

Looking back on my career in nutrition

*the boomerangs,
the fishing nets,
and the piece of string.
the highs,
the lows
and the funnies*

Dr Margaret Ashwell OBE
www.ashwell.uk.com

For LMU October 30th, 2024

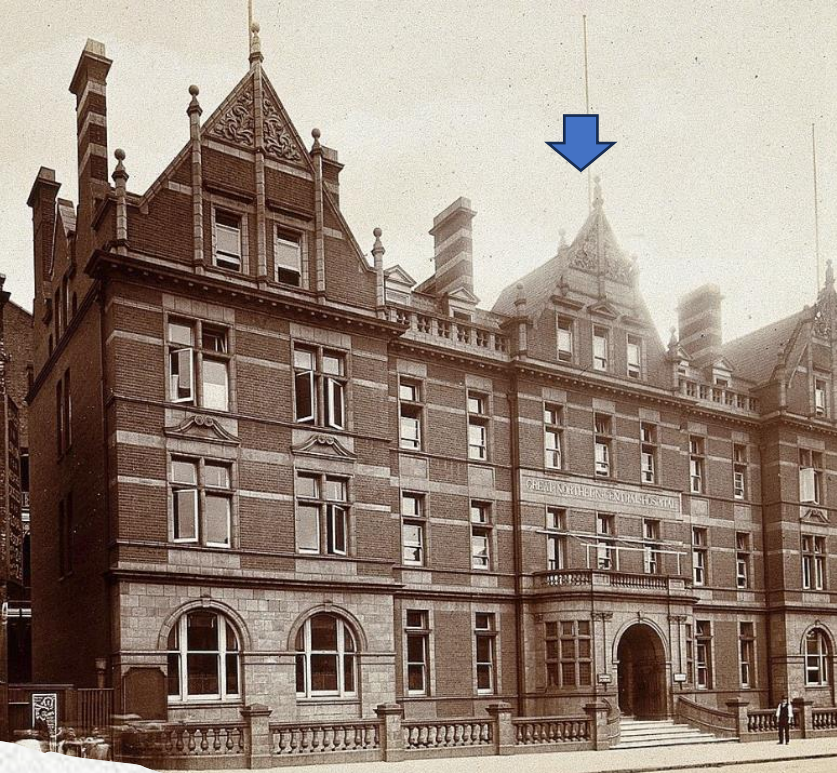


Honorary Fellow
Dr Margaret Ashwell

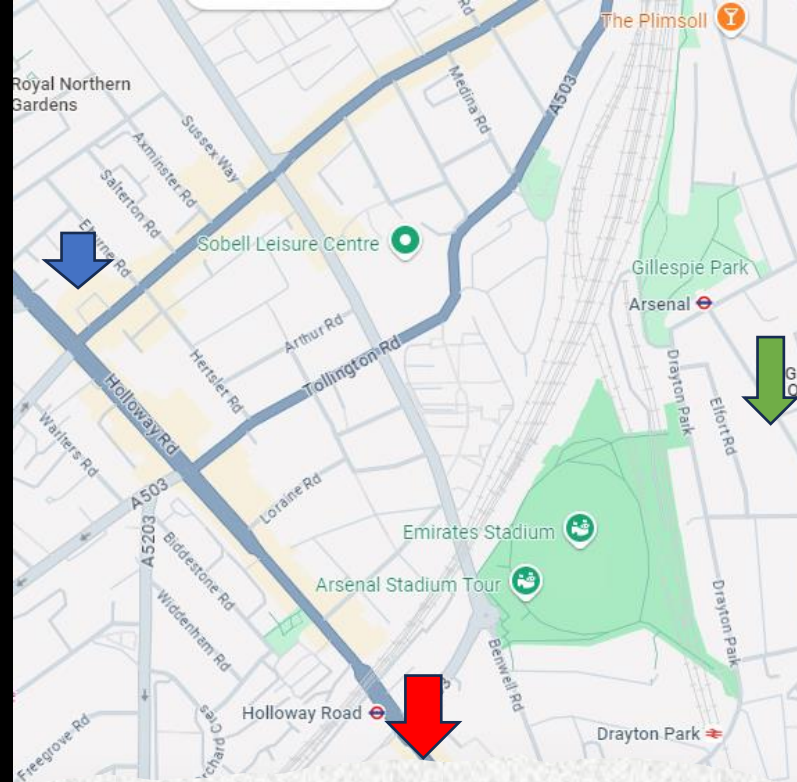
OBE, PhD, DSc, FAFN, RNutr (Public Health)

Looking back over my career, I set myself the task of describing it in three objects. I decided upon a boomerang, a fishing net and a piece of string. You will meet them all a few times in this article.





Royal Northern Hospital 1888-1992



Northern Polytechnic

Why do I like coming to
London Met?

I was born in the hospital just
up the road and lived in
Highbury!

My links with London Met - early days in Highbury



*Born in Royal Northern Hospital,
Holloway Road, N7*



*Christened at Christ Church,
Highbury*



Lived in Highbury Hill, N5



Played in Highbury Fields



Attended Canonbury School until age 6

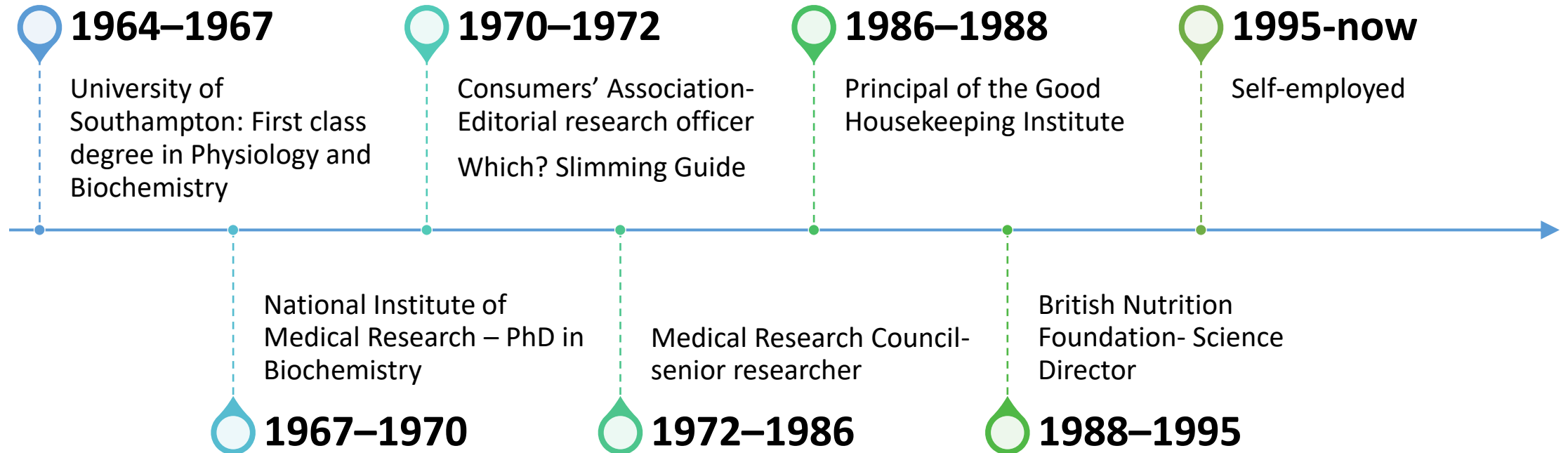
So if I'm asked what I do
- what do I say?



A scientist!

The Ashwell[®]
String Test

My Mosaic career- the boring slide





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Above the water- the
highs

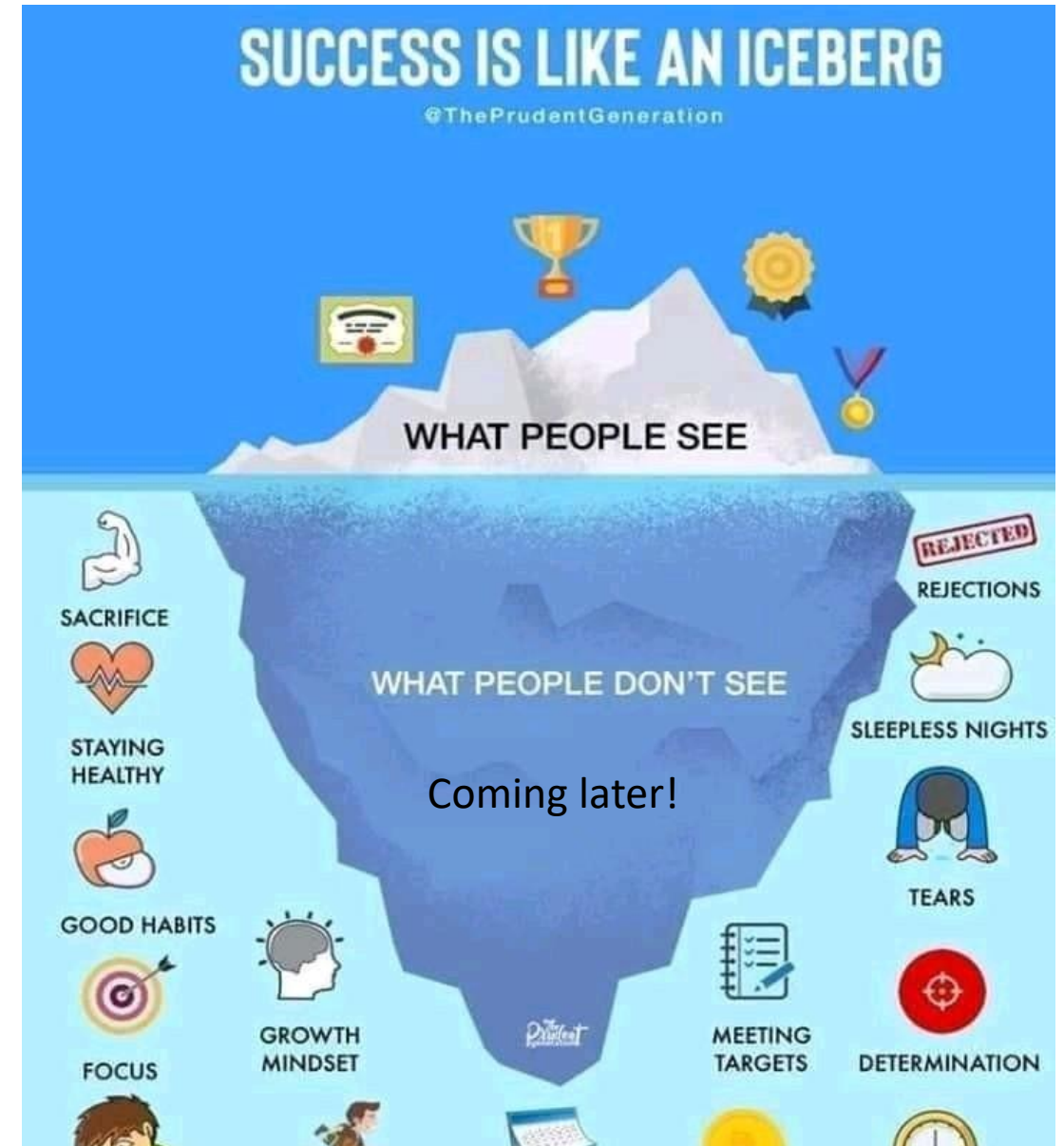
Boomerang



Fishing Net



String



'Boomerangs' in my Mosaic Career- unexpected returns

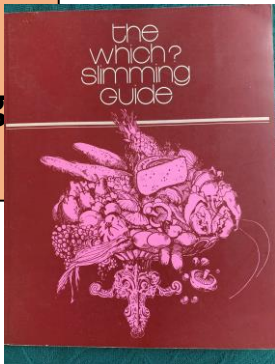
Boomerang #1

1964-67 University of
Southampton
***Skip nutrition
course
within
Biochemistry
degree!***



1967-1970
Medical Research
Council- PhD
Autonomy of
mitochondrial
biogenesis

1970-1972
Editor
"Which?
Slimming
Guide"



1970-1972
MRC Medical Research Council
In MRC Nutrition
Units:
Focus on adipose
tissue and
energy *not*
nutrients



Principal,
Good
Housekeeping
Institute

Boomerang #2



1988-95 Science
Director, BNF
Focus on
macronutrients
- *not micronutrients*

1995-2007
Government research
adviser
Focus on
micronutrients

Boomerang #3



1984-1988 Nutrition
Society Hon Sec:
Professional Register
starts
*But not involved in
Register*

2016-2021 Elected
President of
Association for
Nutrition:
*Focus on professional
regulation*



My fishing net: Instigating networks or collating stories

1973-
now

The Adipose Tissue Discussion
Group

1993-
now

1985-
now

EASO
European Association
for the Study of Obesity

1996-
now

sense.
Self Employed Nutritionists' Support & Enlightenment

If a network
does not exist
for something
you need, start
one!



Presidents and Honorary Fellows
1991-2021:
Their Stories and Recollections
Compiled by Dr Margaret Ashwell OBE



2022

My fishing net: Instigating networks #1



Visit our website www.sense-nutrition.org.uk for more information.

Join us on:

E-mail us at info@sense-nutrition.org.uk

Website: <https://www.sense-nutrition.org.uk/>

LinkedIn www.linkedin.com/in/sense-nutrition

Facebook SENSE UK (Members only)

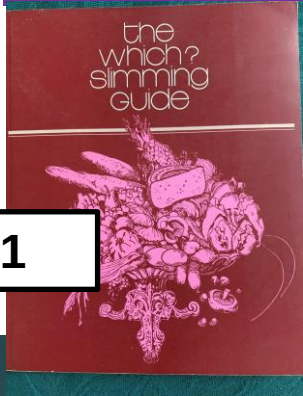
Twitter SENSE Nutritionists [@Nutrition_SENSE](https://twitter.com/Nutrition_SENSE)



My greatest fishing net idea: Collating stories about McCance and Widdowson



1971

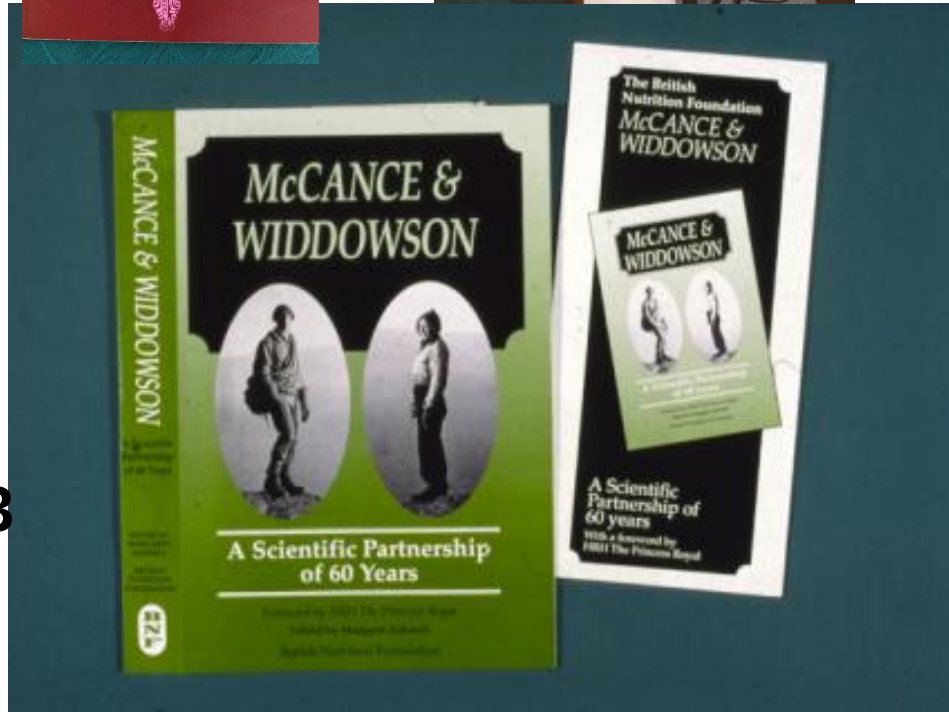


1973



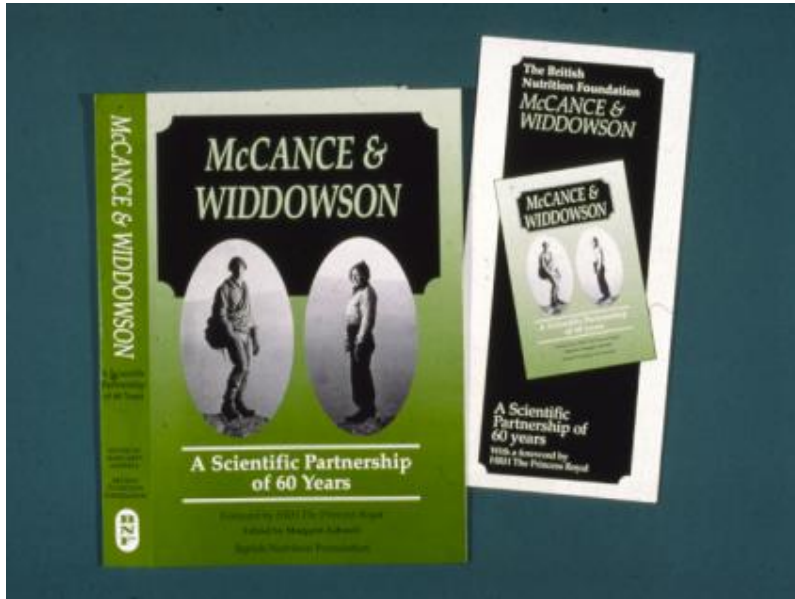
Dr Elsie Widdowson CH, FRS, CBE, DSc
President, British Nutrition Foundation
President, Neonatal Society
President, Nutrition Society

1993



1993

My greatest fishing net: Collating stories about McCance and Widdowson- from 1993 onwards



1993-
now

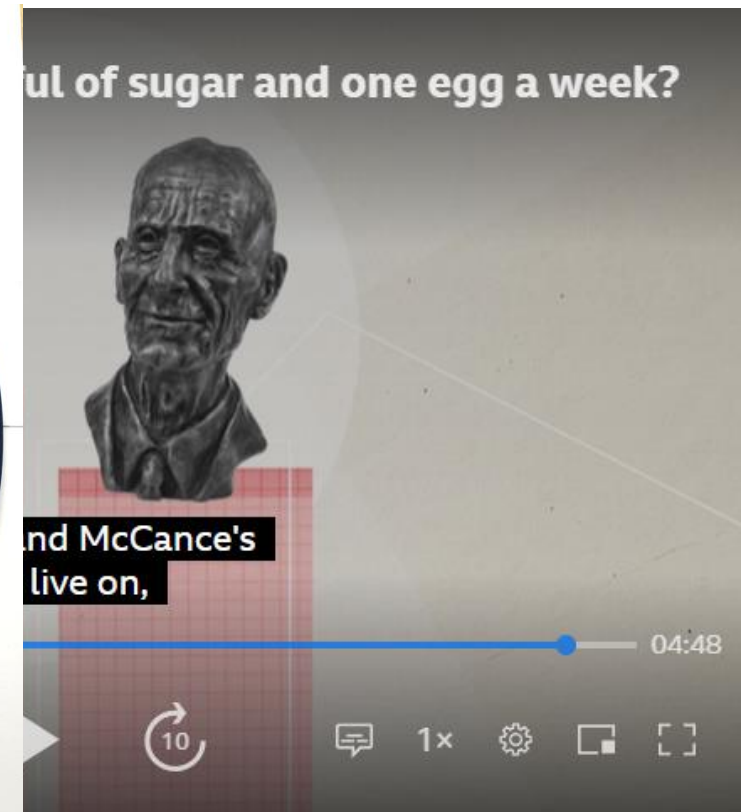


With Helen Sharman
(our first British astronaut)
and Matthew Parris on Great
Lives, BBC Radio 4, 2017

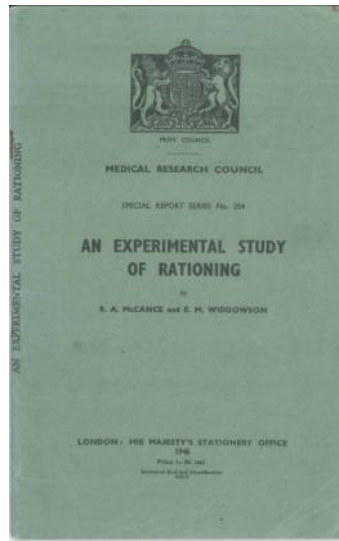


2021 Blue
Plaque
for Elsie

2024 BBC/Royal
Society podcast
<https://www.bbc.co.uk/videos/cqxr4v905nwo>



McCance and Widdowson repeating the testing of rations in the Lake District



Mac: "My longest day in that fortnight was when we covered 36 miles and there was 7000 feet of up and down in it. We did it at an average speed of three to three & a half miles an hour including stops."

Official report to Government in March 1940;
only published Jan 1946

My favourite McCance and Widdowson story- studies in post war Germany show interaction between food and environment- the importance of “Tender Loving Care”

Wuppertal Hospital, 1946-9



Special Articles

MENTAL CONTENTMENT AND PHYSICAL GROWTH

E. M. WIDDOWSON
D.Sc., Ph.D. Lond.

*From the Medical Research Council Department of
Experimental Medicine, Cambridge*

THE observations of Beaumont (1833) on his long-suffering subject, Alexis St. Martin, a Canadian trapper who had had a gunshot wound which resulted in a gastric fistula, showed for the first time “the effect of violent passion on the digestive apparatus.” Later, Pavlov (1910), Alvarez and his associates (see Alvarez 1929), and many others have made important contributions to our knowledge of the processes of digestion. There is no scientific doubt that the secretion of the digestive juices may be induced by pleasurable emotions and inhibited by unpleasant ones. It has also been shown that painful emotions will hinder the movements of the digestive tract and that food may remain in the stomach many hours longer than normal if a person becomes frightened or angry after he has eaten a meal.

Lancet 1951

Elsie: “We weighed and measured the children regularly in two orphanages for 6m while they lived on their same German rations.”

“We planned, at the end of the first 6 m, to provide unlimited bread, with some margarine and jam to spread on it, to the children in Home A while nothing extra was to be given to the children in Home B.”





“We found that during the first six months, when no extra food was supplied, the children in Home (A) were growing faster in height and weight than those in the other Home (B).

It so happened that we had chosen Home (A) to receive the extra food, and we had to go on with our plan.

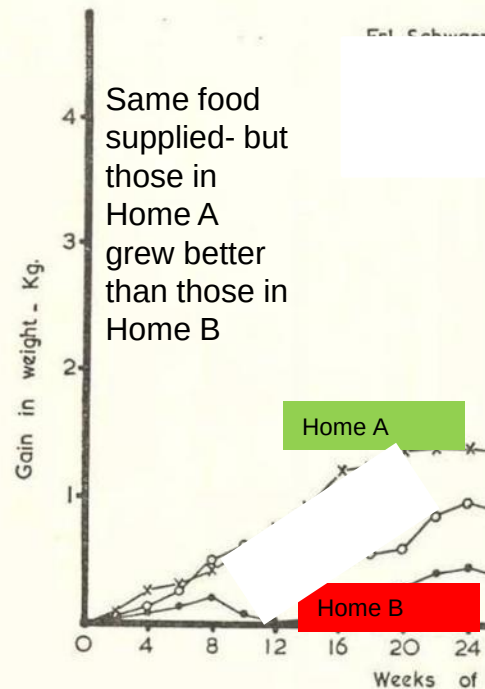


Fig. 1—Average growth in weight.

The Lancet (1951)



“To our astonishment the children in Home A, who had originally grown faster and now received the extra food, immediately began to grow more slowly, while those in Home B began to grow rapidly in weight and height, although they had nothing but their German rations.”

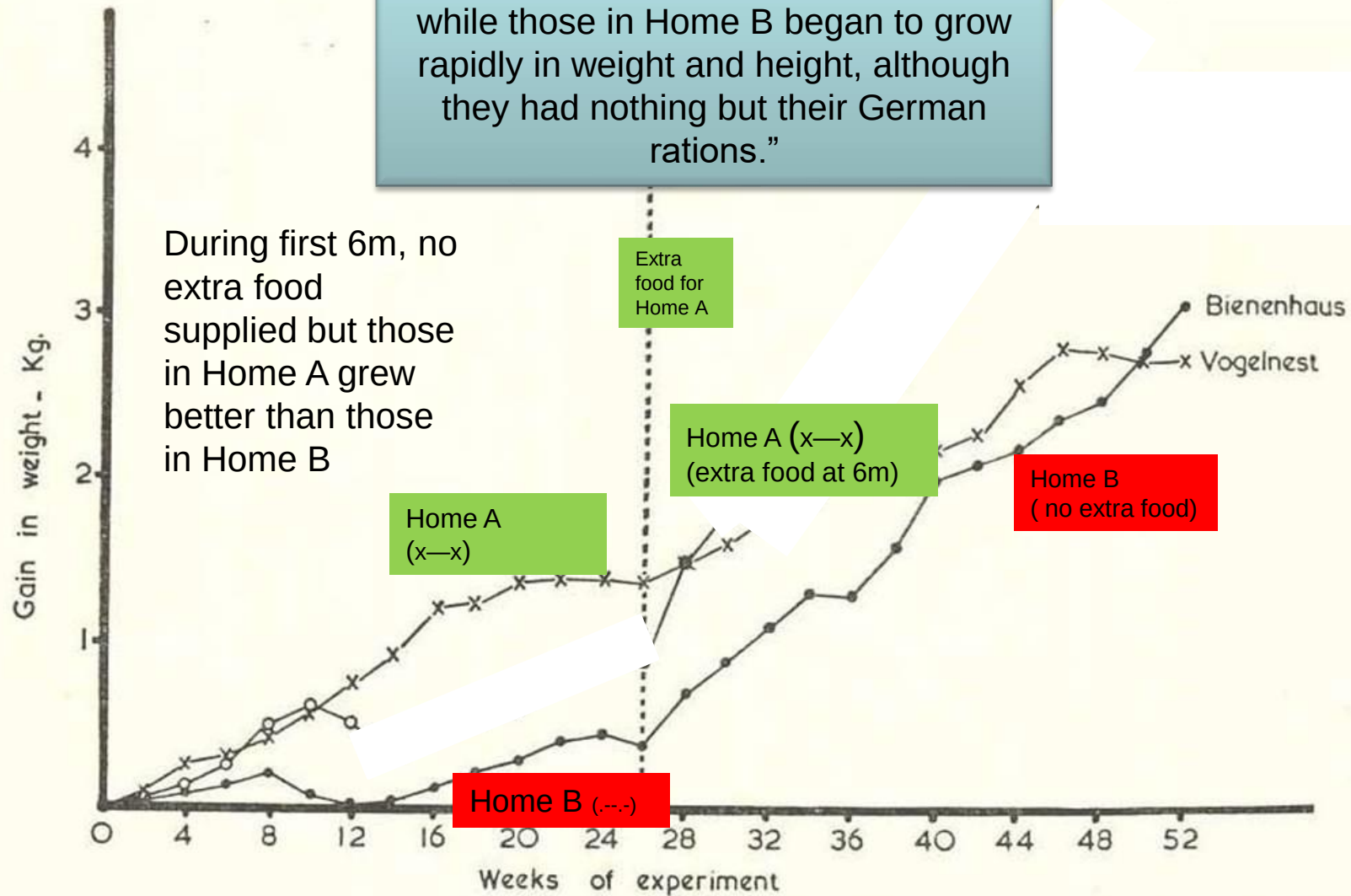


Fig. 1—Average growth in weight.

The Lancet (1951)





“What could the explanation be?

Did the children in Home A eat the extra food? They did. A dietitian supervised their meals all the time.

Was there some noxious agent that somehow moved from one Home to the other just when we began to give the extra food? There was.

It so happened that the housemother who presided over Home B during the first six months was moved by the authorities to Home A just when we began to give the extra food to Home A.

Thanks to the smartness of our dietitian, we discovered that the housemother was a most unpleasant woman and very unkind to the children.

The unhappiness of the children was sufficient to delay their growth in spite of the extra food.”

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“I don't leave home without it!”

“Tender loving care (TLC) may make all the difference to the successful outcome of a carefully planned experiment.”



*“If your results
seem impossible,
think and think
again”*

Maybe nutrition and growth are not all
about food?



Maybe TLC (and stress) is important as
nutrition ?

What do we
know about
stress and TLC?

What is released
by stress or TLC?

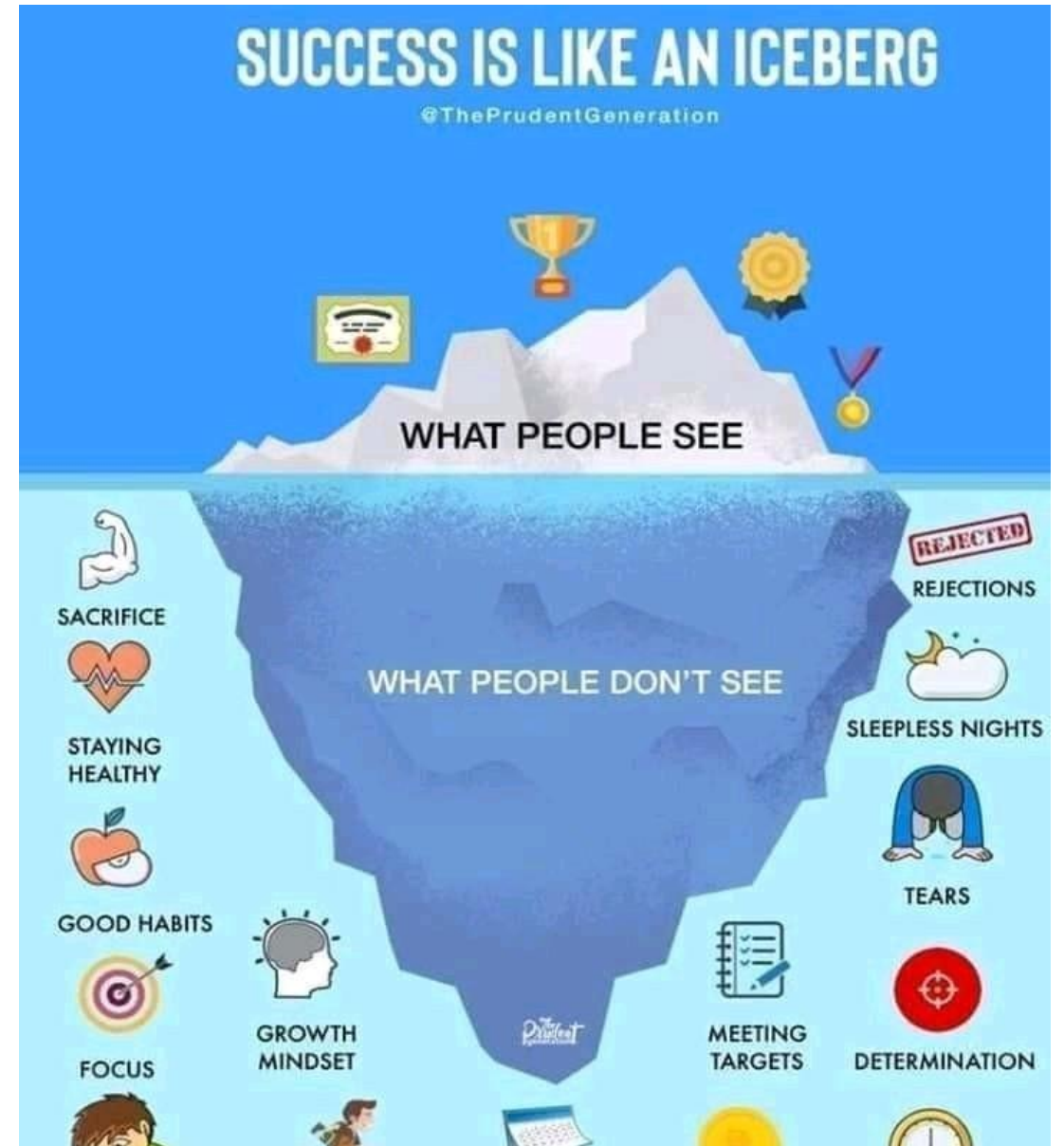
What inhibits
the effects of
stress or TLC?

Above the water- the
highs

Boomerang

Fishing Net

String

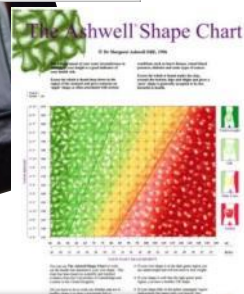


My piece of string test all started officially with a BMJ letter in 1996

1996: Goodbye BMI; Hello waist-to-height ratio

BMJ 1996

Ratio of waist circumference to height may be better indicator of need for weight management



1996: Look after the 'apples' and let the 'pears' look after themselves

Waist-to-height ratio 0.5 is boundary value between OK (green) and =Take Care (yellow)

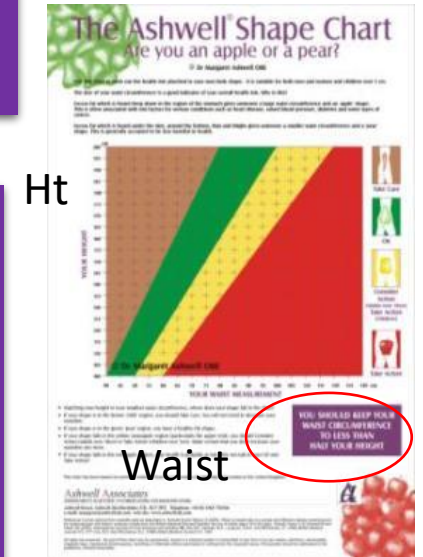
"You should keep your waist circumference to less than half your height!"



How long is a piece of string?
Less than half a person's height
if we want to improve public health



2018: BBC TV with Chris Bavin:
The Truth about Obesity



Remember what I call myself?

I invented the Ashwell® String Test!



A scientist!

Collaboration with David McCarthy at LMU

2006



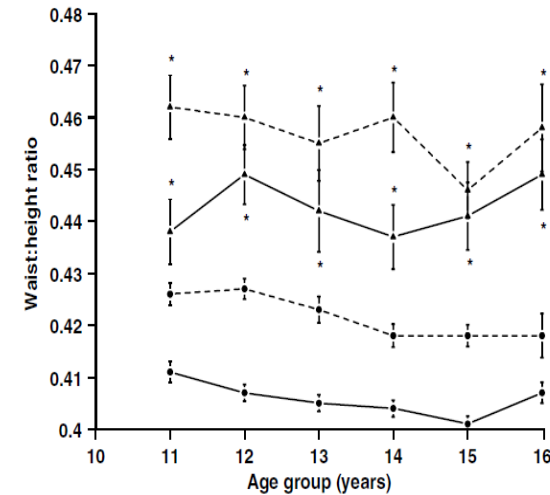
International Journal of Obesity (2006) 30, 988–992
© 2006 Nature Publishing Group All rights reserved 0307-0565/06 \$30.00
www.nature.com/ijo

ORIGINAL ARTICLE

A study of central fatness using waist-to-height ratios in UK children and adolescents over two decades supports the simple message – ‘keep your waist circumference to less than half your height’

HD McCarthy¹ and M Ashwell^{2,3}

¹Institute for Health Research & Policy, London Metropolitan University, London, UK; ²Ashwell Associates, Ashwell Street, Ashwell, Herts, UK and ³Visiting Research Fellow, Oxford Brookes University, Gypsy Lane, Oxford OX30BP

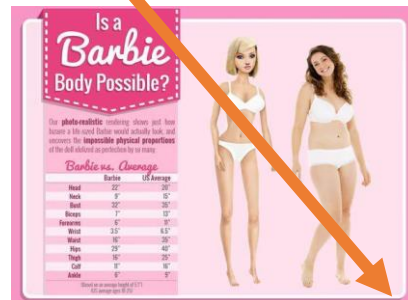


NDNS 1997

BSI 1977-1987

Figure 1 Waist:height ratios in British boys and girls aged 11–16 years. Values = mean ± s.e.; BSI survey (circles), NDNS (triangles); boys (dotted line),

2012



Arklu Launches New British Fashion Doll “Lottie”™

“Lottie’s body is ‘childlike’ –her dimensions are based upon those devised by leading British academics, Professor David (Professor of Nutrition and Health at London Metropolitan University) and Dr Margaret Ashwell OBE”

UPDATED GUIDELINES

OBESITY: IDENTIFICATION, ASSESSMENT AND MANAGEMENT

NICE CG189

NICE National Institute for
Health and Care Excellence



Obesity: identification,
assessment and
management

clinical guideline
published: 27 November 2014
www.nice.org.uk/guidance/cg189

2021: NICE committee start
to look
at the relationship between
anthropometric indices and
health risk

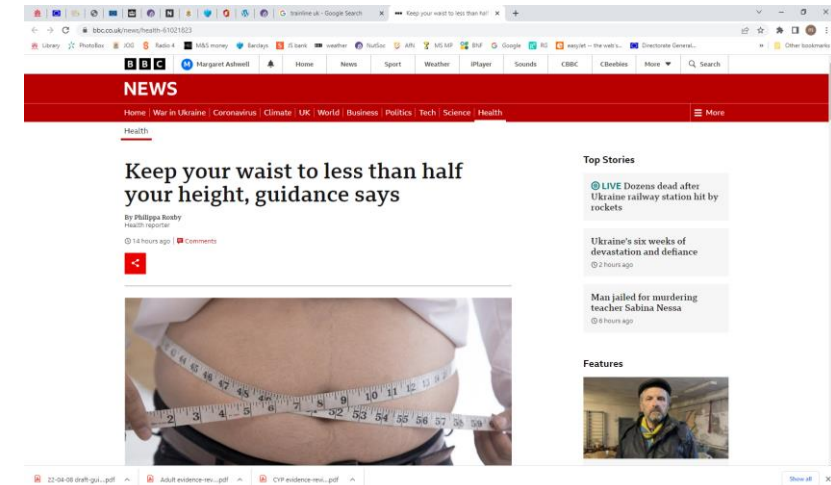
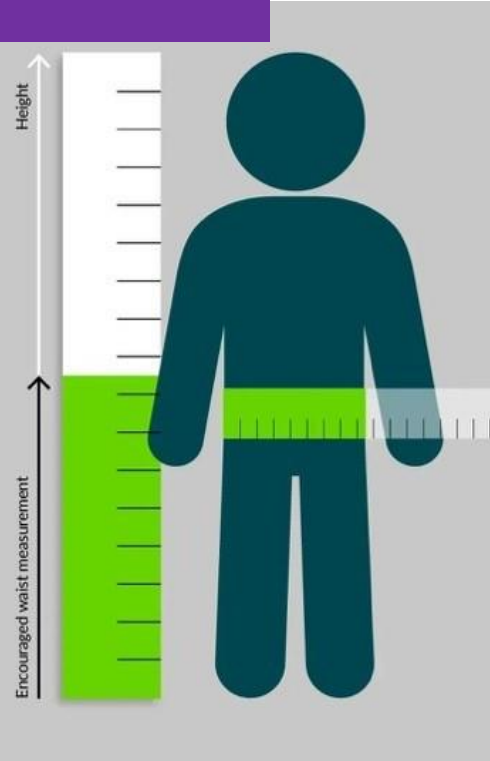
37 publications advocating waist-to-height ratio instead of BMI as the best measure of health risk- all self funded

1. Gibson S, Ashwell M (2020) A simple cut-off for **waist-to-height ratio** (0.5) can act as an indicator for cardiometabolic risk: recent data from the Health Survey for England. *Br J Nutr* **123**, 681-690.
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5. Ashwell M, Gibson S (2017) Normal weight central obesity: the value of **waist-to-height ratio** in its identification. In response to the question: measurement, not BMI, is stronger predictor of death risk, study finds. *BMJ* **357**, j2033
6. Ashwell M (2017) How long is A Piece of String? Less than Half your Height. Five Steps from Science to Screening: A Mini Review. *Obes Weight Manag Contro* **7**, 00191. DOI: 00110.15406/aowmc.02017.00107.00191.
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16. Ashwell M (2011) Shape: the **waist-to-height ratio** is a good, simple screening tool for cardiometabolic risk. *Nutrition Today* **46**, 85-89.
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30. Cox BD, Whiclow MJ, Ashwell MA *et al.* (1996) Comparison of anthropometric indices as predictors of mortality in British adults. *International Journal of Obesity* **20**, 141.
31. Ashwell MA, LeJeune SRE, McPherson M (1996) Ratio of waist circumference to height may be better indicator of need for weight management. *British Medical Journal* **312**, 377.
32. Ashwell MA, Cole TJ, Dixon AK (1996) **Waist circumference** and **waist-to-height ratio** is a strong predictor of intra-abdominal fat. *British Medical Journal* **313**, 559-560.
33. Ashwell M, LeJeune S, McPherson M (1996) Ratio of waist circumference to height may be a better indicator of need for weight management. *British Medical Journal* **312**, 377.
34. Ashwell M, Cole T, Dixon A (1996) **Waist circumference**: **height ratio** is a strong predictor of intra-abdominal fat as measured by computed tomography. *Proceedings of the Nutrition Society*.
35. Ashwell M, Cole T, Dixon A (1996) **Ratio of waist circumference to height** is strong predictor of intra-abdominal fat. *British Medical Journal* **313**, 559-560.
36. Ashwell M (1996) Leaping into shape. *British Nutrition Foundation Nutrition Bulletin* **21**, 32-38.
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26 years later!
2022 NICE updated guidelines-
draft published on 8/4/22.
Final on 8/9/22

Updated draft NICE
guideline encourages
everyone to **keep their
waist measurement to less
than half their height** to
reduce the risk of potential
health problems.

NICE



BMI is only a definition of obesity ;
Waist-to-height ratio is the best measure of health risk
(based on prospective studies in white populations and prospective and cross-sectional in non- whites)

Obesity: identification, assessment and management

- 1.2.11 Define the degree of central adiposity based on waist-to-height ratio as follows:

- healthy central adiposity: waist-to-height ratio 0.4 to 0.49, indicating no increased health risks
- increased central adiposity: waist-to-height ratio 0.5 to 0.59, indicating increased health risks
- high central adiposity: waist-to-height ratio 0.6 or more, indicating further increased health risks.

These classifications can be used for people with a BMI under 35 kg/m² of both sexes and all ethnicities, including adults with high muscle mass.

The health risks associated with higher levels of central adiposity include type 2 diabetes, hypertension and cardiovascular disease. [2022]

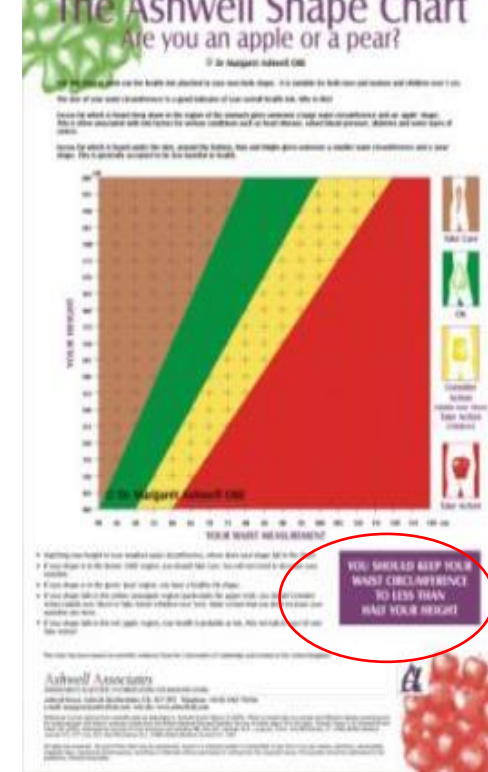
- 1.2.12 When talking to a person about their waist-to-height ratio, explain that they should try and keep their waist to half their height (so a waist-to-height ratio of under 0.5). [2022]

Waist-to-height ratio 0.5 is boundary value between OK and =Take Care

“You should keep your waist circumference to less than half your height!”

Clinical (g
Publishe
www.nic

Updated
8/9/22



For all adults,
all ethnicities,
all children 5y and
over

Obesity: identification, assessment and management

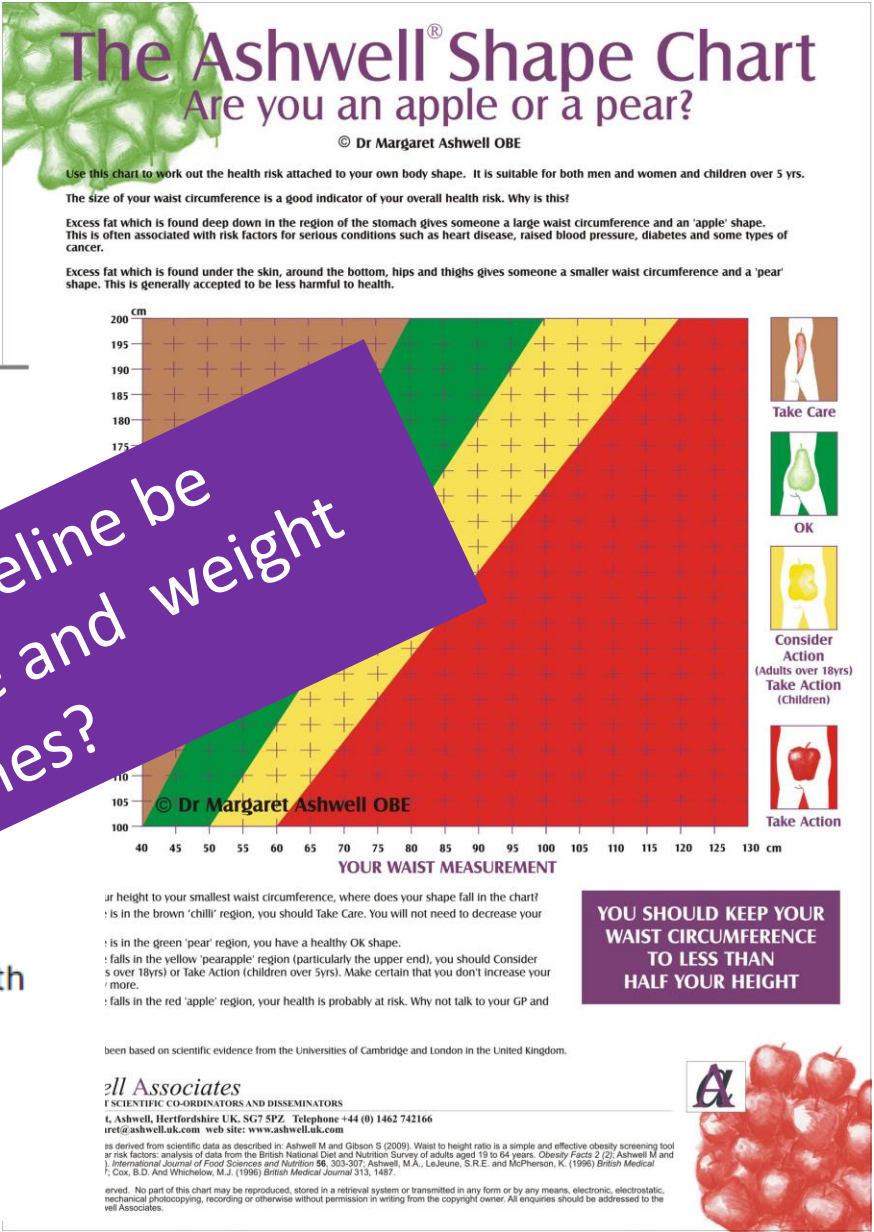
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- healthy central adiposity: waist-to-height ratio 0.4 to 0.49, indicating no increased health risks
- increased central adiposity: waist-to-height ratio 0.5 to 0.59, indicating increased health risks
- high central adiposity: waist-to-height ratio 0.6 or more, indicating increased health risks.

These classifications are based on BMI, with a BMI of 35 kg/m² or more indicating severe obesity. BMI is a measure of body mass, not muscle mass.

The health risks associated with higher levels of central adiposity include type 2 diabetes, hypertension and cardiovascular disease. [2022]

When will the updated NICE guideline be implemented into the NHS website and weight management programmes?



1995

The Ashwell® Shape Chart

Are you an apple or a pear?

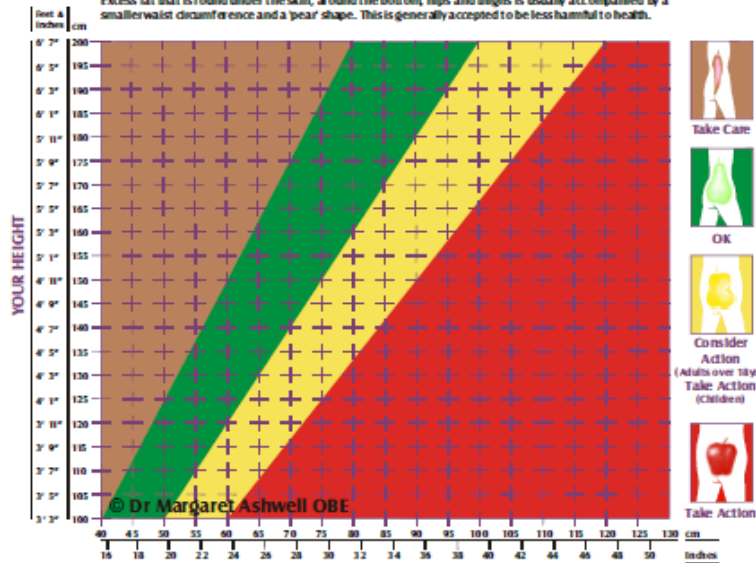
© Dr Margaret Ashwell OBE

Use this chart to work out the health risk attached to your own body shape. It is suitable for both men and women and children over 5 yrs.

The size of your waist circumference is a good indicator of your overall health risk. Why is this?

Excess fat that is found deep down in the region of the stomach gives someone a large waist circumference and an 'apple' shape. This is often associated with risk factors for serious conditions such as heart disease, raised blood pressure and diabetes.

Excess fat that is found under the skin, around the bottom, hips and thighs is usually accompanied by a smaller waist circumference and a 'pear' shape. This is generally accepted to be less harmful to health.



+ If your shape is in the brown 'chill' region, you should Take Care. You will not need to decrease your waistline.

- If your shape is in the green 'pear' region, you have a healthy OK shape.
- If your shape falls in the yellow 'pearapple' region (particularly the upper end), you should Consider Action (adults over 18yrs) or Take Action (children over 5yrs). Make certain that you don't increase your waistline any more.
- If your shape falls in the red 'apple' region, your health is probably at risk. Why not talk to your GP and Take Action!

**YOU SHOULD KEEP
YOUR WAIST
CIRCUMFERENCE
TO LESS THAN
HALF YOUR HEIGHT**

Ashwell Associates (Europe) Ltd

INDEPENDENT SCIENTIFIC CO-ORDINATORS AND DEDICATED

Ashwell Associates (Europe) Ltd., Ashwell Street, Ashwell, Hertfordshire UK. SG7 5PZ. Telephone +44 (0) 1462 742166

e-mail: margaret@adswelluk.com web site: www.adswelluk.com

Reference Curves derived from scientific data as described in: Browning LM, Heish SD, Ashwell M. (2013) Nutrition Research Reviews

23(2) 247-256; Ashwell M and Gholizadeh N (2010). Obesity Facts 2010; McCarty HD and Ashwell M (2010). Int J Obes 3 (supp 2): S99-S100; Ashwell M and Le Leu S (2010). *International Journal of Food Science and Nutrition* 58: 303-307.

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published in *Archives of Sexual Behavior* (Springer) Ltd. May 2011.

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2024

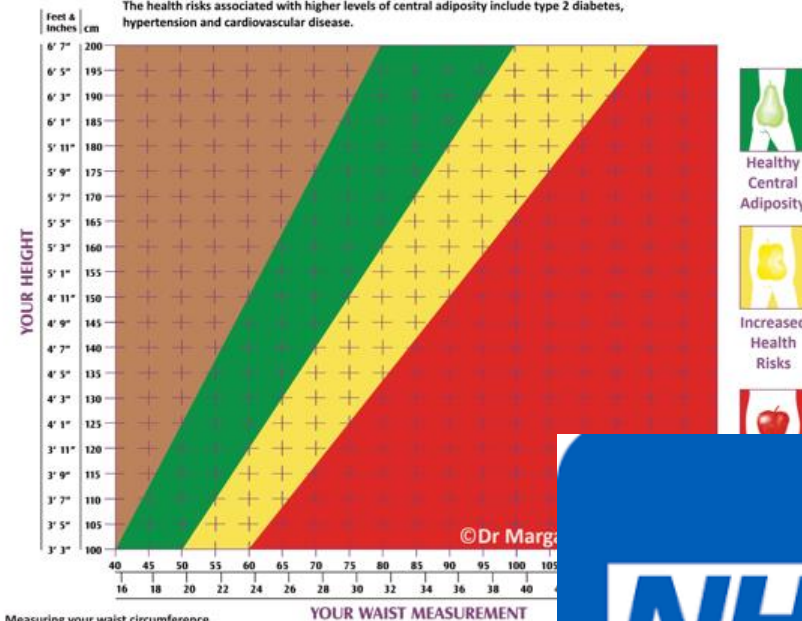
The Ashwell® Chart Waist-to-Height Ratio

© Dr Margaret Ashwell OBE

If your BMI is under 35kg/m², use the Ashwell * Waist-to-Height Ratio Chart to assess and predict your health risks. It is suitable for both sexes, all ethnicities and children aged 5 and over.

The size of your waist circumference in relation to your height (your waist-to-height ratio) is a good indicator of your health risks. This is because your waist-to-height ratio is a practical estimate of central adiposity (the accumulation of excess fat in the abdominal area).

The health risks associated with higher levels of central adiposity include type 2 diabetes, hypertension and cardiovascular disease.



Measuring your waist circumference

Find the bottom of the ribs and the top of the hips.

Wrap a tape measure around the waist midway between these points (this will be just above the belt button) and breath out naturally before taking the measurement.

Measure waist circumference and height in the same units (either both in centimetres, or both in inches).

Matching your waist circumference to your height on the Chart, where is your waist-to-height ratio?

- If your waist-to-height ratio is in the green region (waist-to-height ratio 0.4 to 0.49), your central adiposity indicates no increased health risks.
- If your waist-to-height ratio is in the yellow region (waist-to-height ratio 0.5 to 0.59), your central adiposity indicates increased health risks.
- If your waist-to-height ratio is in the red region (waist-to-height ratio 0.6 or more), your central adiposity indicates further increased health risks.

Ashwell Associates

ASTWICH ASSOCIATES
INDEPENDENT SCIENTIFIC CONSULTANTS AND DISSEMINATORS

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Examples of tweaking the Shape indices

Conicity index, CI (Valdez,1991)

$$C\ Index = \frac{WC\ (cm)}{0.109 \times \sqrt{Weight\ (Kg)/H}}$$

Lipid accumulation product LAP (Kahn , 2005)

Males, LAP = (WC [cm]–65)x(triglyceride concentration [mmol/L])

Females, LAP = (WC [cm]–58)x(triglyceride concentration[mmol/L]).

Visceral adipose index, VAI (Ammann et al(2010))

Males, VAI = (WC/36.58 x BMI)x(TG/0.81)x(1.52/HDL)

Females, VAI = (WC/36.58 x BMI)x(TG/1.03)x(1.31/HDL).

A Body Shape Index (ABSI)
(Krakauer, & Krakauer,2012)

$$ABSI = \frac{WC}{BMI^{2/3} height^{1/2}}.$$

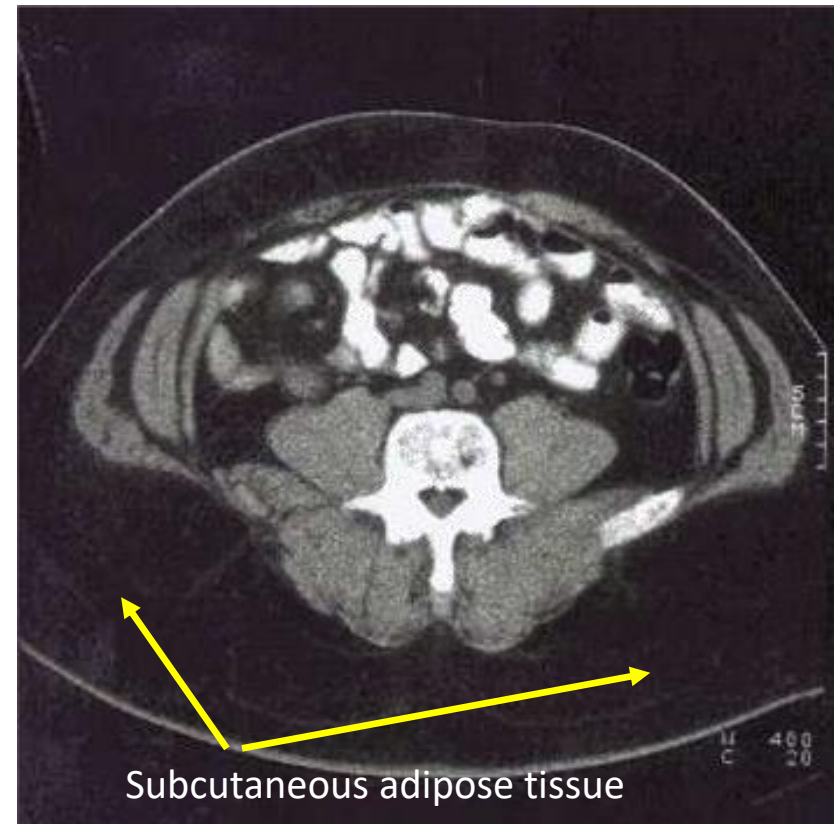
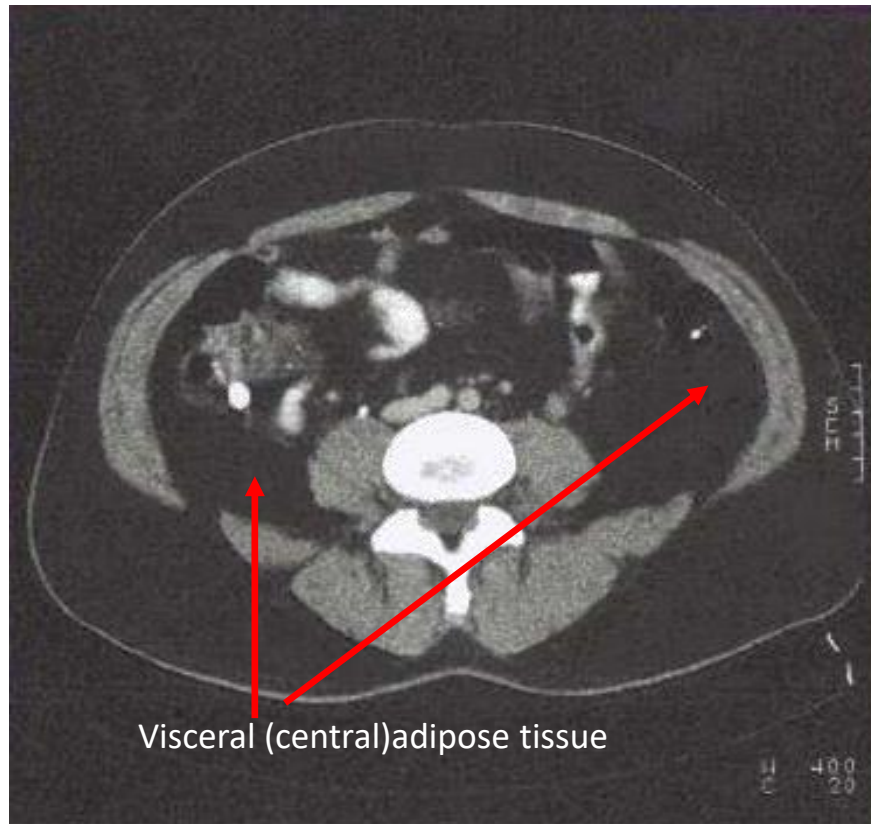
The Body Roundness
Index (BRI)(Thomas et
al, 2013

$$\varepsilon = \sqrt{1 - \left(\frac{(WC/(2\pi))^2}{(0.5 \times height)^2} \right)} \quad BRI = 364.2 - (365.5 \times \varepsilon)$$

WHtR = waist circumference /height could replace all of these

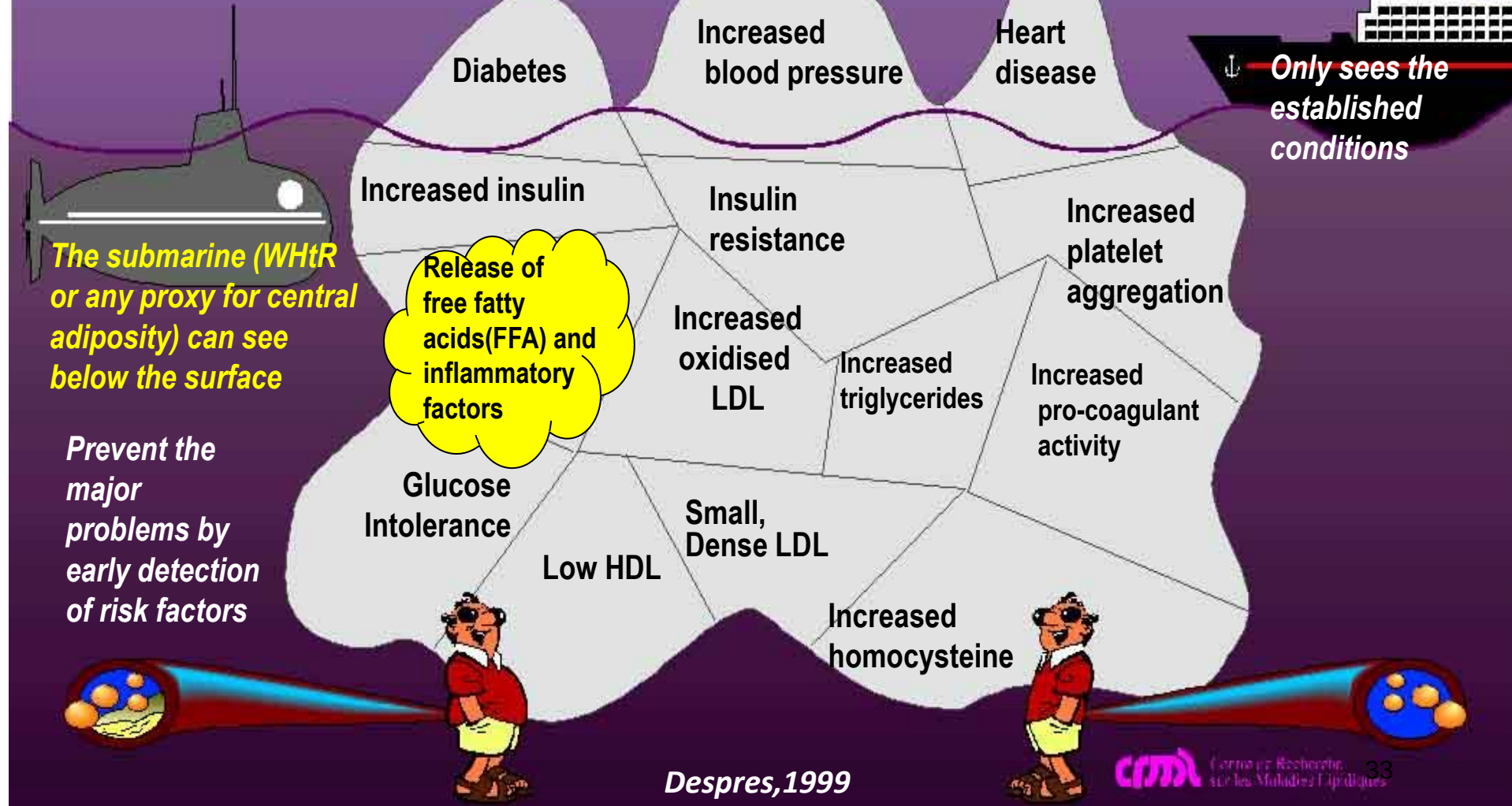
Why is central adiposity (fat) harmful?

It wraps itself around the heart, liver, kidneys and pancreas



Many more risk factors for CVD can be detected earlier by measuring **central adiposity** rather than BMI

BMI
(Total obesity)
The Titanic
can only see the tip of the iceberg



Central adiposity releases more free fatty acids and inflammatory factors which disrupt mitochondrial biogenesis and raise cardiometabolic risk factors

J. Liu et al / Advanced Drug Delivery Reviews 61 (2009) 1343–1352

Studies on
mitochondrial
biogenesis.
Ashwell, M;
PhD thesis, 1970

- ↑ Inflammatory factors from adipose tissue
- ↑ reactive oxygen species (ROS)
- ↑ damage to mitochondrial DNA and disruption to *mitochondrial biogenesis*
- ↑ disruption of oxidative phosphorylation.
- ↑ insulin resistance, dyslipidemia and CVD

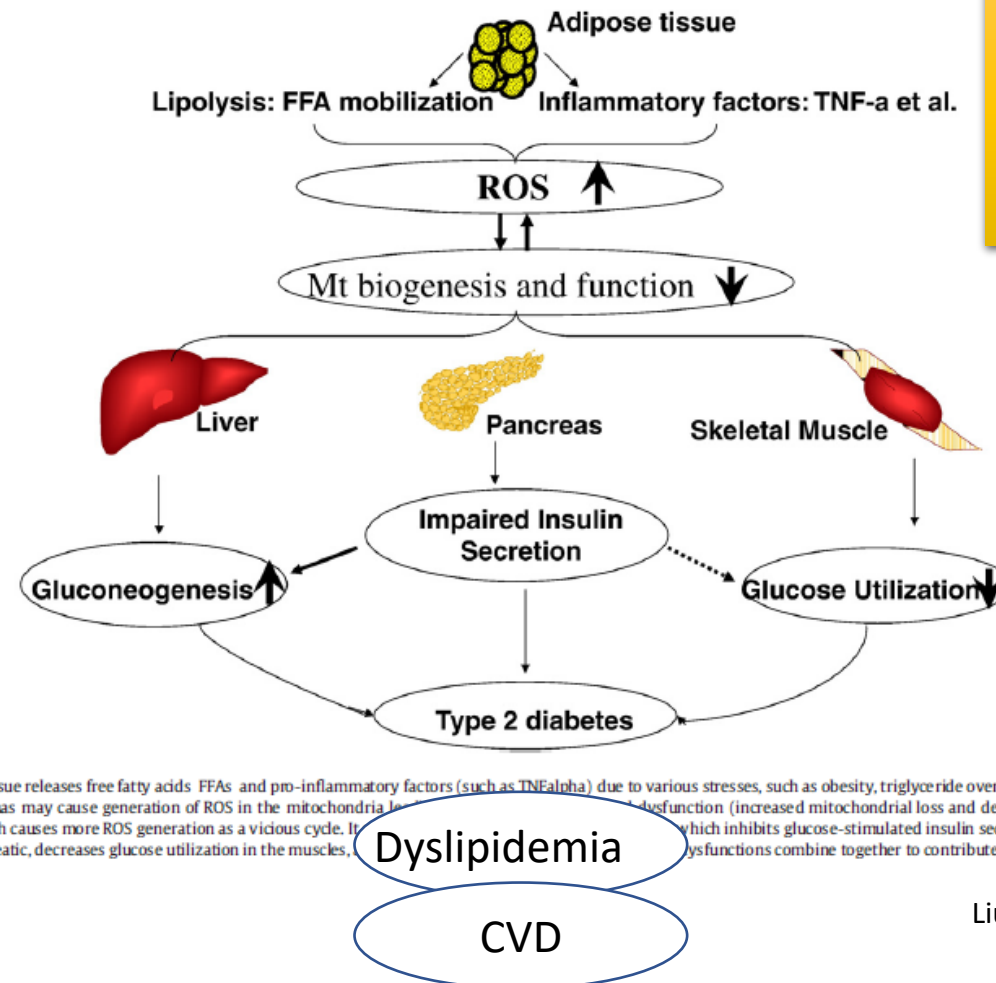


Fig. 1. Adipose tissue releases free fatty acids (FFAs) and pro-inflammatory factors (such as TNF-α) due to various stresses, such as obesity, triglyceride overload, and dislipid FFAs and TNF-αs may cause generation of ROS in the mitochondria (mitochondrial dysfunction (increased mitochondrial loss and decreased mitochondrial biogenesis), which causes more ROS generation as a vicious cycle. It also leads to mitochondrial dysfunction in pancreatic, decreases glucose utilization in the muscles, and these dysfunctions combine together to contribute to the development of type 2 diabetes.

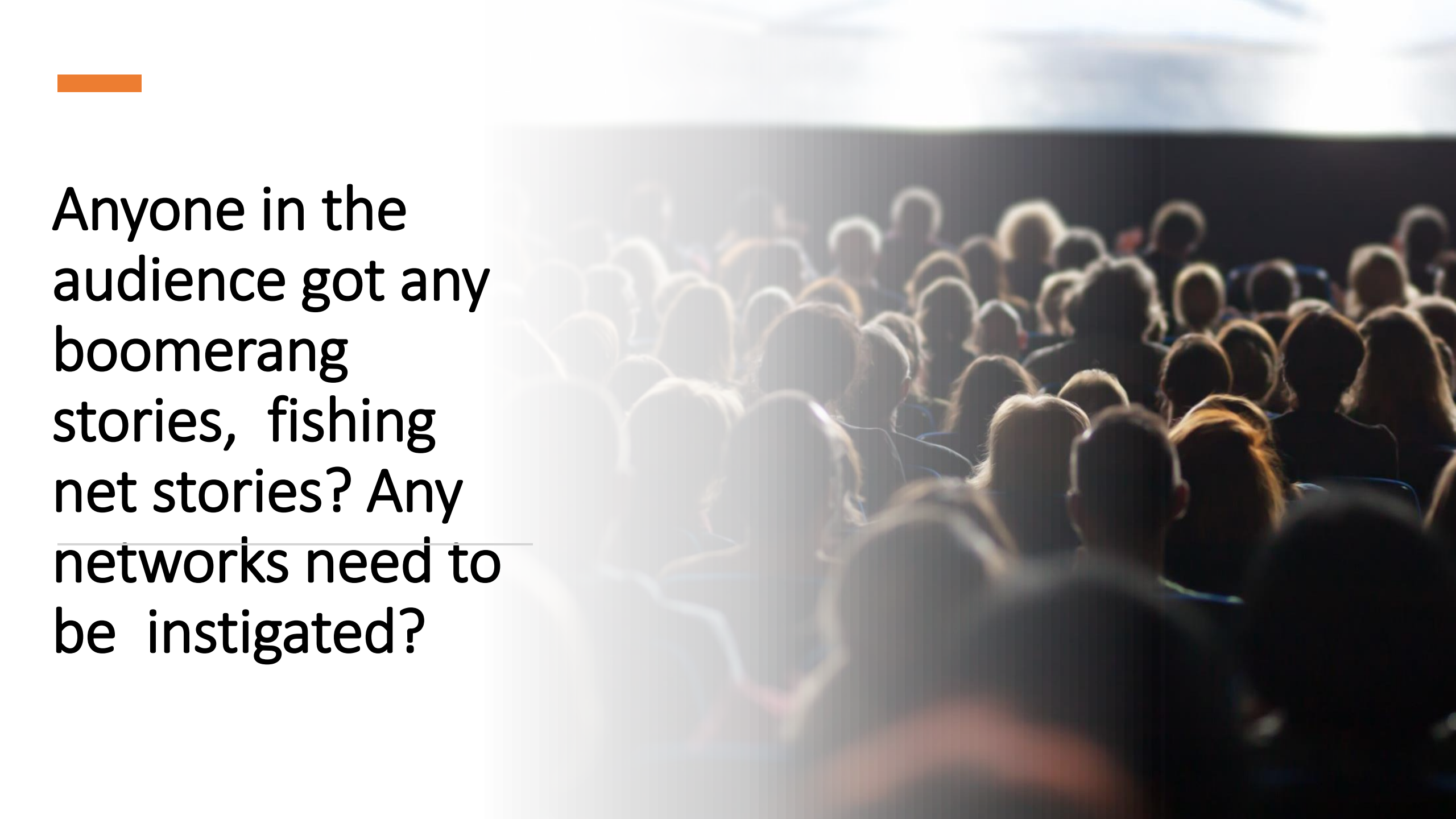
Boomerang #4

Mitochondrial dysfunction



Central adiposity
and health risk

Liu et al, 2009



Anyone in the audience got any boomerang stories, fishing net stories? Any networks need to be instigated?

Below the water
6 employed jobs- 3
sackings



1972: MRC Scientist at Clinical Research Centre in Harrow
1981: Transfer to MRC Dunn Nutrition Unit in Cambridge

Why the move?

- Difference of opinion on scientific communication

Opportunity?

- Move from Greater London to Ashwell near Cambridge
 - Near Papworth
 - Collaboration with other Cambridge scientists



1986-1988 Principal of Good Housekeeping Institute (GHI)



Appointed to Government's Food Advisory Committee (FAC)
as Consumer representative in 1986



National Magazine Company,
Hearst Corporation of America



1986-1995 Government's Food Advisory Committee (FAC)



1995



1988 Principal of Good Housekeeping (GHI)
to Science Director, British Nutrition Foundation (BNF)



Science communicators are different to journalists
when they communicate:

- Journalists: Make it short, make it juicy, make it up
- Science communicators : Make it short, make it juicy, don't make it up (base it on the evidence base)

Opportunity on leaving in 1988

- Move back from the crazy world of the media to science
- Have a super team of scientists working with me at BNF

1988 to 1995 British Nutrition Foundation (BNF)



BRITISH
Nutrition
FOUNDATION

The Report of the
British Nutrition
Foundation Task Force



Iron

Nutritional and
physiological
significance



Volume 48 | March 2003 | ISSN 1467-3010 (online)

Nutrition Bulletin

Perspectives in nutrition science for an international audience

research
news and view
reviews policy
acts behind the headlines
research
news and view
reviews



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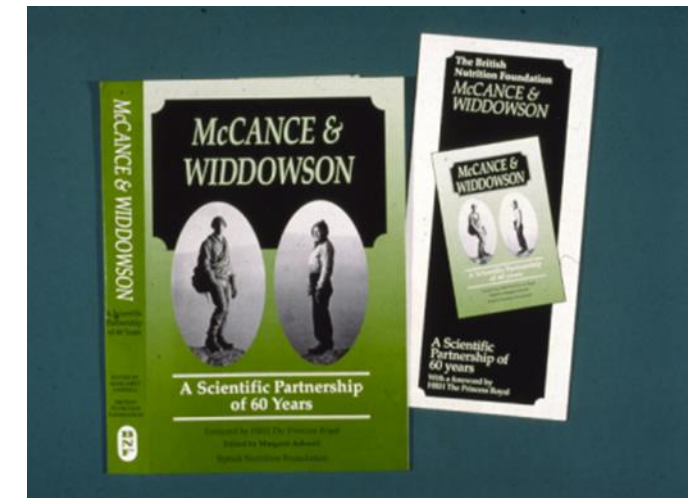
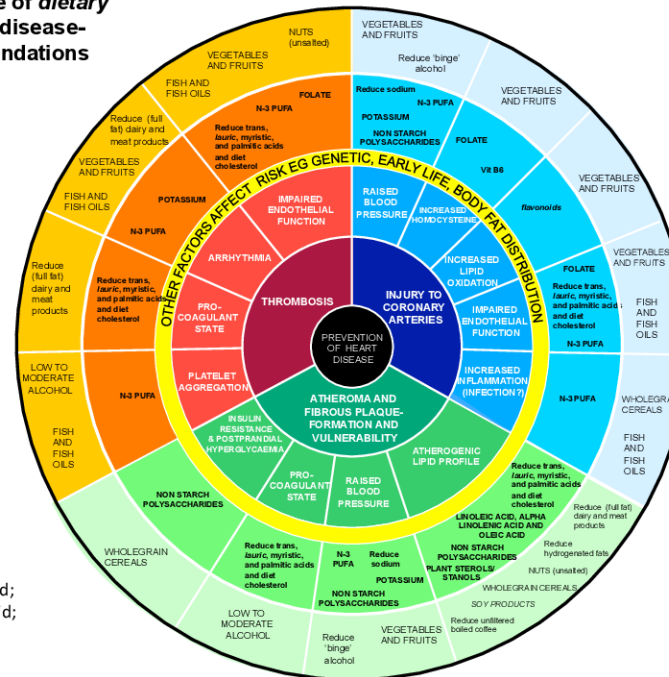
Figure 2: A Round Table of dietary factors related to heart disease-incorporating recommendations of WHO, 2003

Key

- Foods and food components to increase in black CAPITALS
- Foods and food components to reduce in black lower case
- WHO convincing or probable evidence in regular case; possible evidence in italics

Abbreviations

- EPA, eicosapentaenoic acid;
- DHA, docosahexaenoic acid;



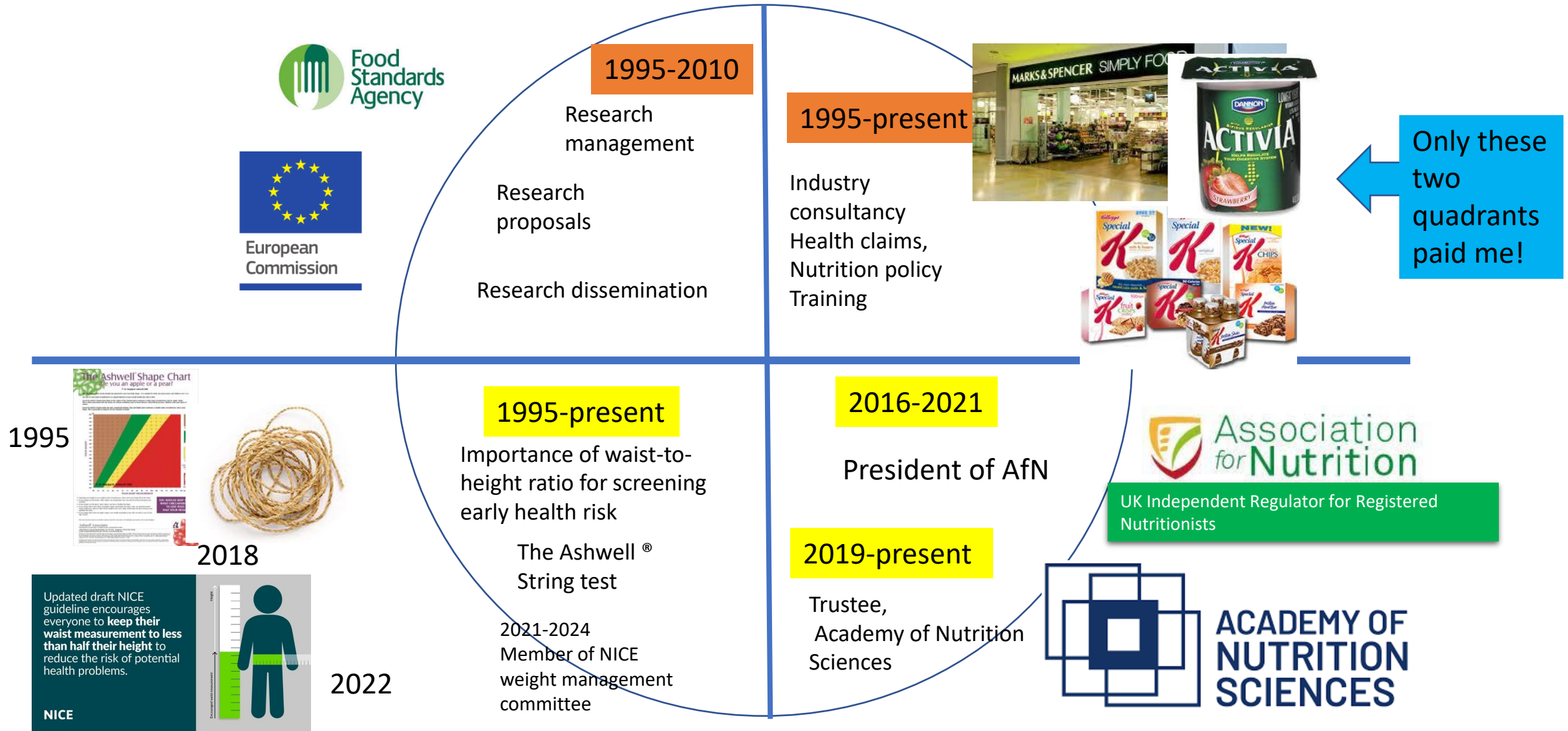
1995 BNF to Self-employed

- Why the move?
 - New broom sweeping clean
- Opportunity
 - 29 years (and more I hope!) of self employment:
 - Working with Governments
 - Working with Industry
 - Working with Universities
 - Working with other self- employed nutritionists in SENSE



1995-present

Self-employment as Ashwell Associates- the four quadrants



What lessons have I learned from all my mishaps?

“Life's disappointments are like speed bumps;
things you have to get over in order
to enjoy the rest of life's journey”

**Your pain is the breaking of
the shell that encloses your
understanding.**

Khalil Gibran

BrainyQuote

“Do not judge me by
my successes, judge
me by how many times
I fell down and got
back up again.”

Nelson Mandela (1918-2013)
Former President of South Africa

WORLD
ECONOMIC
FORUM

Do less, be more!

Looking back on my career in nutrition

*the boomerangs,
the fishing nets,
and the piece of string.
the highs,
the lows
and the funnies*

Dr Margaret Ashwell OBE
www.ashwell.uk.com

For LMU October 30th, 2024



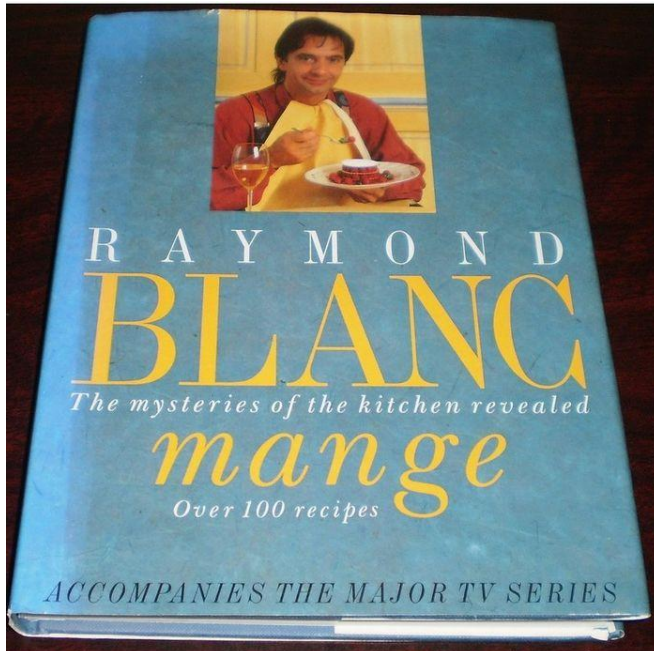
Honorary Fellow
Dr Margaret Ashwell

OBE, PhD, DSc, FAFN, RNutr (Public Health)

Looking back over my career, I set myself the task of describing it in three objects. I decided upon a boomerang, a fishing net and a piece of string. You will meet them all a few times in this article.

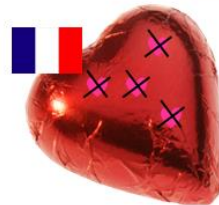


Meeting Raymond Blanc 1994-97

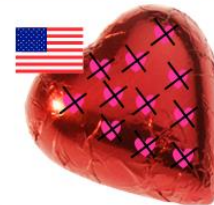


2.66x!

Heart Disease Death



39.8 deaths out of 100,000 people



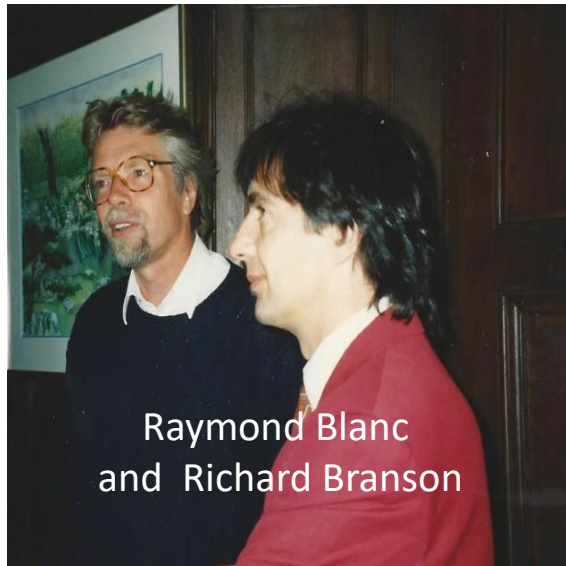
106.5 deaths out of 100,000 people

French men far less likely to die from heart attacks than in USA or UK

THE FRENCH PARADOX
what is the secret?



Consultancy project with Raymond Blanc and Richard Branson at Le Manoir aux Saisons in 1995/6





Being stumped by Princess Anne in London in 1991 and getting my own back 27 years later

BNF Patron: Princess Anne

2018



Take Home messages

- A 'mosaic' career can be just as exciting as a linear career
- Volunteer for everything! Contacts can lead to paid work.
- Network, network, network. Instigate a new network if needed.
- Use your fishing net- what stories can you collate?
- Remember that by working hard, you pose a threat to others
- If things go wrong, remember they will always get better.
- Comfort yourself-You are never the only one suffering upsets in your career.
- Help others and they will help you.
- There's nowt as queer as folk!
- Make sure you have fun!

Looking back on my career in nutrition

*the boomerangs,
the fishing nets,
and the piece of string.
the highs,
the lows
and the funnies*

Dr Margaret Ashwell OBE
www.ashwell.uk.com

Thank you for listening.
Good luck in all your careers!



Honorary Fellow
Dr Margaret Ashwell

OBE, PhD, DSc, FAFN, RNutr (Public Health)

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