The Caerphilly Collaborative Cohort Study

Peter Elwood and Janet Pickering with John Gallacher, Tony Bayer et al.

Division on Population Medicine, Cardiff Dementia Platform, Oxford University

Cardiff Mercure Cardiff Holland House Hotel June 21st 2019

Live Caer-philly

‘To treat a disease is an admission of failure
Prevention is the ultimate aim of medical practice.’

Cochrane

Peter Elwood and John Gallacher
Division on Population Medicine, Cardiff
Dementia Platform, Oxford University

Cardiff Mercure Cardiff Holland House Hotel June 21st 2019

The Caerphilly Collaborative Cohort study 1979 -

A wide based long-term prospective study...
- over 400 publications - from aspirin to angina, from diet to dementia and from hearing to heart disease.
Healthy Lifestyles Reduce the Incidence of Chronic Diseases and Dementia: Evidence from the Caerphilly Cohort Study.

Peter Elwood, Julieta Galante, Janet Pickering, Stephen Palmer, Tony Bayer, Yoav Ben Shlomo, Marcus Longley, John Gallacher.

Public Library of Science 2013
https://doi.org/10.1371/journal.pone.0061877

The five healthy behaviours

- Non smoking
- BMI 18-25
- ½ Hour/day X 5
- ‘Five a day’
- ‘There is no safe limit’

Cost of unhealthy behaviours to NHS Wales

- Smoking £386 m
- Obesity £86 m
- Lack of exercise ?
- Inappropriate diet ?
- Alcohol excess £70 m

10% of the total NHS costs! *

The five healthy behaviours

How beneficial is a change in lifestyle? *Is it worth the bother?*

My Health – whose responsibility?

THE 35-year CAERPHILLY PROSPECTIVE STUDY 1979 -
2,500 men aged 45-59 yrs: 90% of the eligible population questioned and examined every five years, for 35 years

HEALTHY BEHAVIOURS at baseline in 1979
- Non-smoking
- Body weight
- Diet
- Exercise
- Alcohol intake

Recorded for 2,500 men aged 45-59 yrs

EVERY FIVE YEARS all the subjects re-examined
- Many of the questions and tests repeated and new ones added
- GP and hospital notes inspected and disease events recorded
HEALTHY BEHAVIOURS at baseline in 1979
- Non-smoking
- Body weight
- Diet
- Exercise
- Alcohol intake

Recorded for 2,500 men aged 45-59 yrs

OUTCOMES: health and wellbeing during the following 35 years
- Diabetes, vascular disease, cancer, dementia and all-cause death
- Wellbeing - happiness, satisfaction, fulfilment, physical and social activity

THE FIVE HEALTHY BEHAVIOURS

The five healthy behaviours:
- non-smoking
- a low body weight
- regular exercise
- a healthy diet
- a low alcohol intake

UNHEALTHY LIFESTYLE
- None or one behaviour

HEALTHY LIFESTYLE
- Four or five behaviours

Dokaed clinical data collected from primary care and hospital records and standard diagnostic criteria applied.
**REDUCTIONS IN DISEASE**

<table>
<thead>
<tr>
<th>HEALTHY BEHAVIOURS*</th>
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<th></th>
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* Reductions based on Odds Ratios, adjusted for age, social class, and, for dementia, a base-line cognitive function test (NART)

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* Confined to men who followed the behaviours consistently

**Reductions based on odds ratios and adjusted for age and social class, and for cognitive decline and dementia, also adjusted for a base-line cognitive function test (NART)**

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## REDUCTIONS IN DISEASE

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<thead>
<tr>
<th>HEALTHY BEHAVIOURS</th>
<th>Diabeties (234 men)</th>
<th>Vascular disease (195 men)</th>
<th>Cancer (608 men)</th>
<th>Cognitive decline (259 men)</th>
<th>Dementia (121 men)</th>
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Significance of trend: 0.00005 0.00005 0.001 0.001 0.006

In the US Women’s Health Study, a 61% reduction in type 2 diabetes was observed in those who followed the five behaviors consistently. In a similar study, there was a 20% reduction in heart disease. Reductions in diabetes were observed in 294 men who followed the behaviours, and in 356 men who did not. The reductions were 67% in men who followed the behaviours, and 27% in those who did not. In a study of 1,392 men, those who followed the five behaviours had a 20% reduction in cancer. In a study of 1,392 men, those who followed the five behaviours had a 20% reduction in cancer. In another study, 172,000 non-smoking subjects, the 4% of subjects who achieved a high score based on body weight, diet and alcohol intake, showed a reduction of 14% in incident cancer (RR: 0.86, 95% CI: 0.78, 0.94). [McCollough et al. Cancer Epidemiol Biomarkers Prev 23: 1999-1997]

### Supporting literature

* Confined to men who followed the behaviours consistently
**Reductions based on odds ratios and adjusted for age and social class, and for cognitive decline and dementia, also adjusted for a base-line cognitive function test (NART)
UK Biobank
343,150 subjects; 14,285 cancers in 5 years

UK BIOBANK
350,000 subjects; 14,500 cancers in 5 years

Reductions

<table>
<thead>
<tr>
<th>All five healthy behaviours</th>
<th>Colorectal cancer</th>
<th>Breast cancer</th>
<th>All cancer</th>
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<tbody>
<tr>
<td>25%</td>
<td>35%</td>
<td>32%</td>
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Significance: 0.001 0.001 0.001

Each individual healthy behaviour is associated with about an 8 or 9% reduction

---

**REDUCTIONS IN DISEASE**

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**BENEFITS OF A HEALTHY LIFESTYLE:**

1. Reductions in incident disease:
   - up to 70% less diabetes
   - up to 60% less heart disease and stroke
   - up to 35% less cancer
   - up to 60% less dementia
### REDUCTIONS IN DISEASE

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<tr>
<th>HEALTHY BEHAVIOURS*</th>
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<th>Vascular disease (712 men)</th>
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### BENEFITS OF A HEALTHY LIFESTYLE:

1. Reductions in incident disease
2. Delayed onset of disease:
   - vascular disease events delayed by up to 13 years
   - dementia delayed by up to 6 years
   - death from any cause by up to 6 years

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### BENEFITS OF A HEALTHY LIFESTYLE:

1. Reductions in incident disease
2. Delayed onset of disease
3. Disease free on retiring:
   - 10% of subjects who had neglected healthy living
   - 23% of those who had followed a healthy lifestyle

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### BENEFITS OF A HEALTHY LIFESTYLE:

1. Reductions in incident disease
2. Delayed onset of disease
3. Disease burden in the community reduced
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### BENEFITS OF A HEALTHY LIFESTYLE:

1. Reductions in incident disease
2. Delayed onset of disease
3. Retiring disease free
4. Disease burden in the community reduced
   - if the subjects in the Caerphilly cohort had each been urged to take up one additional healthy behaviour....

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### BENEFITS OF A HEALTHY LIFESTYLE:

4. Disease burden in the community reduced
   - if the subjects in the Caerphilly cohort had each been urged to take up one additional healthy behaviour....
   - if only half had done so, there would have been....

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### BENEFITS OF A HEALTHY LIFESTYLE:

4. Disease burden in the community reduced
   - if the subjects in the Caerphilly cohort had each been urged to take up one additional healthy behaviour....
   12% less diabetes
   6% less vascular disease
   9% less cancer
   13% less dementia
Benefits of healthy living....

....if half the subjects in the Wales each took up one additional healthy behaviour, there would be:

- 12% less diabetes
- 6% less vascular disease
- 9% less cancer
- 13% less dementia

**REDUCTIONS IN DISEASE**

**Inequalities in health**

<table>
<thead>
<tr>
<th>Behaviour</th>
<th>Deaths during 35-year follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diabetes</td>
</tr>
<tr>
<td>10%</td>
<td>12%</td>
</tr>
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</table>
Inequalities in health

<table>
<thead>
<tr>
<th>LIFESTYLE</th>
<th>Social class at baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reduction in non-manual</td>
</tr>
<tr>
<td>Non smoking</td>
<td>57%</td>
</tr>
<tr>
<td>Low BMI</td>
<td>37%</td>
</tr>
<tr>
<td>Healthy diet</td>
<td>16%</td>
</tr>
<tr>
<td>Regular exercise</td>
<td>44%</td>
</tr>
<tr>
<td>Low alcohol</td>
<td>61%</td>
</tr>
</tbody>
</table>

Inequalities in health

<table>
<thead>
<tr>
<th>Reductions by healthy living</th>
<th>Diabetes</th>
<th>Vascular</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>...any two</td>
<td>15%</td>
<td>12%</td>
<td>15%</td>
</tr>
<tr>
<td>...any three</td>
<td>48%</td>
<td>15%</td>
<td>22%</td>
</tr>
<tr>
<td>Four or five</td>
<td>72%</td>
<td>34%</td>
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Wellbeing
‘…..is when an individual feels he is achieving his/her potential, can cope with the normal tasks and stresses of life and can make a contribution to her/his community’ Based on a WHO definition

Wellbeing in older people

‘Wellbeing … What is it?

WELLBEING

general health

cognitive function

social support

self esteem

happiness/satisfaction/fulfilment

mood/affect
Wellbeing and a healthy lifestyle

Wellbeing: estimated when the subjects were retired (75-89 yrs)

Questionnaires on:
- General health
- Self-esteem
- Happiness
- Fulfilment
- Interests and hobbies
- Physical and social activities

The average scores for men who had lived a healthy lifestyle were about double the scores for men who had lived an unhealthy lifestyle, all \( P<0.001 \) preliminary analyses.

Inequality in wellbeing

<table>
<thead>
<tr>
<th></th>
<th>Non-manual social class</th>
<th>Manual social class</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-assessed good health</td>
<td>64%</td>
<td>48%</td>
<td>( P&lt;0.0005 )</td>
</tr>
<tr>
<td>Good health for age</td>
<td>74%</td>
<td>59%</td>
<td>( P&lt;0.0005 )</td>
</tr>
<tr>
<td>Depression</td>
<td>15%</td>
<td>20%</td>
<td>( P=0.005 )</td>
</tr>
<tr>
<td>Moderate/severe anxiety</td>
<td>24%</td>
<td>29%</td>
<td>( P=0.099 )</td>
</tr>
<tr>
<td>Coping with daily activities</td>
<td>25.8</td>
<td>24.7</td>
<td>( P=0.001 )</td>
</tr>
<tr>
<td>Self value</td>
<td>44.9</td>
<td>44.1</td>
<td>( P=0.151 )</td>
</tr>
<tr>
<td>General positive attitude</td>
<td>42.1</td>
<td>39.4</td>
<td>( P&lt;0.0005 )</td>
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<tr>
<td>Number of close social contacts</td>
<td>10.1</td>
<td>9.4</td>
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Inequality in wellbeing

The good life: from Socrates to Surbiton
John Gallacher

‘... the global evaluation of life... is directly influenced by virtue rather than by success, with success being important insofar as it contributes to virtue. In short... people derive satisfaction from achieving things they consider to be worthwhile: the wisdom of years.’

Quality in Ageing and Older Adults, Vol. 12 Issue: 1, pp.17-25.
https://doi.org/10.5042/qiaoa.2011.0141
Wellbeing and a healthy lifestyle

Questionnaires on:
- General health; Self-esteem; Happiness; fulfilment; Interests and hobbies; Physical and social activities

The average scores for men who had lived a healthy lifestyle were about double the scores for men who had lived an unhealthy lifestyle all P<0.001
### THE POTENTIAL OF LIFESTYLE MEDICINE

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<td><strong>Statins</strong>*</td>
<td><strong>Increase in risk</strong></td>
<td><strong>-33%</strong></td>
<td><strong>Nil</strong></td>
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<tr>
<td><strong>Aspirin</strong></td>
<td><em>nil</em></td>
<td><em>-25%</em></td>
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* Nakamura et al. Lancet 2006;368:1155-63
  Circulation 2012;126:282
  Maki et al. Postgrad Med 2018
  Diabetes.co.uk

**Antiplatelet Trialists' Collaboration. BMJ 1988;296: 320-331
  Elwood  et al.   Public Library of Science. 25.9.2018 [https://doi.org/10.1371/journal.pone.0203957]*

*these are not alternatives!*
## THE POTENTIAL OF LIFESTYLE MEDICINE

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**SIDE EFFECTS**

None... only an improvement in well being

**Muscle cramps, increased risk of diabetes**

**Indigestion, increased risk of GI bleeding**
THE POTENTIAL OF LIFESTYLE MEDICINE

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Decreased about 40% over the past 20 yrs
Gov UK. Health Profile for England 2018

More than doubled in the UK within the last twenty yrs
Diabetes UK

FINALLY…
What was the uptake of health behaviours?

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<th>Unhealthy Lifestyle:</th>
<th>1980</th>
<th>2013</th>
<th>2016 **</th>
</tr>
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<tbody>
<tr>
<td>None or one behaviour</td>
<td>40%</td>
<td>41%</td>
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</tr>
<tr>
<td>Healthy lifestyle:</td>
<td>8%</td>
<td>5%</td>
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** 'Health in Wales' https://www.wales.nhs.uk/healthtopics/lifestyles
How were the results publicised?

A ‘launch’ meeting was held
600 people attended
talks on each of the behaviours
side-shows by 30 recreational
40 men and their wives invited to the meal and the
- A report ‘Better than any pill…’ printed. 1,000 copies distributed
- A challenge to Wales – taken up by the BBC
- A web item designed

What is the situation in Wales now?
### What is the situation in Wales now?

<table>
<thead>
<tr>
<th>Cost of unhealthy behaviours</th>
<th>Behaviours</th>
<th>Adults 2016/7</th>
</tr>
</thead>
<tbody>
<tr>
<td>10% of the total NHS costs in Wales</td>
<td>None or one, Two, Three, Four or five</td>
<td>45%, 31%, 18%, 5%</td>
</tr>
</tbody>
</table>

Hale Phillips Jewel 2012

‘For a healthier happier and fairer Wales’
**Our seven priorities are:**

- Influencing the wider determinants of health
- Improving mental well-being and resilience
- Promoting healthy behaviours
- Securing a healthy future for the next generation
- Protecting the public from infection and environmental threats
- Supporting the development of a sustainable health and care system focused on prevention and early intervention
- Building and mobilising knowledge and skills to improve health and well-being across Wales


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**What is the situation in Wales now?**

**HealthWise Wales** – a web-based national population study

![HealthWise Wales Logo]

Prof Shantini Paranjothy (Principal Investigator)
Dr Pauline Ashford Watt (Research Manager)

Division of Population Medicine Cardiff University

https://www.healthwisewales.gov.wales

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**HealthWise Wales – a new resource**

At present 29,000 adults across Wales — and still growing

1. A core of basic questions are asked at intervals
2. Long-term follow up of disease incidents through linkage to routinely collected healthcare data (SALE, Swansea University)
3. A platform for researchers to question and recruit participants
4. Public and participant involvement embedded throughout
The BSLM - another new resource

The BSLM aims to establish lifestyle medicine as central to health and wellbeing by promoting the prevention of avoidable lifestyle-related diseases.
The potential within Wales

<table>
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<tr>
<th></th>
<th>Diabetes</th>
<th>Vasc. Dis</th>
<th>Cancer</th>
<th>Dementia</th>
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<tbody>
<tr>
<td>Individuals</td>
<td>-72%</td>
<td>-67%</td>
<td>-35%</td>
<td>-65%</td>
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<td>Community*</td>
<td>-12%</td>
<td>-6%</td>
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* If half the subjects took up one additional behaviour

The advantages of Wales

An ideal size for innovation & research in health promotion strategies

Already 29,000 subjects are available for trials

A realistic target has been evaluated

Annual monitoring of changes in behaviours is in progress

Collaboration within Wales

The Division of Population Medicine, Cardiff University
The potential within Wales

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Wales could lead the world!

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The OKC Million Project

On Monday April 4th 2011 mayor Cornett of Oklahoma announced a city-wide effort to loose 1 million pounds body weight..... The project became knows as 'OKC Million'
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Over the following eight years the Mayor gave Oklahoma City a dramatic make-over, putting the entire city on a diet, reshaping roads and neighbourhoods and asking rate-payers for $777 million to make the city a slimmer, healthier and happier place.

By January 2012, more than 51,000 people had signed up and Oklahoma City reached the target of shedding a million pounds – 38 of which had once belonged to the Mayor himself!

Jennifer Yang Global health reporter Mon., Nov. 16, 2015

To Rob and Sue.....

The mayor of Cardiff is Councillor Diane Elizabeth Rees
Her telephone number is 029 2087 2087

Unhealthy behaviours are responsible for 10% of NHS costs in Wales
Making the economic case for prevention in Wales
Hale Phillips Jewel 2012

...if half the people in Wales took up one additional healthy behaviour there would be....
12% less diabetes
6% less vascular disease
9% less cancer
13% less dementia

Healthy Lifestyles – Better than any pill – and no side effects
Evidence from the Caerphilly study 2013
Public Library of Science 2013, https://doi.org/10.1371/journal.pone.0081877