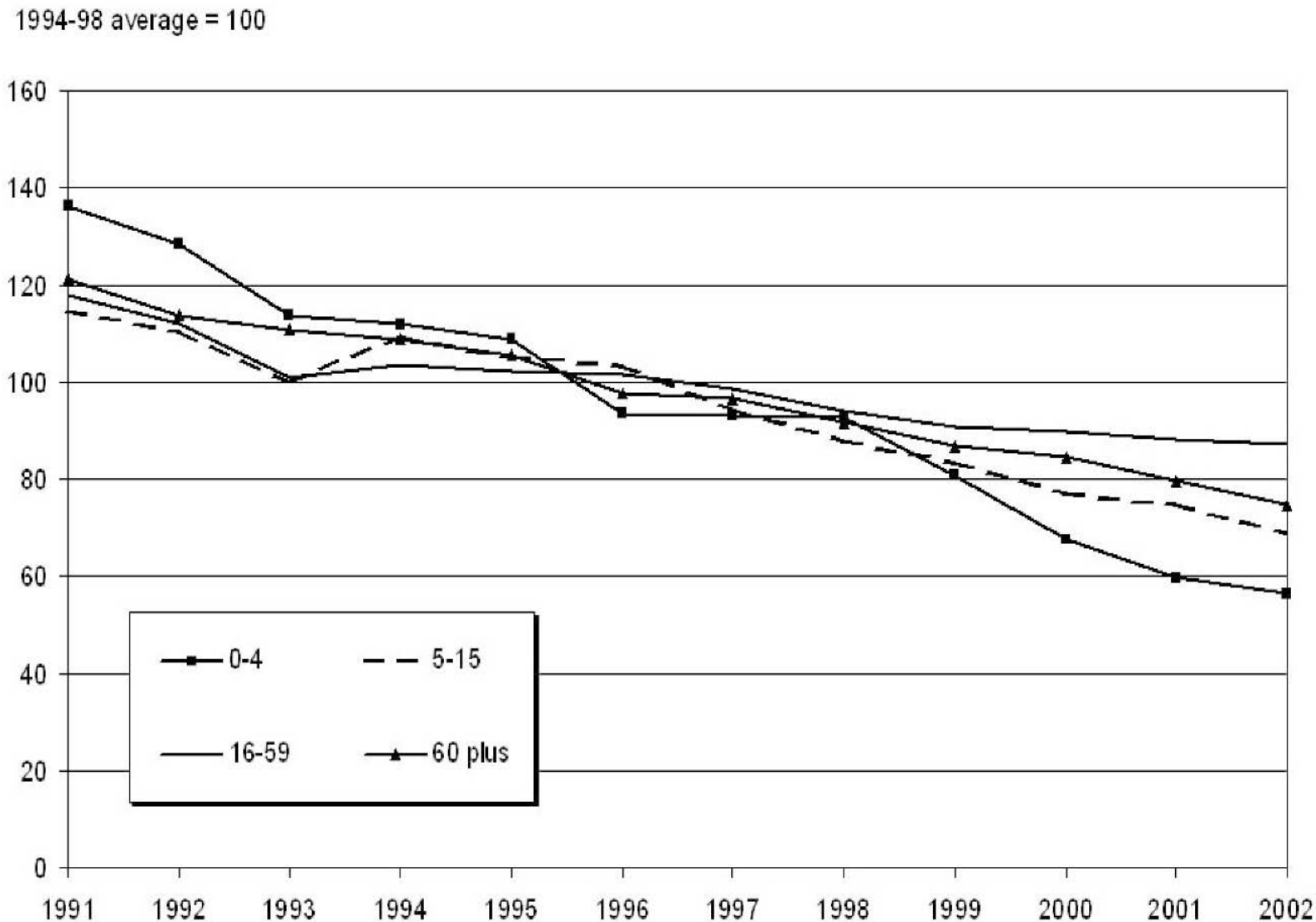
Minimising added risks - physical

- Accidents per 100,000 deaths
  - female 18 (3 road vehicles)
  - male 24 (9 road vehicles)

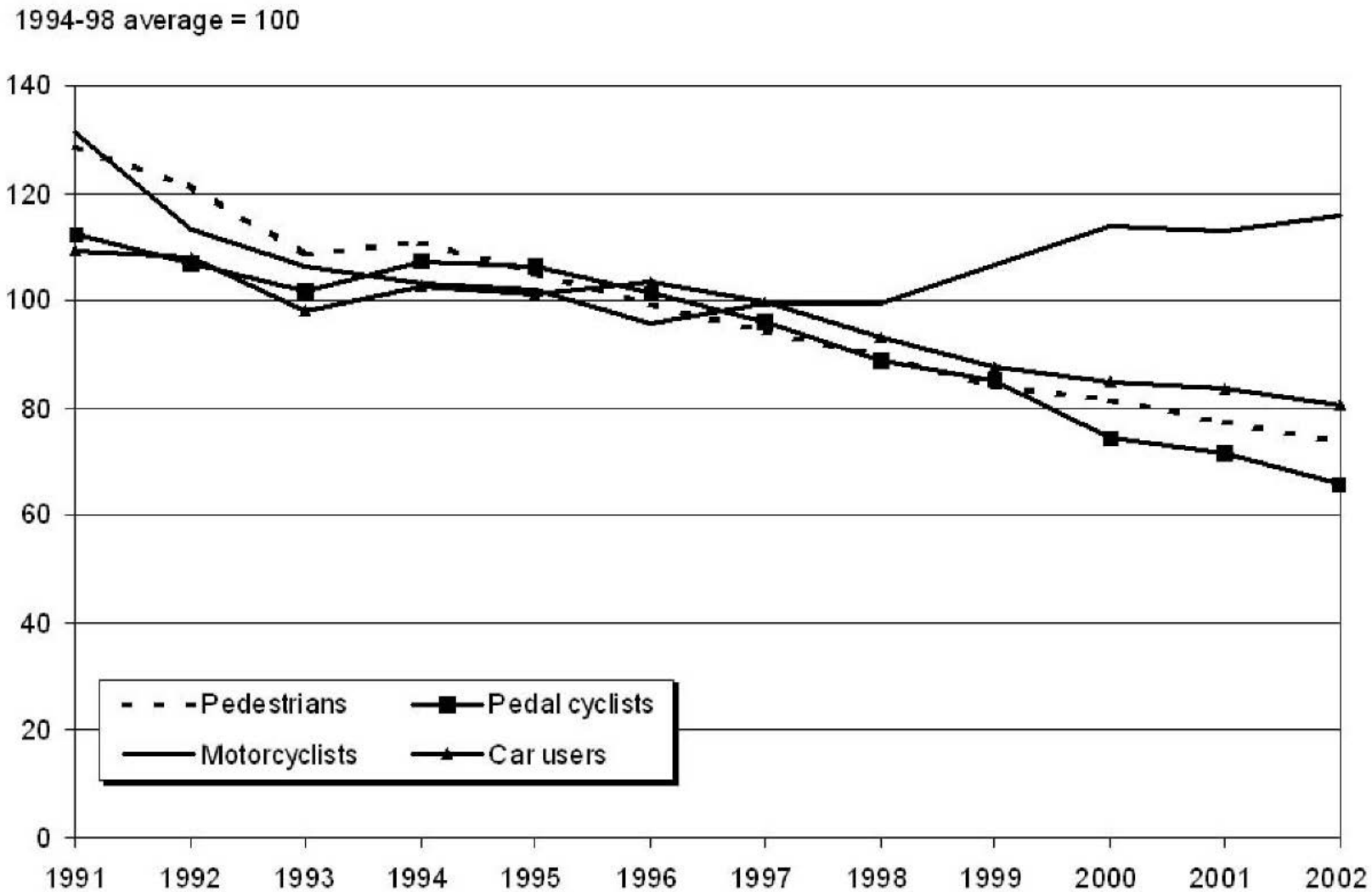
Accidents, population, and traffic



Killed or injured, by age



Killed or injured, by road user type



Minimising added risks - chemical

- Industrial
  - point source inputs
  - standards (emission & environmental)
- Environmental application
  - diffuse inputs
- Rate of creation of new chemicals

Standards and compliance

- Purpose and origins of standards
- Demonstration of compliance
- Use of information
- Public understanding

Purpose and origins of standards

- For humans, or for other biota ?
- Experimental – if so, upon what, and for what?
- Epidemiological – statistical techniques?

Origins of standards: experimental

- Animal (& human)‘toxicity’ studies
  - animal to human conversion factor (x10)
  - human variability factor (x10)
- Experimental data
  - No Observed Adverse Effect Level
  - Lowest Observed Adverse Effect Level

Origins of standards: epidemiological

- Stochastic
  - common disease, small difference in prevalence
  - rare disease, insufficient data
- Need to demonstrate existence of cause and effect

Managing added chemical risks

- Apply IPPC
- Minimise waste creation, and recycle
- Strict and forceful control
- Don’t create chemicals unnecessarily

Minimising added risks - biological

- GMOs
- Invasive disease-carrying species
- Microbial

Standards and compliance

- Purpose and origins of standards
- **Demonstration of compliance**
- **Use of information**
- **Public understanding**

EC bathing water standards

- Total coliform bacteria
- Faecal coliform bacteria
- 95% of samples have to meet (I) standards, per bathing season
- 19 or 20 out of 20 samples to pass
- 2 or more samples to fail
- Also (G) standards (higher values, but 80%)

What's in my back yard - map it ! - Microsoft Internet Explorer

File Edit View Go Favorites Help

Back Forward Stop Refresh Home Search Favorites History Channels Fullscreen Mail Print

Address sp?name=ea&cmd=&XCOORD=251780&YCOORD=147380&top=167380&bottom=127380&left=231780&right=271780&clkOver=&maptool=zoomrefresh&layertool=bwd&MapLayerBWD=true Links

ENVIRONMENT AGENCY

Overview Map

Map Tools

Zoom In

Zoom Out

Pan to Point

Identify Feature

Scale: 1: 500000

Overview 1:3 mill 1:1 mill 1:500000 1:100000

Layer Tools

Identify	Name	Display	Legend
○	ISR	☐	Site Location
◉	BWD	☑	Excellent, Good, Poor

Refresh Maps

Internet zone

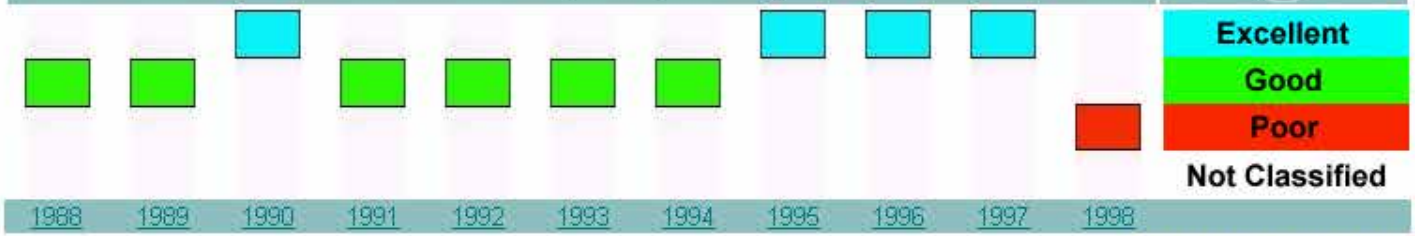
Start Microsoft PowerPoint - [Pr... What's in my back ya... Fri, 19 Mar 1999 9.28

ENVIRONMENT AGENCY

what's in my BACK YARD? [Ask a Question]

Sites identified on the maps, ordered by Bathing Water Name.

Site Name	Map it
Annual Quality Classifications	
Saunton Sands, Devon (Ref 34100)	



Select a year for further details

ENVIRONMENT AGENCY

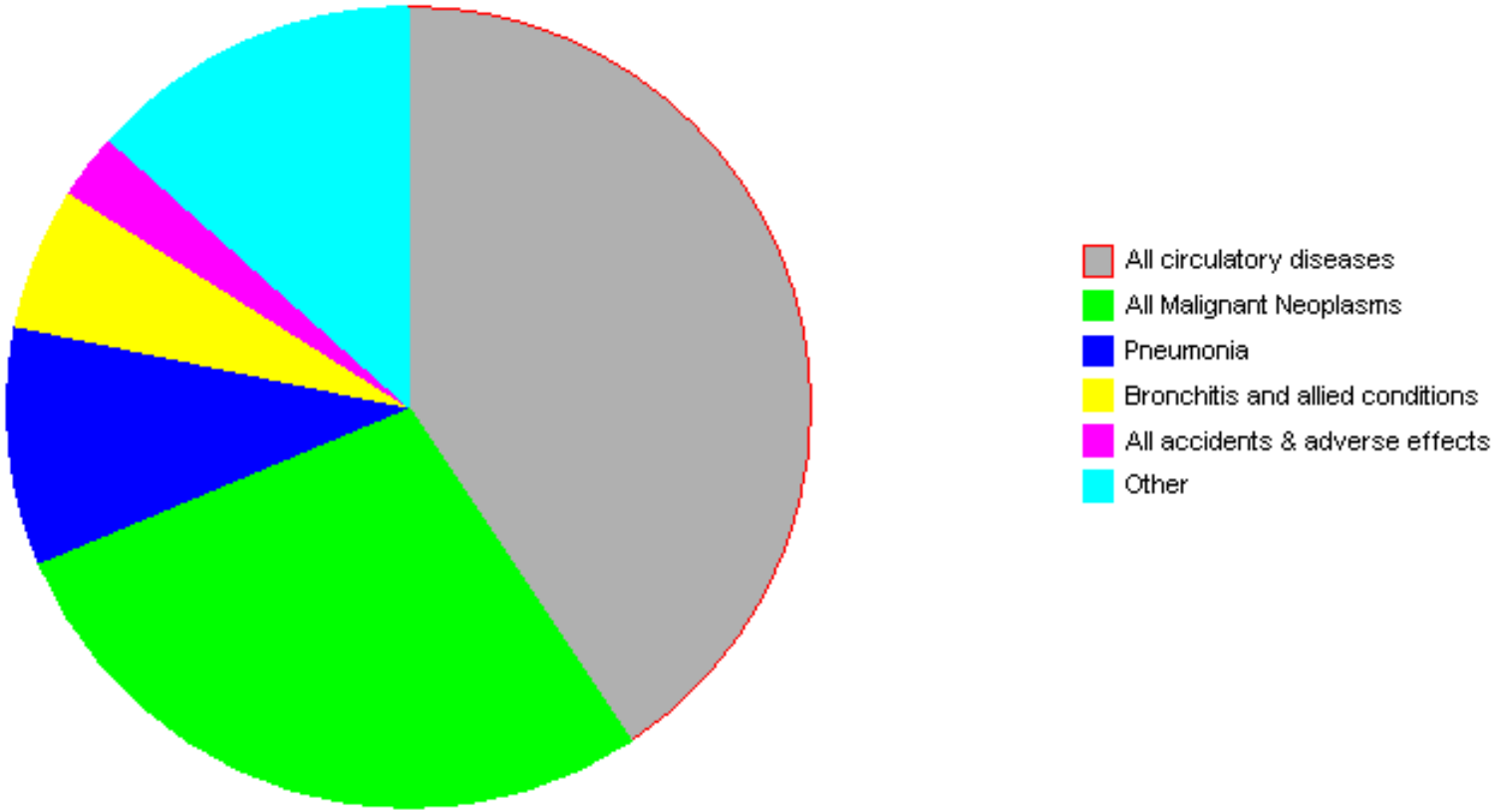
what's in my BACK YARD? [Ask a Question]

Bathing Waters Directive

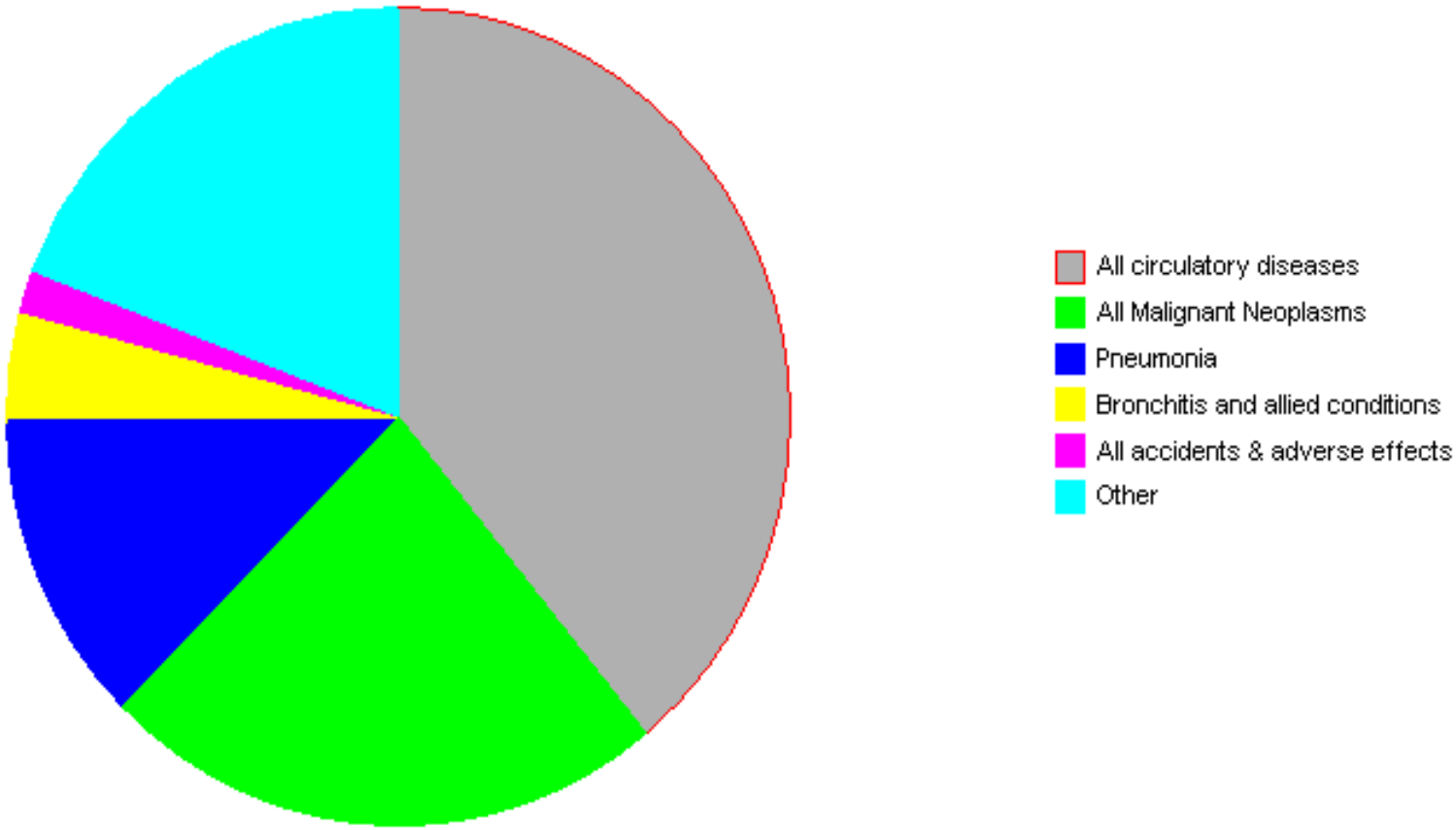
1998 Bathing Water Quality for **Saunton Sands** (Site Reference 34100)

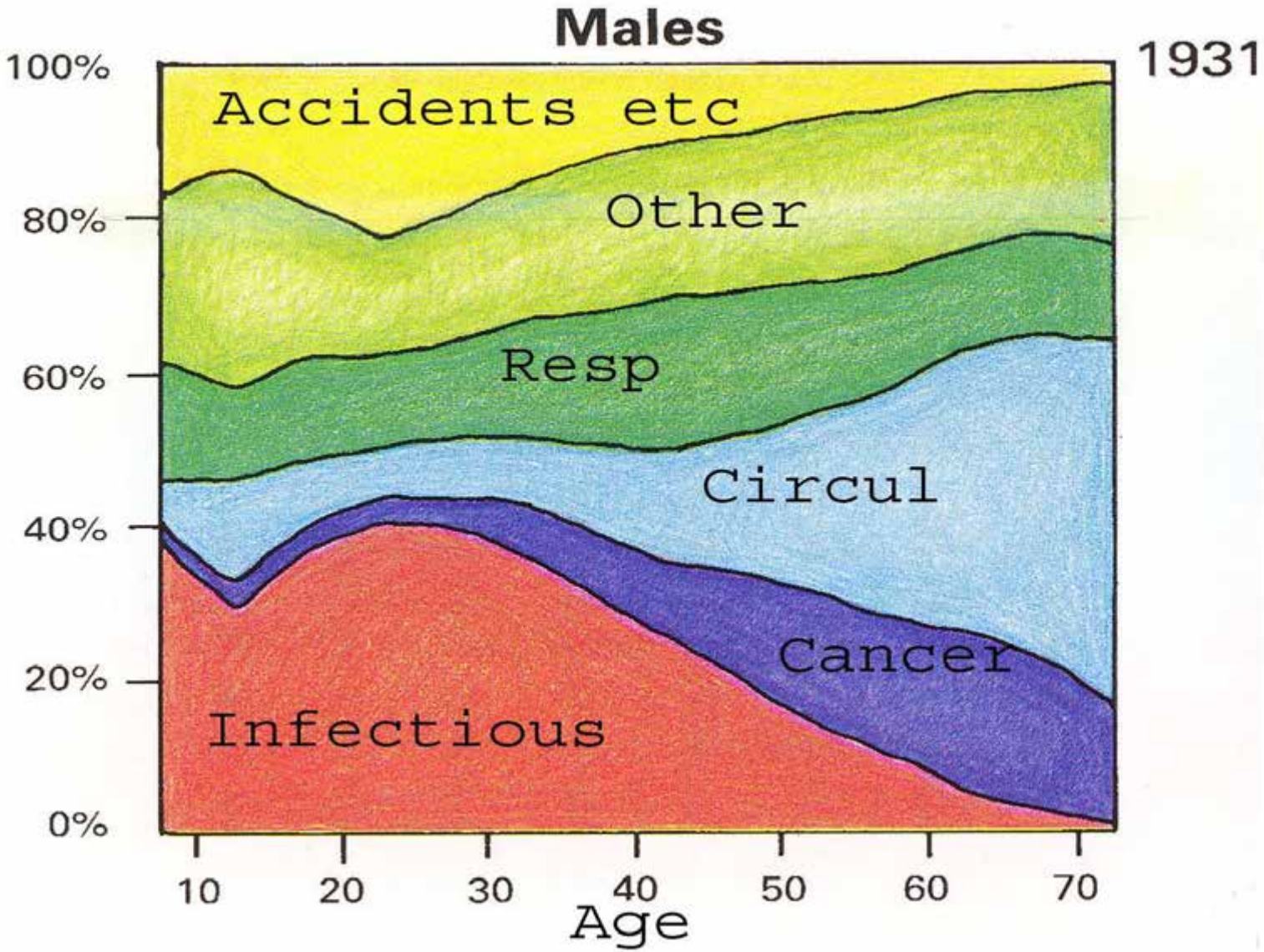
Date	Time	Total Coliforms (colonies / 100ml)	Faecal Coliforms (colonies / 100ml)	Faecal Streptococci (colonies / 100ml)	Salmonella	Enteroviruses (plaque forming units / 10 ltrs)	Water Quality
5/8/98	10:45	21	3	2	-	-	Excellent
5/11/98	11:55	259	108	27	-	-	Good
5/15/98	10:50	53	24	9	-	-	Excellent
5/27/98	10:45	11	4	8	-	-	Excellent
6/3/98	11:45	147	62	24	-	-	Excellent
6/12/98	10:50	2610	91	6	-	-	Good
6/16/98	10:40	76	37	5	0	-	Excellent
6/19/98	10:30	50	13	5	-	-	Excellent
6/28/98	11:20	280	136	21	-	-	Good
7/7/98	16:20	9	<10	9	-	-	Excellent
7/14/98	10:50	2240	2500	155	-	-	Poor
7/23/98	17:05	3100	2300	38	-	-	Poor
7/30/98	10:50	97	18	9	-	-	Excellent
8/8/98	11:30	97	9	27	-	-	Excellent

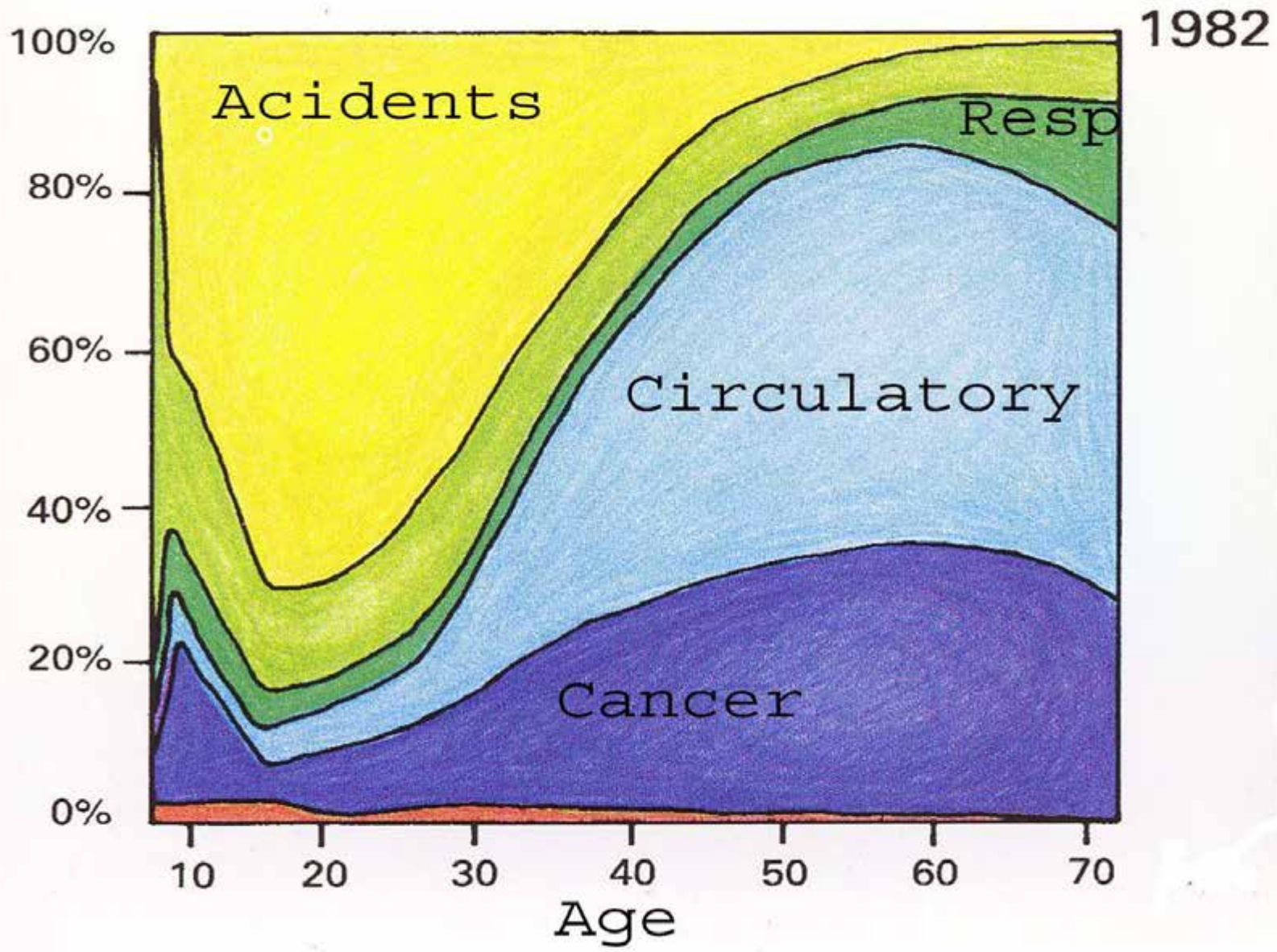
Male deaths by selected causes, 2000



Female deaths by selected causes, 2000




Males
1931
100%
80%
60%
40%
20%
0%
Accidents etc
Other
Resp
Circul
Cancer
Infectious
10
20
30
40
50
60
70
Age


1982
100%
80%
60%
40%
20%
0%
Acidents
Resp
Circulatory
Cancer
10
20
30
40
50
60
70
Age

Human genome

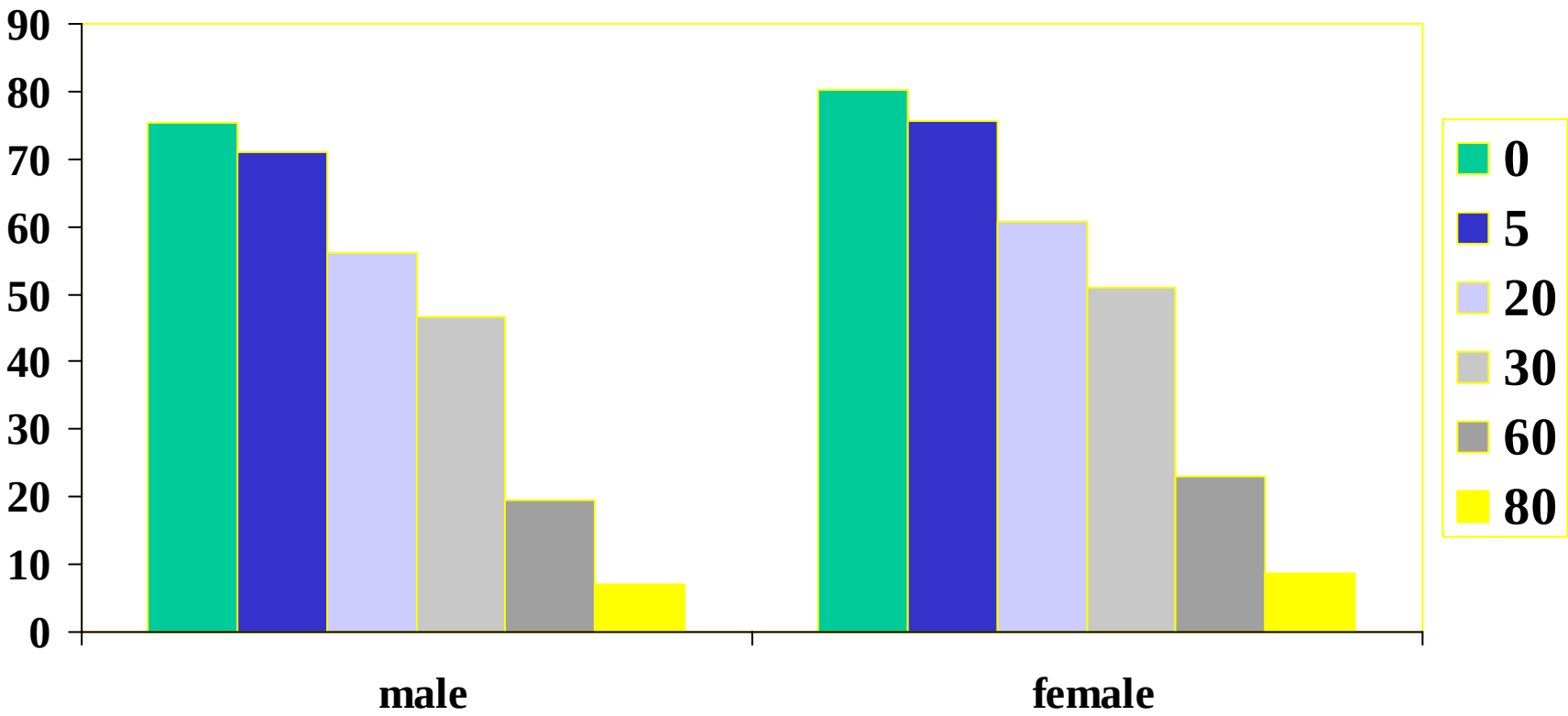
- Ageing accelerates with age
  - mutation increase with cell division
  - ability to repair DNA decreases
- Mutation rates differ
  - in males and females for the same gene
  - by 1000 fold from gene to gene
- Hundreds of genes implicated in some diseases

Life expectancy at birth

- 1900 - males 45 years
  - females 49 years
- 2000 - males 75.5 years
  - females 80.2 years

[From age of 12 onwards, risk of death doubles every 8 years or so]

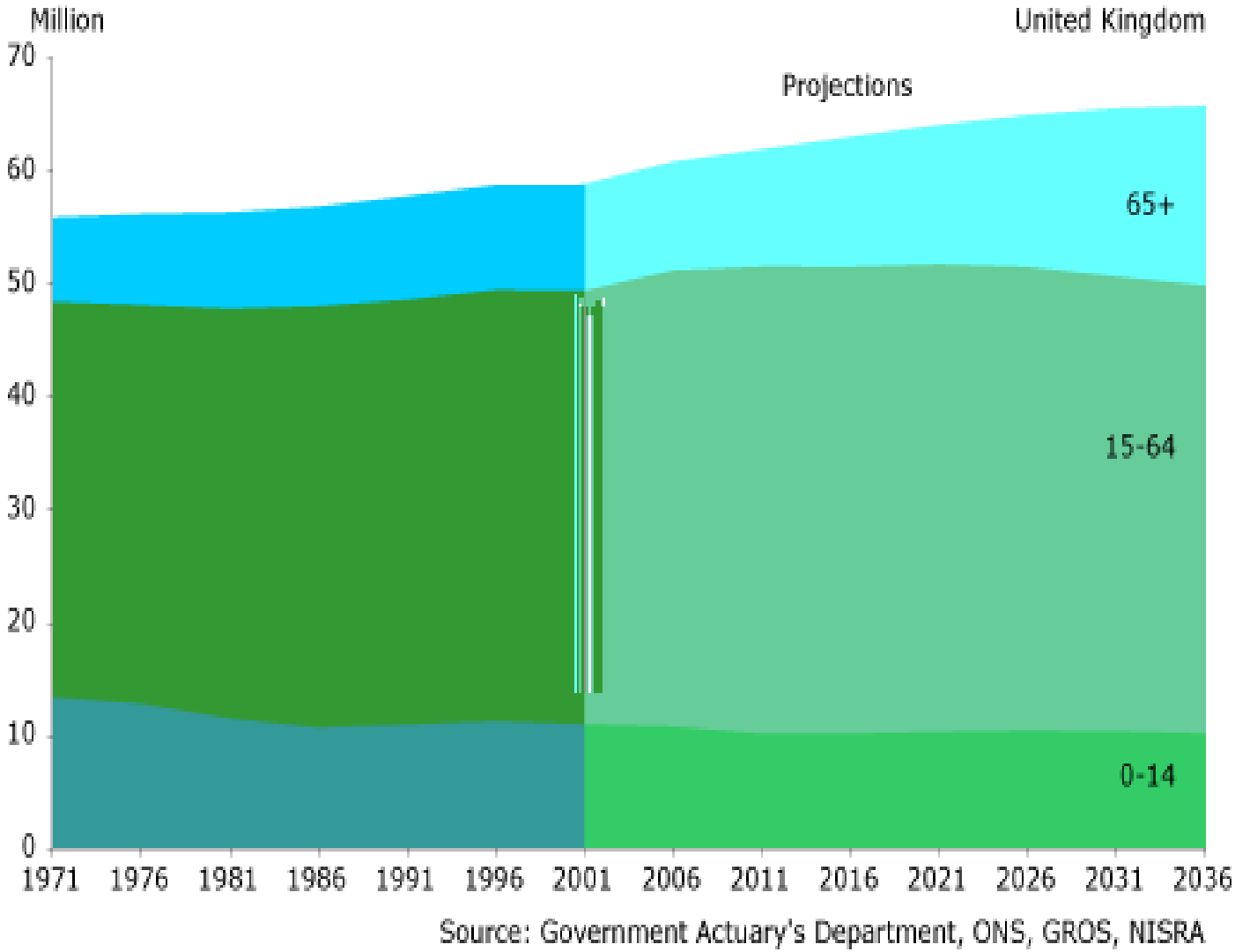
Life expectancy (years) for different age groups



UK Population age structure

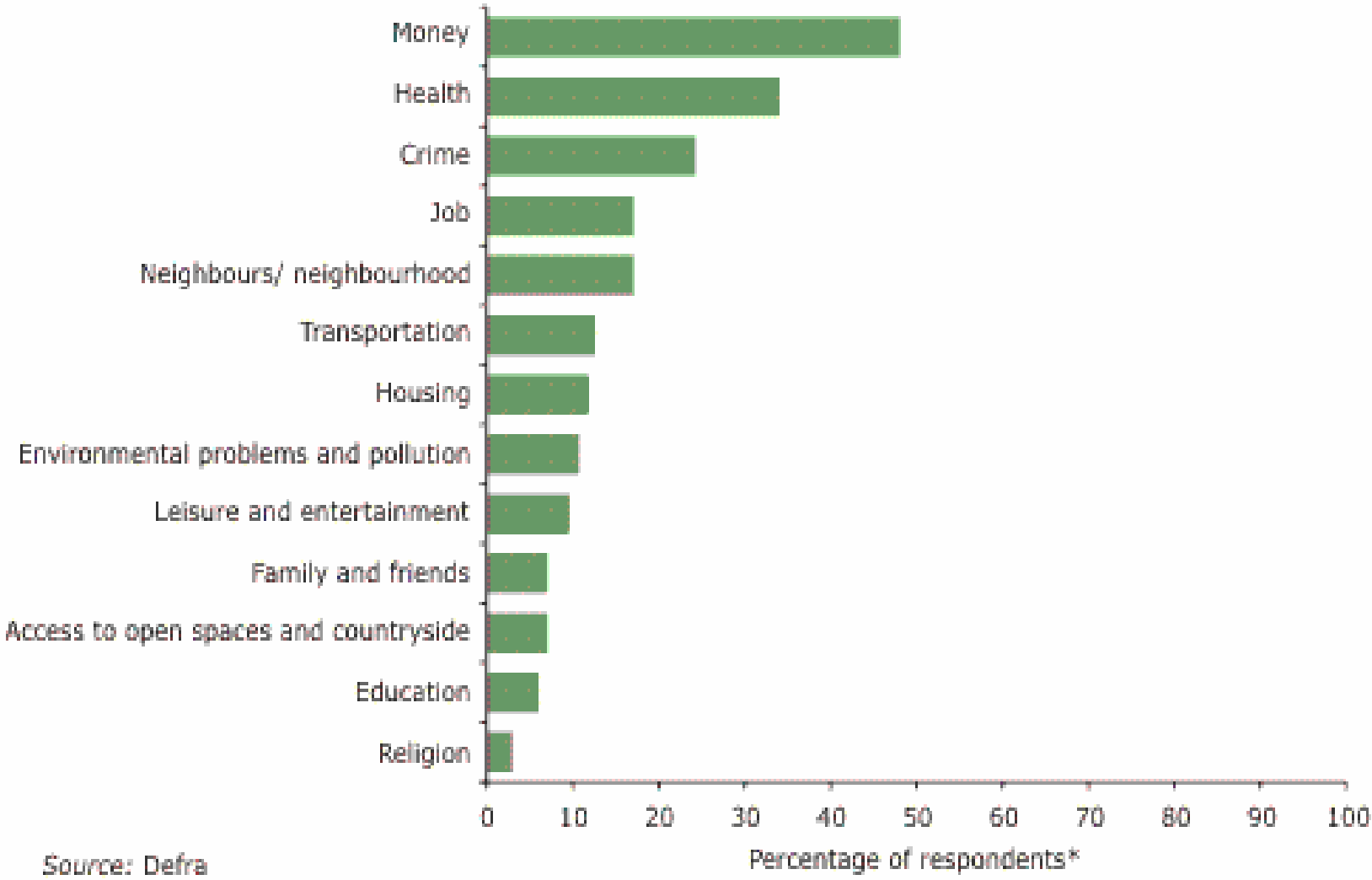
- Ageing (or more mature) society
- > 65s double that of 1930
- >80s increased by 50%
- >90s doubled
- Now have 20% of population > 60
- In 10 years time, over 65s> under 16s

Figure 1: Population estimates and projections, by age group: 1971-2036



Source: Government Actuary's Department, ONS, GROS, NISRA

Figure 2.1: Most important factors affecting quality of life: 2001



Source: Defra

*Percentages do not sum to 100 because more than one answer could be given

What are we trying to protect them from; and thus what, in this context…….. is the environment?

- Not just the absence of disease
- Quality of life
  - physical and biological factors
  - social and psycho-sociological factors
  - ability to assess, control, influence

Ethical views on human and environmental protection

- Human protection
  - deontological
  - utilitarian
- **Environmental protection**
  - **anthropocentric**
  - **biocentric**
  - **ecocentric**

ANTHROPOCENTRIC

- Only humans have moral significance
- The environment is of concern primarily in so far as it affects humans

BIOCENTRIC

- Moral significance extended to other species – related to particular biological characteristics
- Responsibilities may include concern for individuals

ECOCENTRIC

- Moral value attributed to both biotic and abiotic components of the environment
- Variety of views about which entities have moral value

Areas of international agreement

Five common (inter-connected) features included in international environmental legislation:

- sustainable (economic) development
- conservation (species or habitat)
- maintain biodiversity
- *environmental justice*
- *respect for human dignity*

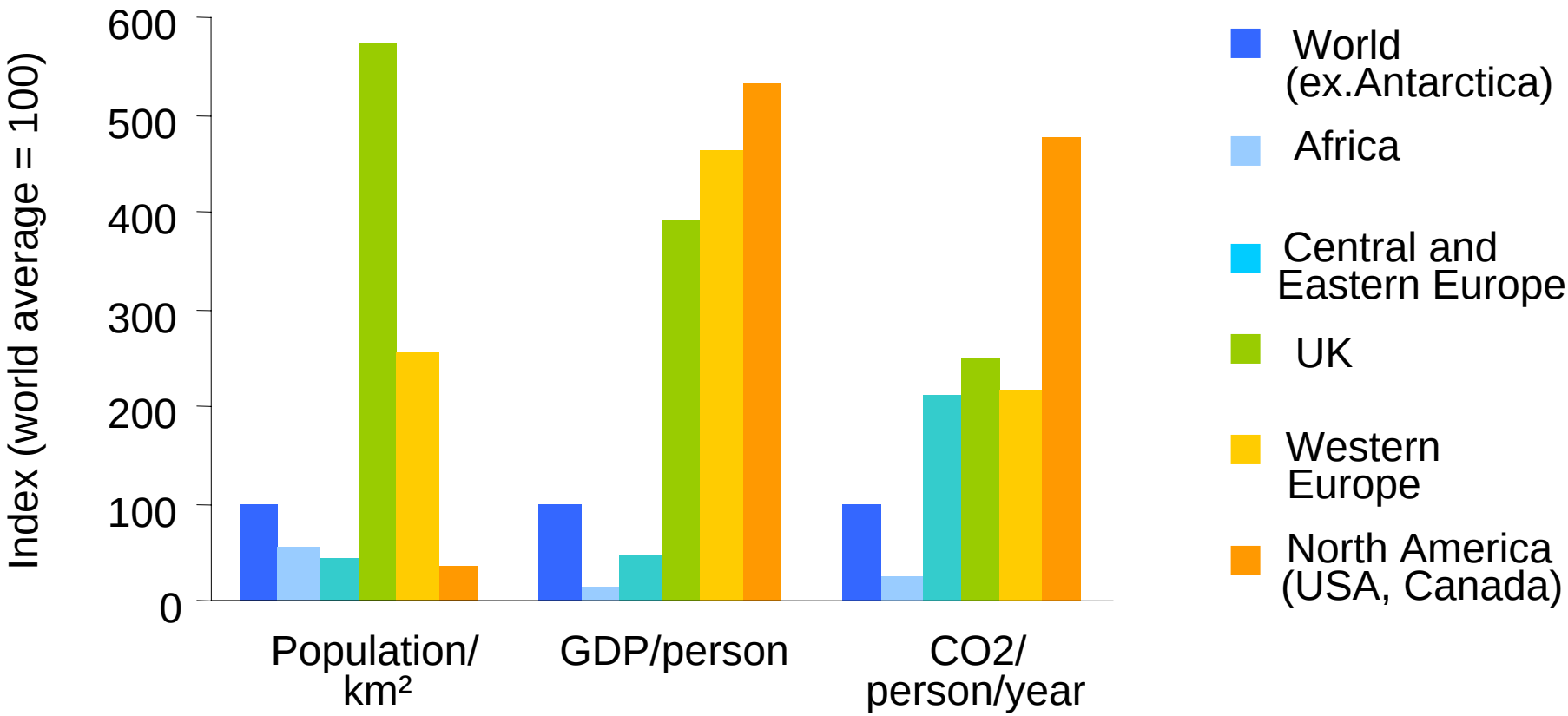
Environmental management

- **Environmental exploitation**:
  - sustainable culling and cropping of populations
- **Pollution control**:
  - protecting humans and the environment generally from specific pollutants
- **Nature conservation**:
  - protecting specific species and habitats from damaging activities generally

Real Risks for the Future

- Climate change (energy production)
  - atmospheric & weather related effects
  - climatic changes (desertification)
  - sea level rise
- Loss of natural resources
- Loss of habitats and biodiversity

World comparisons of population, GDP and carbon dioxide emissions, 1996



Source: WWF - World Wide Fund for Nature, 1999

A COMMON APPROACH

To protect human health by

- **avoiding deterministic effects and**
- **minimising stochastic effects.**

And to protect the environment by

- **reducing the frequency of effects likely to 'harm' fauna and flora to a level where they would have a negligible impact on**
- **conservation of species, maintenance of biodiversity, or the health and status of natural habitats or communities.**