

# Healthy trees, healthy people

## Arboricultural Association

Sir Richard Thompson  
Past-president, Royal College of Physicians

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Royal College  
of Physicians

Setting higher standards

# Looking at gardens

Flowering plants promote relaxation (EEG & EMG)

*Yamano et al 2004*

Viewing plants reduces BP & heart rate

*Son et al 2004*

Viewing plants improves EEG in schizophrenia

*Son et al 2004*

Gardening reduces stress

*Unruh 2004*



# Clinical outcomes

Uppsala

Cardiac surgery

Randomised to view nature scenes

Reduced post operative anxiety & pain

Abstract painting increased anxiety!

Eltinge & Ulrich 1993



# Room plants

Reduce micro-organisms by 60%  
and dust 20%

Remove carbon monoxide  
toxins



# Ornamental indoor plants

270 patients randomised

Surgical hospital recovery rooms

Eight species of plants after surgery

Reduced - LoS

use of analgesics

pain, anxiety, fatigue

Improved-physiology

satisfaction with rooms

SH Park, 2002, MD Kansas



# Sculpture

“Bird garden” on roof top  
Surrounded by cancer wards  
No greenery, only sculptures  
20% of patients had strong negative  
reactions

so urban design can influence health

Hefferman et al 1995; Duke U



# Air pollutants

Coarse particulates -  
10-2.5 microns

dust

pollen

fungal spores

insect parts

emissions – vehicles, burning

often complex

- enter gastrointestinal tract



# Air pollutants

Fine particulates –

< 2.5 microns

partly formed by aggregation and  
condensation

penetrate deep into lungs

large surface area for adsorption

acid aerosols

mutagenic

carry transition metals





# Air pollutants

Nanoparticles

< 100nm

enter circulation

enter cells

affect properties of blood

? cardiovascular disease



# Emissions

Vehicles; petrol & diesel

CO, ozone, N&S oxides, NH<sub>3</sub>

Cooking stoves

Coal, gas & biomass burning

Landscape fires

– 200K deaths p.a.

Africa, SE Asia, S&E Europe

Cigarettes



# Fine particles and health

## Fine particles & ozone

strongly associated with:

overall mortality

excess premature deaths

hospital admissions

cardiovascular disease

COPD

asthma *WHO working group*

No thresholds of secondary cigarette smoke



# Air pollution & health

COMEAP estimates that pollution causes:

29K excess deaths p.a. in UK  
4-8% of all deaths  
at cost of £29bn p.a.

Reducing pollution improves health e.g.  
clean air act in London



# Road proximity

Holland

Living near major road associated with:

cardiopulmonary deaths RR 1.95

all deaths 1.41

but **not** non-lung cancer & non- CV deaths

Hoek et al 2002

*Could this be partly socio-economic?*



# Trees

Remove carbon dioxide and store carbon

Remove particulates

    sulphur dioxide

    nitrogen oxides

    carbon monoxide

    ozone

    toxic elements - lead,nickel,cadmium

Reduce water run off



# Cleansing by trees

One urban park in USA daily removed:

particulates 48lb

nitrogen dioxide 9

sulphur dioxide 6

carbon monoxide 0.5

carbon 100

One maple removed 60mg Cd, 140mg Cr,  
820mg Ni & 5.2g Pb annually

*Evergreens may be better*



# Trees

Shade people & buildings, cool temperatures-reduce hot weather excess deaths

protect from frost & wind-reduce cold weather deaths

Sequester carbon

Reduce particulates (by 60% at street level)

Reduce pollutants (oxides, ozone etc)

Increase negative ions

*Artificial trees*





# Climate warming and health

Rise of sea level – inundation  
migration

epidemics

Warming

- heat waves

extreme weather

water run-off

spread of diseases

Forests important



# Health effects of gardens

Egypt-court gardens for mental  
ill health

Japan-restful gardens

Monasteries for ill patients

19<sup>th</sup> century hospital gardens

Florence Nightingale

*And gardens contain trees!*



# Physical improvement from gardening

Cardiovascular & respiratory

Back

Flexibility & strength

Vitamin D

Better diet; grow own food

Less coffee & cigs!

Weight loss – diabetes etc

55% of a study group said ‘improved a lot’

*There is a gym outside your window!*



# Exercise

Benefits cardiovascular system

Improves mood, depression, dementia

Improves balance & reduces falls

Protects bone density

Improves lung disease

Improves stroke disability

**Counteracts the effects of obesity**

William Bird



# Calories burned in 30 min

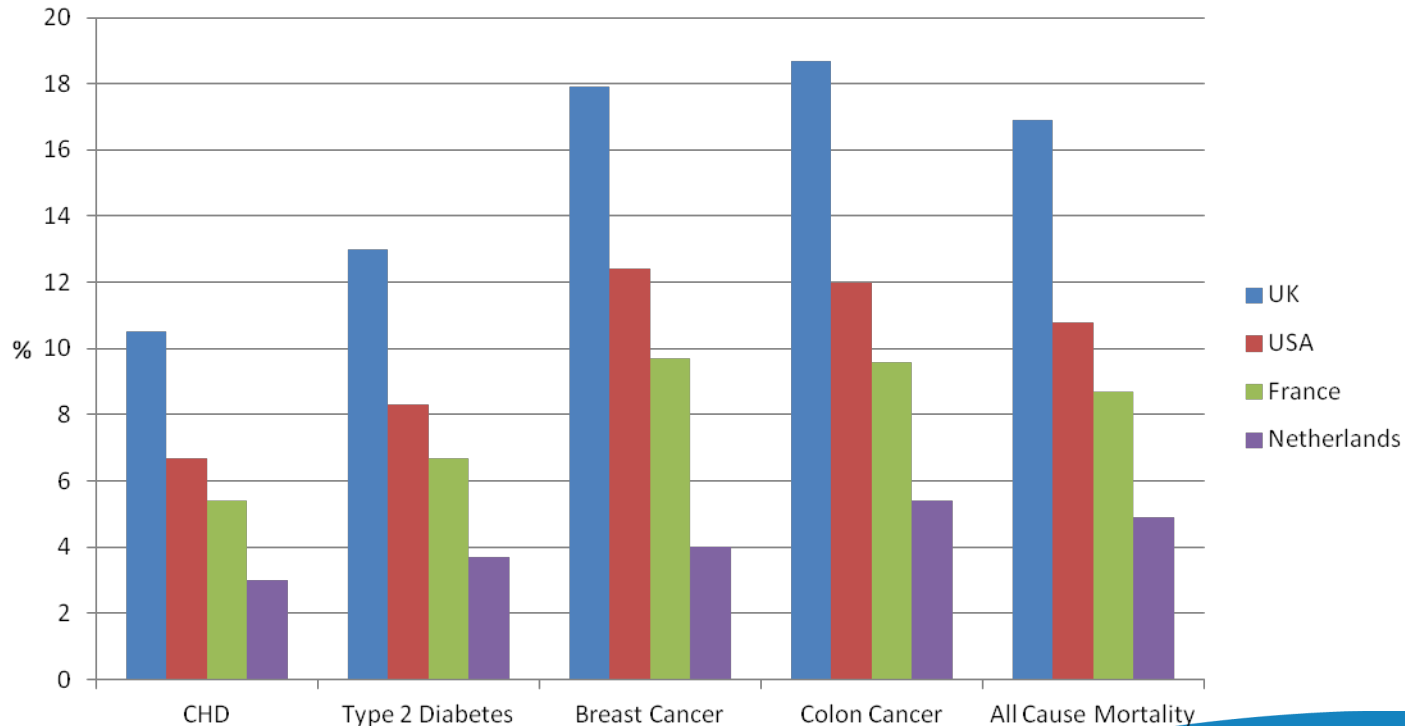
Sleeping	36	
Walking	90	
Raking	162	=rowing machine
Weeding	182	
Digging	202	=lifting weights
Chopping wood	243	
Push mowing	243	=treadmill
Shovelling	243-364	
Turning compost	250-300	



# Mortality due to Inactivity

## Population Atributable Fraction of mortality due to Inactivity (%)

Lee I-M et al. Effects of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. The Lancet 2012 Published online July 18.



# Exercise

Inactivity is 4<sup>th</sup> leading cause of death

*So increase activity  
improve exercise environment*

including more trees!



# Benefits of gardening

Physical fitness & balance

Cardiovascular & respiratory health

Complications of obesity

Encourages weight loss

Potential savings for NHS

**Prescribe gardening**

**Make more gardens!**





# Social & Therapeutic Gardening

Is the purposeful use of plants and plant-related activities to promote health and wellness for an individual or group



# Social and therapeutic gardening

For the physically disabled:

- stroke
- partially sighted & blind
- elderly

For the mentally disabled:

- mental health problems
- learning difficulties
- dementia



# THRIVE

2006 survey of disabled:

28% gardening as hobby

2/3 participated in gardening

87% had access to a garden

found gardening beneficial  
enjoyed gardening tasks



# Conclusions

Brown sculpture gardens deleterious  
Green gardens improve mental health  
& recovery from surgery

Biodiverse, not barren green saharas

Gardening improves mind and body  
i.e. therapeutic for mental and  
physical illnesses

Trees benefit health



# Trees

Remove particulates

Destroy toxins

Improve mental and physical health

Improve urban environment

Reduce climate change



# Conclusion

**Rx – wise doctors prescribe:**

more gardens  
more gardening  
more green parks  
**more trees!**



# Thank you



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# Gardening

At home: garden or allotments

Within projects

e.g. THRIVE at Battersea Park &  
Reading

Complementary therapy



# Care farming

Strong in Europe - *Greencare* farms  
500 Norway, 550 Netherlands etc (2004)  
Farmers, healthcare & patients  
Psychiatric patients, learning disabilities,  
drug abusers, elderly, obesity, stress

National Care Farm Initiative UK

J Pretty, Univ of Essex



# THRIVE

Sites at Reading & Battersea Park

1000 projects across UK

24,000 disabled & disadvantaged people  
involved each week

Therapy & research

Teaching therapeutic gardening

Information & journal



# Benefits of gardening

Hobbies

Health

Better food grown

Nutrition

Accredited training

Employment in gardening industry

Income



# Disability

In the UK: **10M with disability, of which**

770K are children

750K with dementia – 1M in 2025

250K admitted to psychiatric  
hospitals annually

300K disabled from stroke



# Sunlight

Vitamin D in skin

-March to October

Reduces blood pressure



# Physical disability

- Impairs physical performance
- Causes depression
- Reduces ability to work
- Causes poverty
- Social isolation
- Increases alcohol, obesity & smoking
- Reduces activity



# Stroke

**300K with stroke in UK**

IR aged 40:

*'I couldn't see a way I would ever be able to .....walk in my garden, let alone work in a garden. Therapy through gardening is a powerful tool-it helped me come to terms with my stroke, and it helped me to learn how to live again'*





# Visual impairment

*'I get so cross with myself not being able to do more in my garden. I don't want to rely on others all the time.*

*THRIVE make you realise there are things you can do'.*

-a partially sighted client





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# Benefits of gardening

Physical:

- strength, movement ,coordination

Mental:

- social, friends, less isolation
- numeracy & literacy
- conversation
- confidence & self esteem
- better mood
- improves dementia



# Viewing nature scenes

In few minutes:

reduces-emotion/psychological stress

fear, anger, sadness

BP, PR, muscle tension

brain EEG activity (Japan)



# Emissions & health

Chronic poisoning – carbon monoxide

Asthma & COPD – ozone, N&S oxides, NH<sub>3</sub>

Lung cancer – particulates

heavy metals (Pb, Cd, Cr, Hg)

hydrocarbons

Cardiovascular disease

Hypertension



# *Fitness the Dynamic Gardening Way*

Jeff Restuccio 1992



# Green gardens in hospitals

Improve mood

Reduce stress in patients, families & staff

Place of escape from stress

Increase satisfaction of patients, families & staff

Biodiversity important

But not if concrete gardens

*Roger Ulrich, 2002*

