The importance of using waist-to-height ratio for primary screening; a piece of string is the simplest ever public health tool.

Dr Margaret Ashwell OBE

Updated June 2015

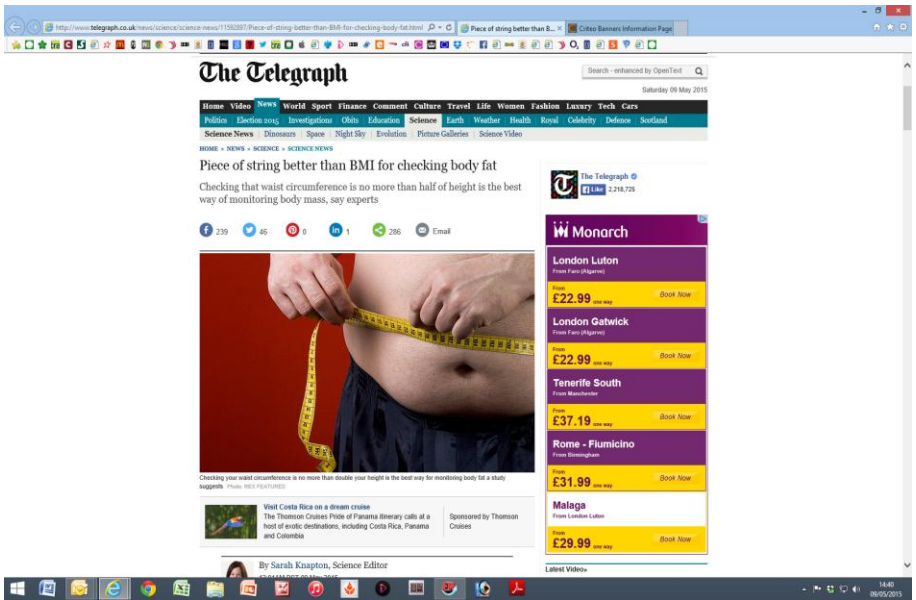
thebmj

BMJ 2015;350:h2434 doi: 10.1136/bmj.h2434 (Published 11 May 2015) Page 1 of 1

RESEARCH NEWS

CrossMark click for updates

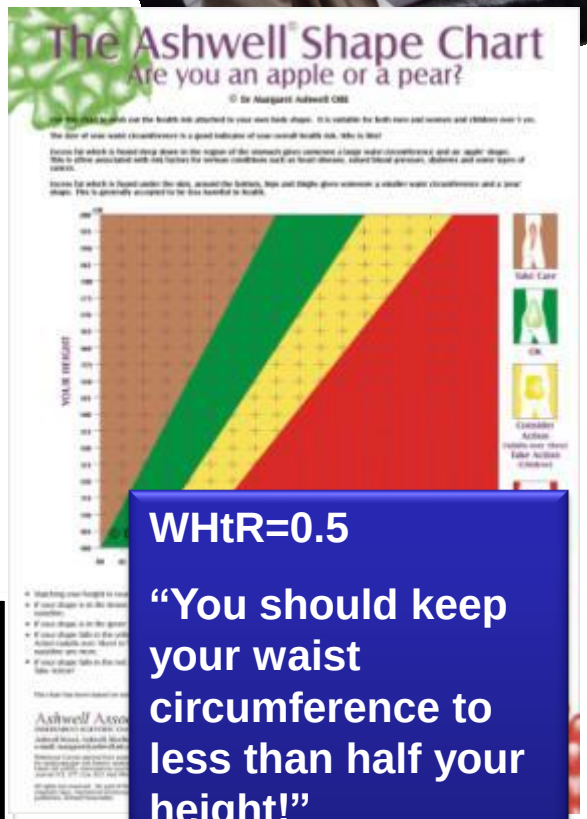
Piece of string can assess cardiovascular risk, study finds



The importance of using waist-to-height ratio for primary screening; a piece of string is the simplest ever public health tool.

Dr Margaret Ashwell OBE

Oxford School of Public Health 3/6/15



One simple strategy to help the global obesity epidemic:

Focus prevention and treatment on those with central obesity- screened using WHtR

WHtR=0.5

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

Why goodbye BMI? BMI measures muscle as well as fat.
Arnie and Danny have same BMI,
but only Danny has WHtR well over 0.5

Arnold Schwarzenegger

Ht=188 cm

120kg

BMI 34

Waist = 90cm

WHtR=0.47

Danny de Vito

Ht=154 cm

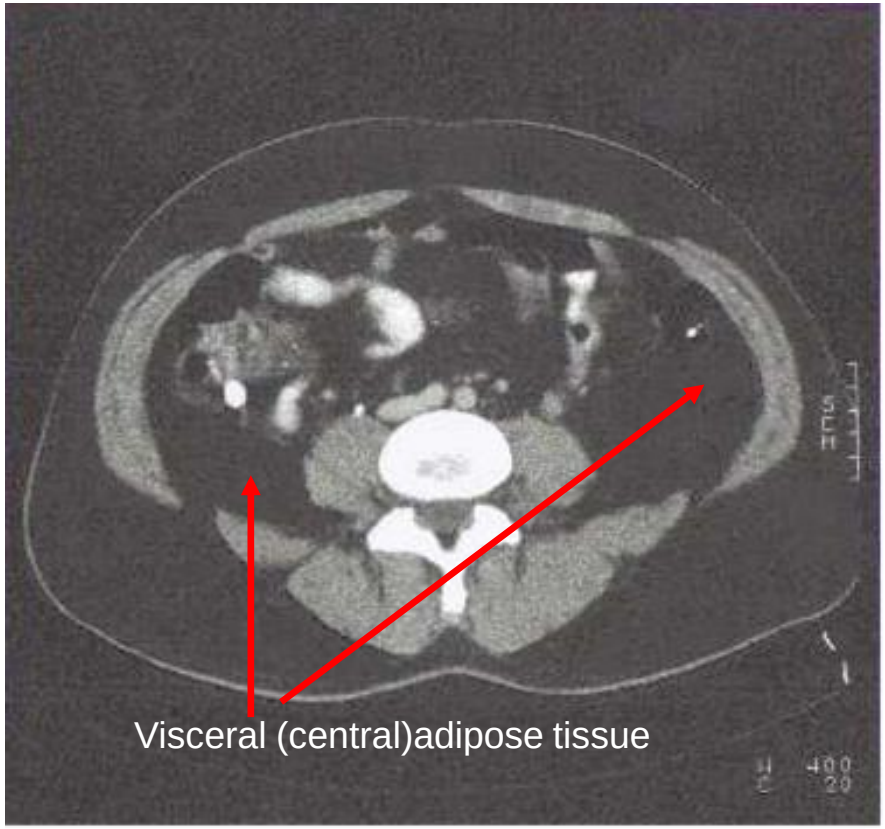
85 kg

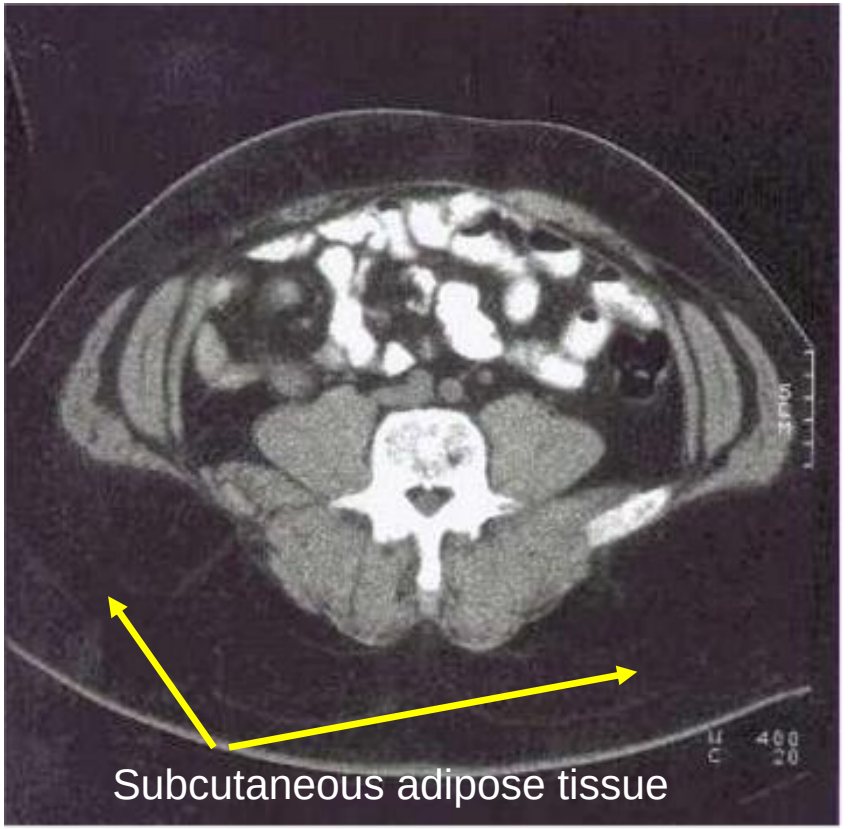
BMI 35

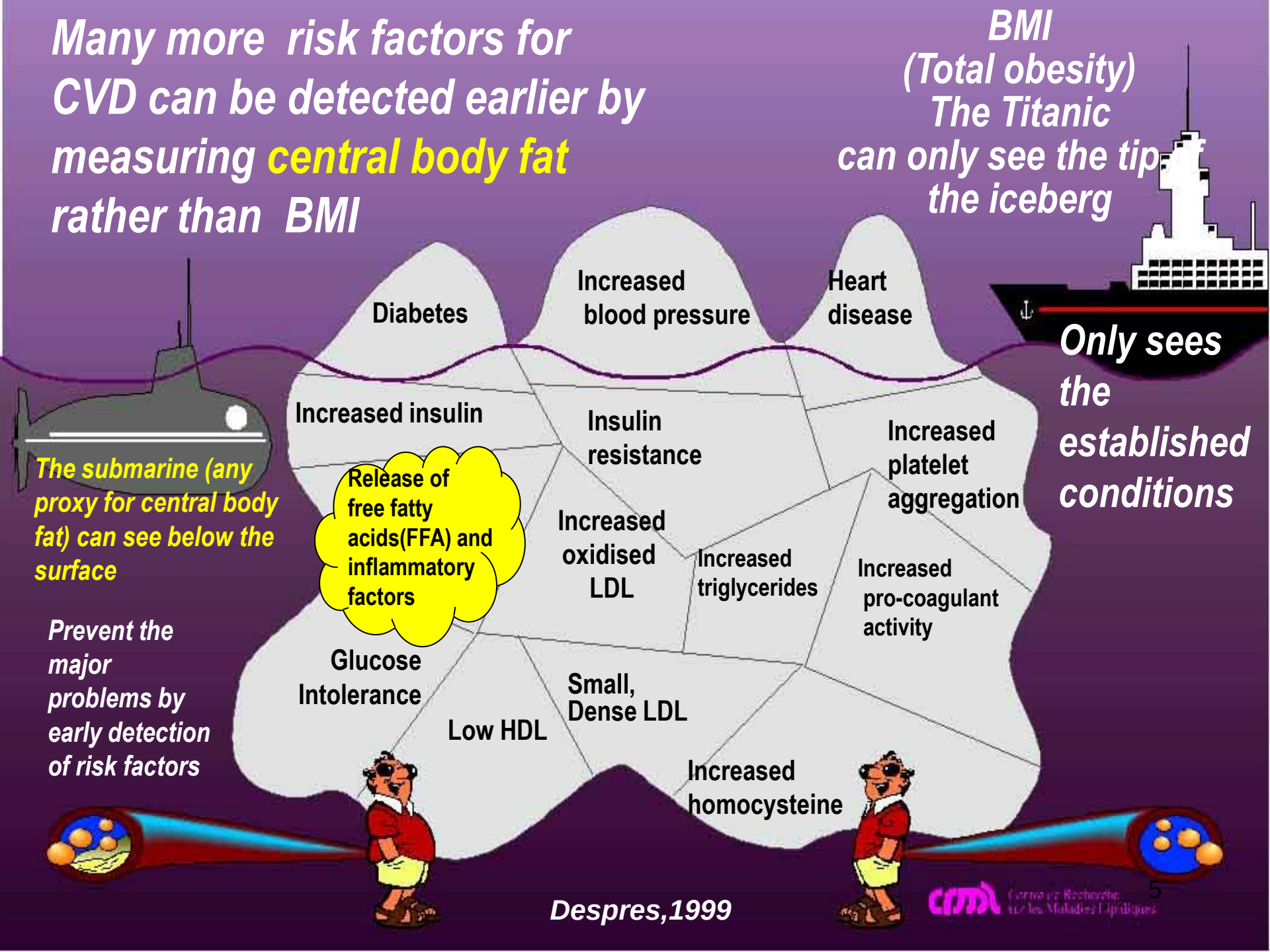
Waist =110

WHtR=0.71

Why is central 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 body fat rather than BMI
BMI (Total obesity) The Titanic can only see the tip of the iceberg
Only sees the established conditions
The submarine (any proxy for central body fat) can see below the surface
Prevent the major problems by early detection of risk factors
Diabetes
Increased blood pressure
Heart disease
Increased insulin
Insulin resistance
Increased platelet aggregation
Release of free fatty acids(FFA) and inflammatory factors
Increased oxidised LDL
Increased triglycerides
Increased pro-coagulant activity
Glucose Intolerance
Small, Dense LDL
Low HDL
Increased homocysteine
Despres,1999

Increased release of FFA and inflammatory factors from central adipose tissue disrupts mitochondrial biogenesis and raises cardiometabolic risk

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

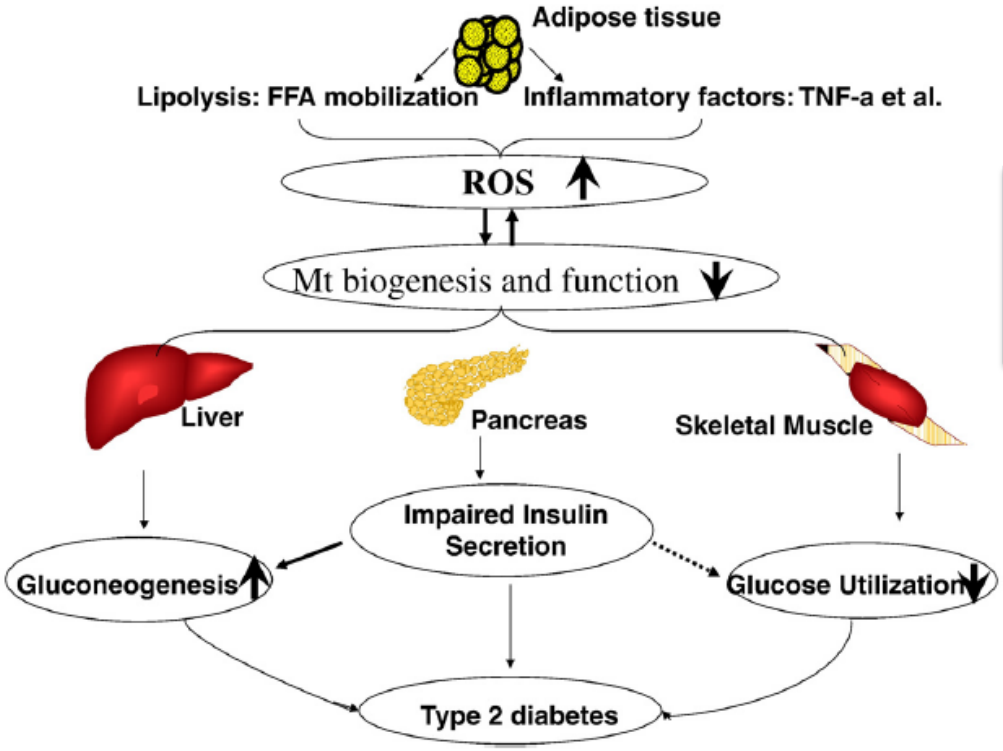


Fig. 1. Adipose tissue releases free fatty acids FFAs and pro-inflammatory factors (such as TNFalpha) due to various stresses, such as obesity, triglyceride overload, and dislipidemia. FFAs and TNFalphas may cause generation of ROS in the mitochondria l… …dysfunction (increased mitochondrial loss and decreased mitochondrial biogenesis), which causes more ROS generation as a vicious cycle. It… …which inhibits glucose-stimulated insulin secretion to impair β-cell function in pancreatic, decreases glucose utilization in the muscles, … …ysfunctions combine together to contribute to the development of type 2 diabetes.

Dyslipidemia

CVD

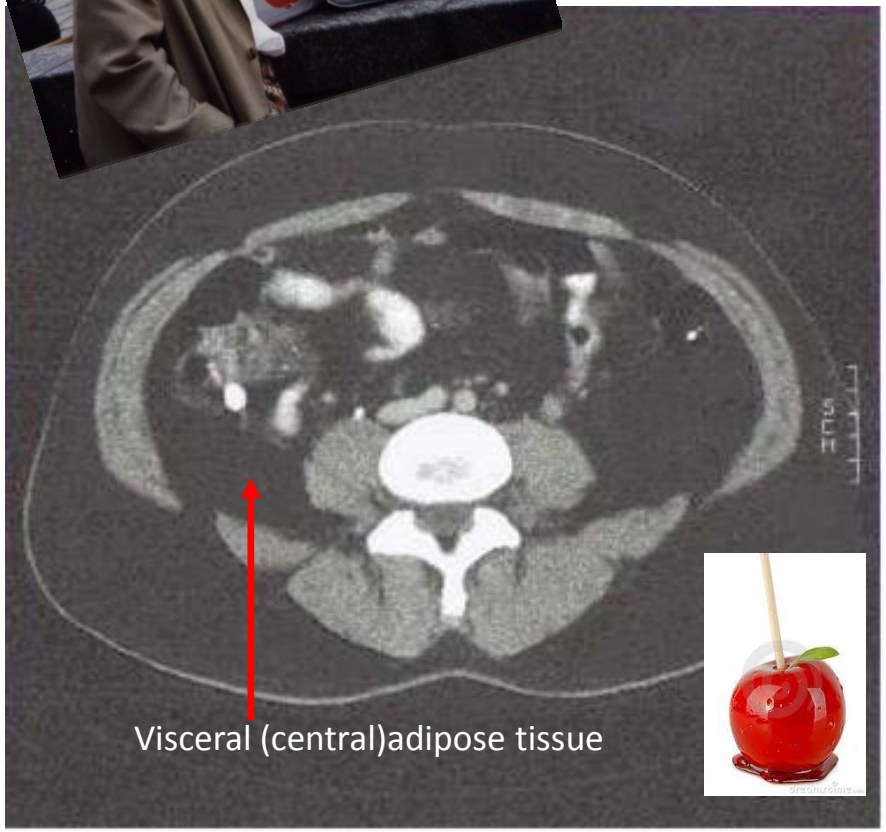
Studies on mitochondrial biogenesis. Ashwell, M; PhD thesis, 1970

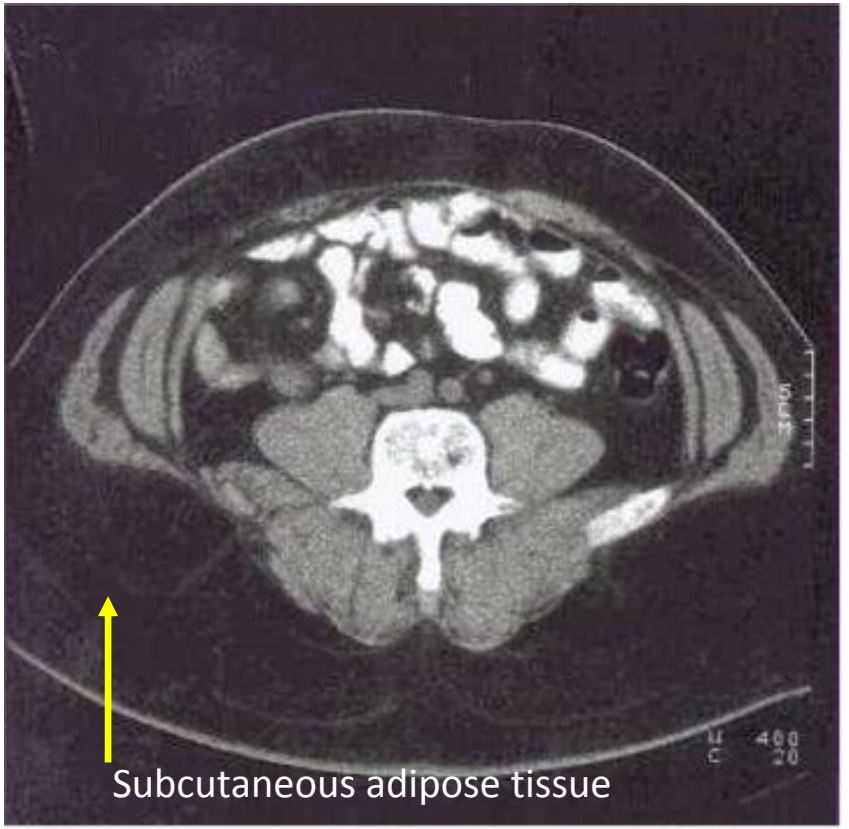
Liu et al, 2009

So, if central fat is harmful, how do we screen for it in a public health context?

1. Is there a simple anthropometric proxy measure for central fat?
2. Is there a good link between this proxy measure and morbidity?
3. Is there a good link between this proxy measure and mortality?
4. Is this proxy measure the simplest?

'Central' body fat can be measured by CT (Ashwell et al. 1985 BMJ. 290: 1692-4) **and MRI**





TOFI- thin on outside, fat on inside
?? TOFI apples??

FOTI- fat on outside, thin on inside

Back to the last century (1996): three studies led to the first Ashwell (R) Shape Chart

1.Cross-sectional HSE analysis (Ashwell, Lejeune & McPherson, BMJ 1996)

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

EDITOR,—The metabolic consequences of obesity relate to the accumulation of visceral fat, which is seemingly reflected by the waist circumference. We add our support to the proposal that sex specific action levels based on the waist circumference could be used as a measure for managing weight.[1,2] We also suggest that the ratio of waist circumference to height may be a superior measure for women as well as men.[3]

We took data from the 1992 health survey for England.[4] For each person (1411 men and 1481 women aged 30-74) anthropometric measure-

metabolic consequences of obesity than women. However, proof of the value of any proposed simple measure for indicating weight management and the scientific validation of proposed categories for action require data from a longitudinal follow up of morbidity and mortality.

We thank J Sainsbury plc for financial support.

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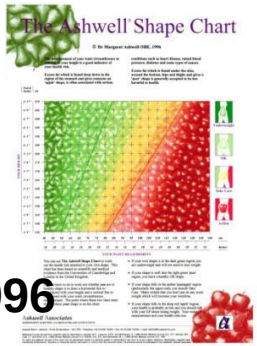
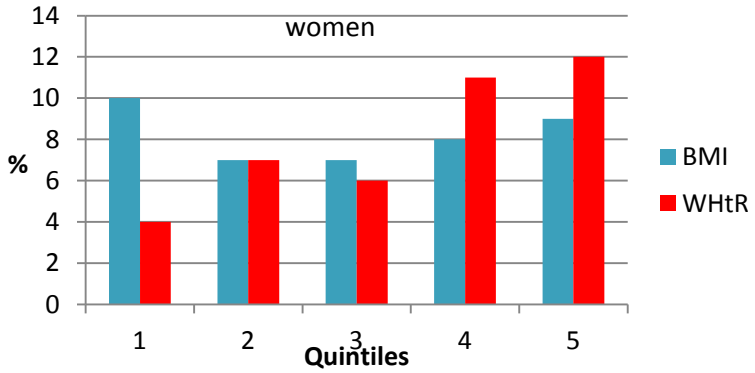


1996

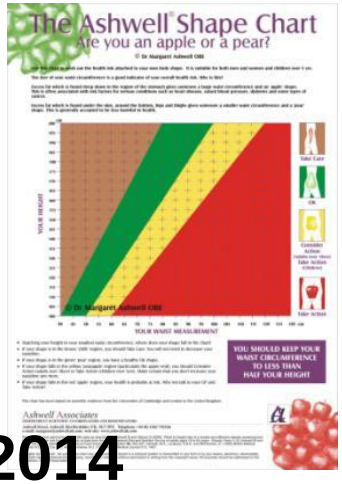
2. Prospective analysis of HALS UK prospective (10yr) data (Cox and Whichelow, BMJ, 1996)



Stronger link for mortality with WHtR than with BMI

3. Re-analysis of CT data

(Ashwell, Cole and Dixon, BMJ 1996)



2014

Fast forward to 21st century

Waist-to-height ratio is a better screening tool than waist circumference or BMI for adult cardiometabolic risk factors: systematic review and meta-analysis

Margaret Ashwell, Pippa Gunn and Sigrid Gibson
Obesity Reviews (2012)

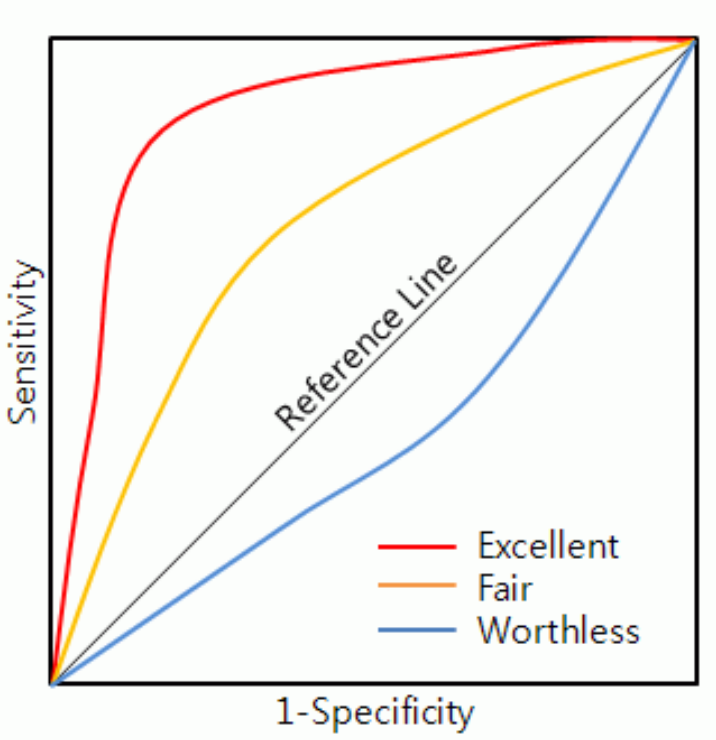
Meta-analyses of papers from systematic reviews

Systematic review
Using an objective and transparent approach to collate *pertinent* scientific papers, with the aim of minimizing bias

Meta-analysis
Pooling *pertinent* individual studies to give a mean effect size with confidence limits

ROC analysis allows us to compare screening tools

- Receiver operating characteristic (ROC) curves are used to see how good a measure can be as a screening tool
- They plot sensitivity against 1-specificity.
- The area under the curve (AUC) offers the best combination of sensitivity and specificity
- Higher AUC = better discriminator (1=perfect; 0.5 = no better than chance)

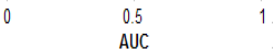


Overview of 31 studies in meta-analysis (Ashwell, Gunn and Gibson 2012)

- Studies were conducted between 1985 and 2008, in 18 different countries including Asia and South America.
- Study population size ranged from less than 200 to over 45,000 participants with a total of 123,231 men and 182,620 women.
- Age limits for inclusion into each of the individual studies ranged from 18 to 100 yr.
- Cardiometabolic outcomes were grouped into five broad categories:
  - –diabetes (D),
  - –hypertension (HT),
  - – dyslipidaemia,
  - – metabolic syndrome (MS)
  - –CVD outcomes (includes CHD and CVD outcomes and includes calculations of High Coronary Risk Score).

Discrimination of diabetes is better for waist-to-height ratio (p<0.001 compared with BMI)

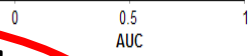
Study	Subgroup	Mean	Lower	Upper
Aekplakorn et al., 2006	M	0.651	0.614	0.688
Can et al., 2008	M	0.520	0.420	0.620
del Cristo Rodriguez Perez et al., 2010	M	0.670	0.640	0.700
Gracey et al., 2007	M	0.620	0.526	0.714
He et al., 2008	M	0.705	0.692	0.718
Ho et al., 2003	M	0.670	0.625	0.715
Koch et al., 2008	M	0.620	0.590	0.650
Lee et al., 2008	M	0.560	0.496	0.624
Li & McDermott, 2009	MA	0.680	0.625	0.735
Li & McDermott, 2009	MT	0.730	0.675	0.785
Li, Ford et al., 2010	M	0.600	0.555	0.645
Lin et al., 2002	M	0.706	0.679	0.733
Mansour & Al-Jazairi, 2007	M	0.630	0.615	0.645
Mellati et al., 2009	M	0.630	0.575	0.685
Mirmaran et al., 2004	M	0.630	0.545	0.715
Paniagua et al., 2008	M	0.620	0.545	0.695
Park et al., 2009	M	0.570	0.534	0.606
Sargeant et al., 2002	M	0.740	0.596	0.884
Schneider et al., 2007	M	0.690	0.660	0.720
Taylor et al., 2010	ME	0.780	0.715	0.845
Taylor et al., 2010	MM	0.790	0.735	0.845
Tseng et al., 2010	M	0.733	0.701	0.765
Total Random		**0.663**	**0.639**	**0.686**



pooled area under the curve (AUC) for BMI
0.66 (0.64,0.69)

Results shown for men; similar results for women

Study	Subgroup	Mean	Lower	Upper
Aekplakorn et al., 2006	M	0.705	0.671	0.739
Can et al., 2008	M	0.610	0.520	0.700
del Cristo Rodriguez Perez et al., 2010	M	0.720	0.690	0.750
Gracey et al., 2007	M	0.720	0.636	0.804
He et al., 2008	M	0.737	0.725	0.749
Ho et al., 2003	M	0.740	0.700	0.780
Koch et al., 2008	M	0.690	0.670	0.710
Lee et al., 2008	M	0.620	0.556	0.684
Li & McDermott, 2009	MA	0.720	0.660	0.780
Li & McDermott, 2009	MT	0.760	0.710	0.810
Li, Ford et al., 2010	M	0.600	0.550	0.650
Lin et al., 2002	M	0.769	0.745	0.793
Mansour & Al-Jazairi, 2007	M	0.700	0.685	0.715
Mellati et al., 2009	M	0.700	0.645	0.755
Mirmaran et al., 2004	M	0.640	0.555	0.725
Paniagua et al., 2008	M	0.670	0.600	0.740
Park et al., 2009	M	0.665	0.631	0.699
Sargeant et al., 2002	M	0.780	0.661	0.899
Schneider et al., 2007	M	0.720	0.695	0.745
Taylor et al., 2010	ME	0.790	0.725	0.855
Taylor et al., 2010	MM	0.790	0.735	0.845
Tseng et al., 2010	M	0.738	0.705	0.771
Total Random		**0.711**	**0.694**	**0.728**



pooled AUC for WHtR
0.71(0.69,0.73)

AUC for waist circumference and WHtR for all health outcomes shows they are statistically better than BMI

All health outcomes (mean of all measured outcomes for each study)					
Men (n=33groups)			Women (n=33groups)		
	Mean AUC			Mean AUC	
BMI	0.66		BMI	0.68	
WC	0.69	**0.026**	WC	0.71	**0.022**
WHtR	**0.71**	**0.002**	**WHtR**	**0.72**	**0.002**

But is waist-to-height ratio a better discriminator than waist circumference ?

- Used more powerful statistical method:
  - Calculated the *difference* in AUC between the two paired indices for each study.
  - Tested this against the null hypothesis that the difference is zero.

Discrimination of risk for WHtR *is* significantly better than that for waist circumference in men and women *within studies* for diabetes, hypertension, dyslipidaemia and CVD outcomes.

		Improvement in AUC (WHtR>WC)	
	No. studies	**mean**	**P value**
MEN			
Diabetes	22	0.016	**P<0.0001**
Hypertension	18	0.014	**P<0.0001**
WOMEN			
Diabetes	24	0.011	**P<0.0001**
Hypertension	19	0.014	**P<0.0001**
Dyslipidaemia	17	0.008	**P=0.001**
Metabolic syndrome	13	0.009	**P=0.04**
CVD	6	0.020	**P=0.002**
All outcomes	33	0.010	P<0.0001

For the first time, robust statistical evidence from 31 studies involving more than 300,000 adults in several ethnic groups, shows the superiority of WHtR over WC *and* BMI for detecting cardiometabolic risk factors in both sexes (Ashwell, Gunn and Gibson, 2012).

Systematic review needed relating waist-to-height ratio in children to metabolic risk

Latest published research

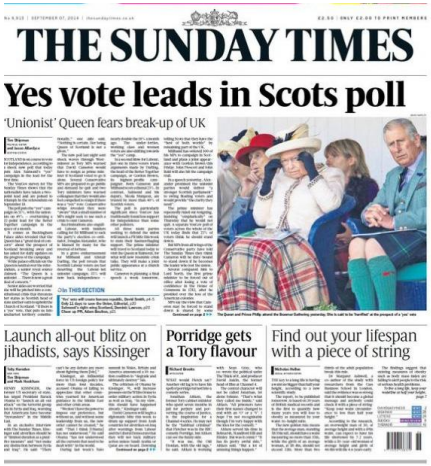
OPEN ACCESS Freely available online

PLOS ONE

Waist-to-Height Ratio Is More Predictive of Years of Life Lost than Body Mass Index

Margaret Ashwell[1]*, Les Mayhew[2], Jon Richardson[2], Ben Rickayzen[2]

1 Ashwell Associates, Ashwell, UK and Visiting Research Fellow, Oxford Brookes University, Oxfordshire, United Kingdom, **2** Cass Business School, City University London, Faculty of Actuarial Science and Insurance, London, United Kingdom



THE SUNDAY TIMES

Yes vote leads in Scots poll

'Unionist' Queen fears break-up of UK

Launch all-out blitz on jihadists, says Kissinger

Porridge gets a Tory flavour

Find out your lifespan with a piece of string

PLOS One September 8th 2014

Early edition
Sunday Times 7/9/14

Spot the difference competition

Later edition
Sunday Times

The Queen and Prince Charles attend the Braemar Gathering yesterday. She is said to be 'horrified' at the prospect of a 'yes' vote

e gets
lavour

Find out your lifespan with a piece of string

Nicholas Hellen

THE key to a long life is having a waist no bigger than half your height, according to a new scientific study.

The report, to be published tomorrow, is based on 20 years of British medical records and is the first to quantify how many years you will lose to obesity as measured by your waist-to-height ratio.

The new golden rule means that the average man, standing 5ft 10in tall, should have a waist measuring no more than 35in, while the girth of an average woman, at 5ft 4in, should not exceed 32in. More than two thirds of the adult population break this rule.

Dr Margaret Ashwell, a co-author of the study with researchers from the Cass Business School in London, said the evidence was so strong that it should become a global message and anybody could check it with a piece of string: "Keep your waist circumference to less than half your height."

According to the research, an overweight man of 30, of average height and with a 49in waist, can expect to have his life shortened by 7.2 years.

The findings suggest that existing measures of obesity such as body mass index are failing to alert people to the risk of serious health problems.

To live a long life, keep your waistline at half your height, page 7

Ashwell M, Mayhew L, Richardson J, Rickayzen B
(PLOS One , September 2014)
Waist-to-height ratio is more predictive of years of life lost than body mass index.

To compare the effect of :

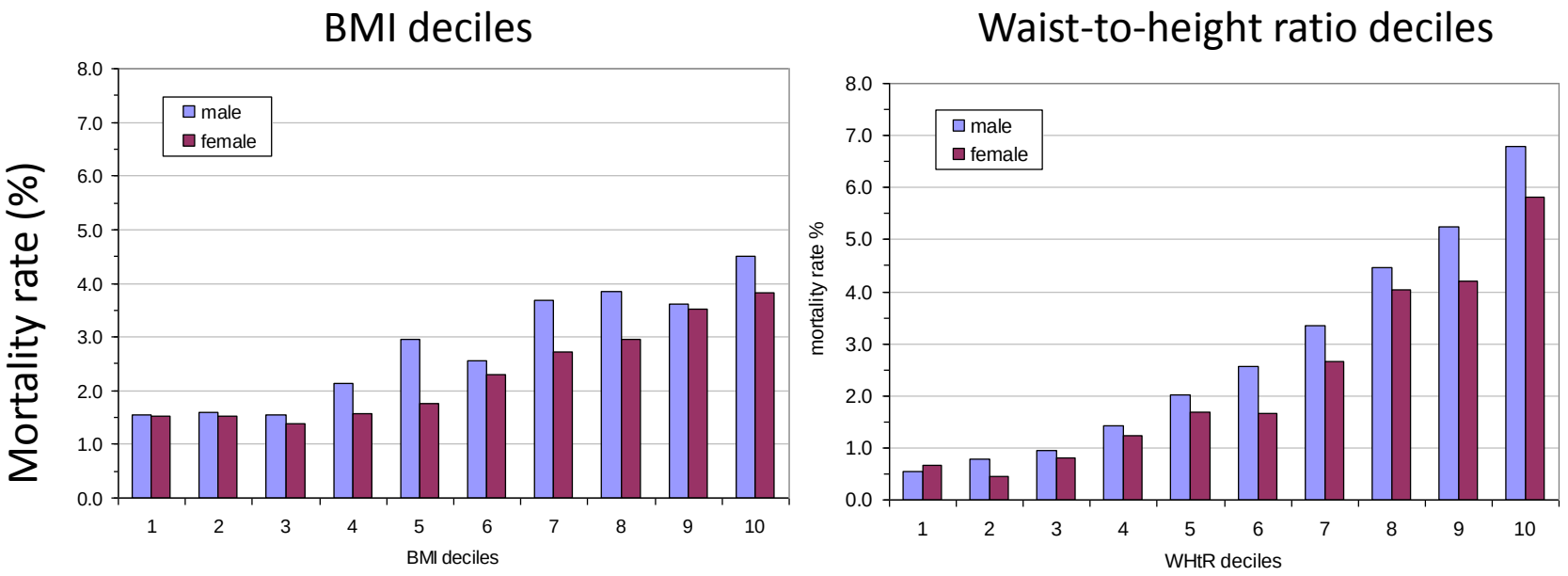
- central obesity (measured by waist-to-height ratio-WHtR)
- and total obesity (measured by body mass index-BMI)

on life expectancy (expressed as years of life lost, YLL) using data from British adults.

For what values of BMI and WHtR is YLL at a minimum?

- The number of years of life lost (YLL) for men and women (aged 30, 50 and 70 years) was found by comparing the life expectancies of 'obese' lives with those lives at optimum levels of BMI and WHtR.
- Data used:
  - Prospective 20yr Health and Lifestyle Survey (HALS, 2005)
  - cross sectional Health Survey for England (HSE, 2006)
  - interim life tables for the United Kingdom (ONS, 2006)

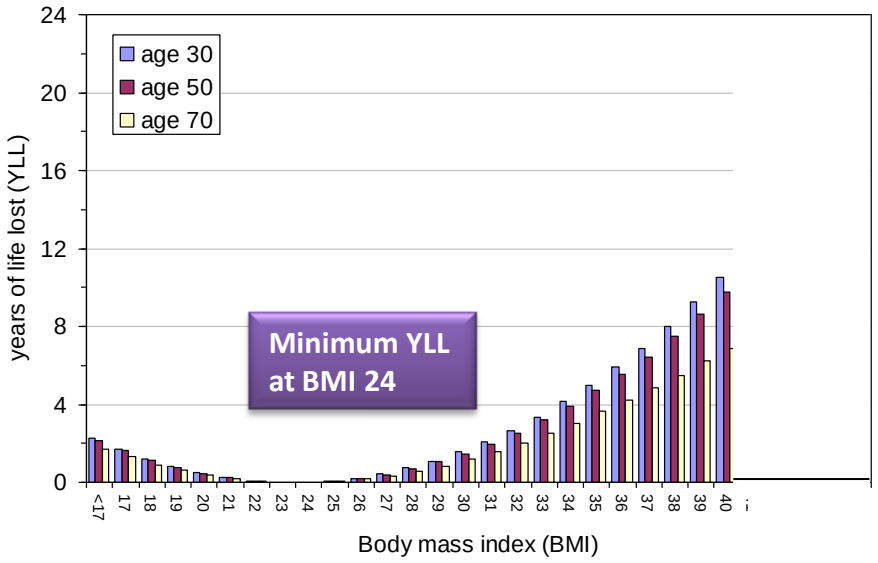
Stronger link between WHtR and mortality rates than between BMI and mortality rates
(using HALS 20 year follow up data, 1985 to 2005)



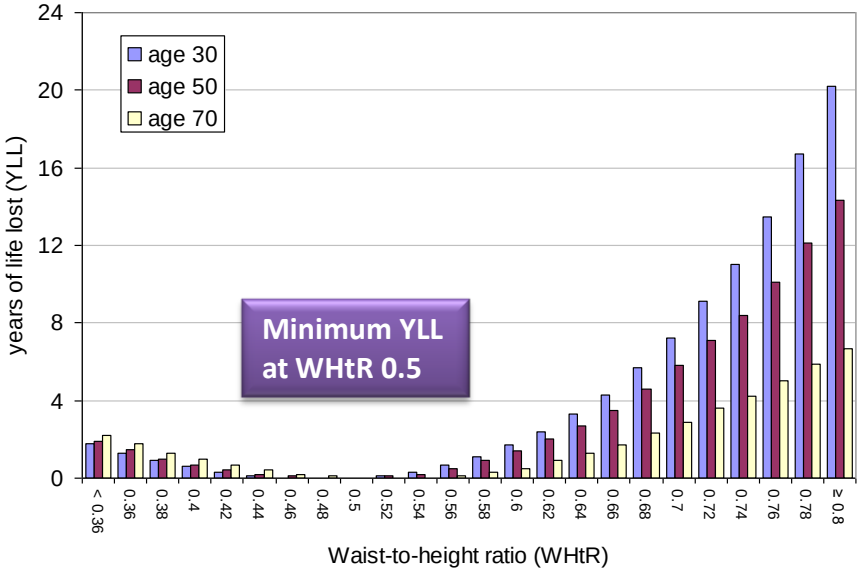
There is a clearer correlation between WHtR and mortality rates than BMI and mortality rates($P<0.01$).

Quantification of YLL at different values of BMI and WHtR for men for three representative ages (30, 50 and 70 yrs)

BMI

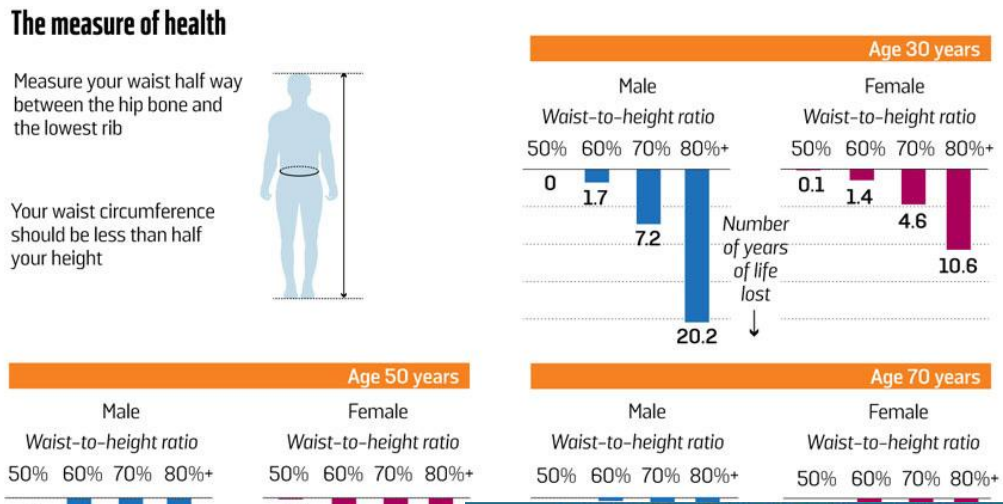


Waist-to-height ratio



Similar results for women

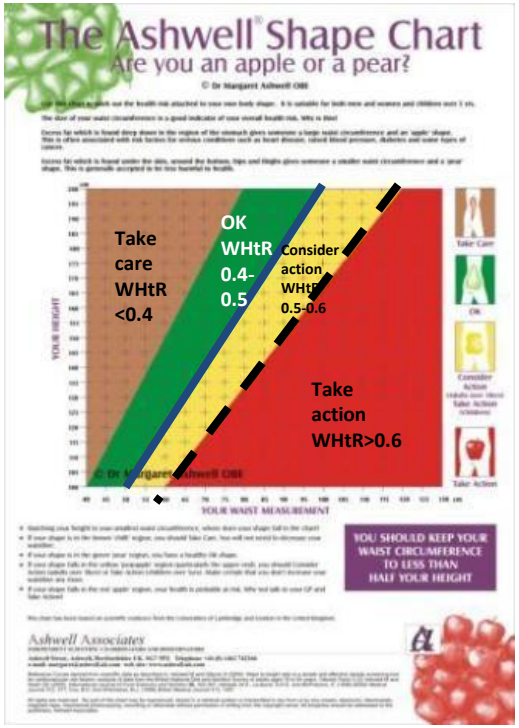
Some examples of YLL for men and women (non-smokers) aged 30, 50 and 70 years



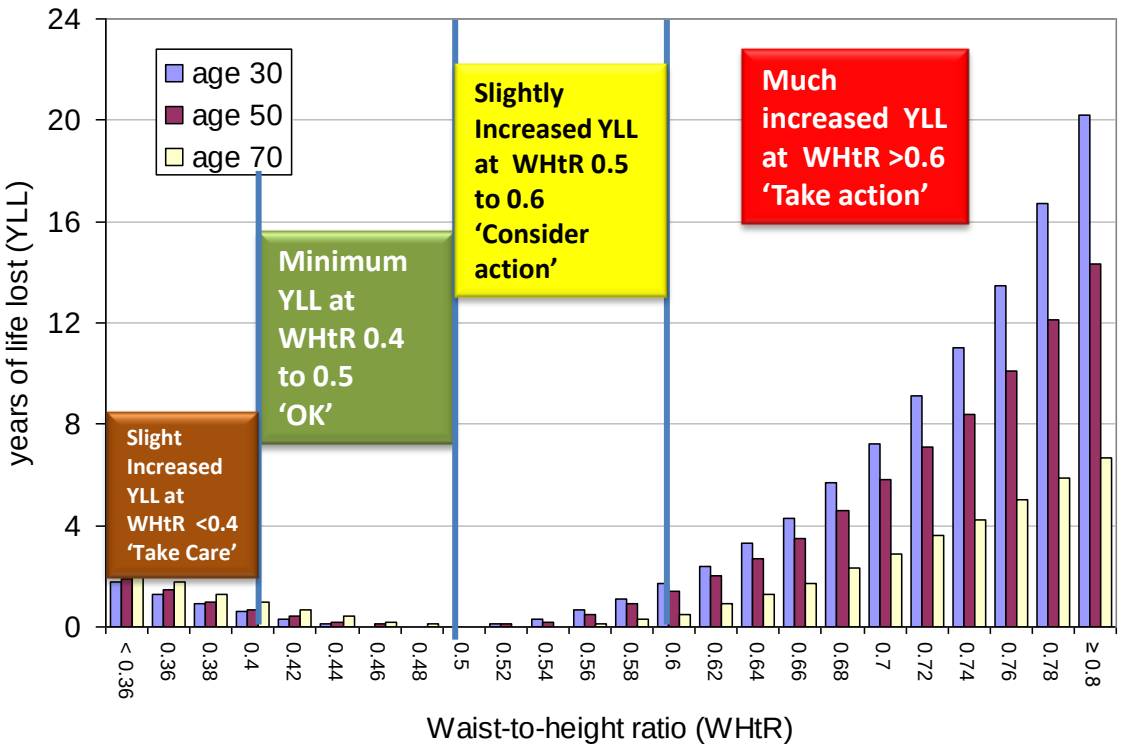
Sunday Times

Daily Mail

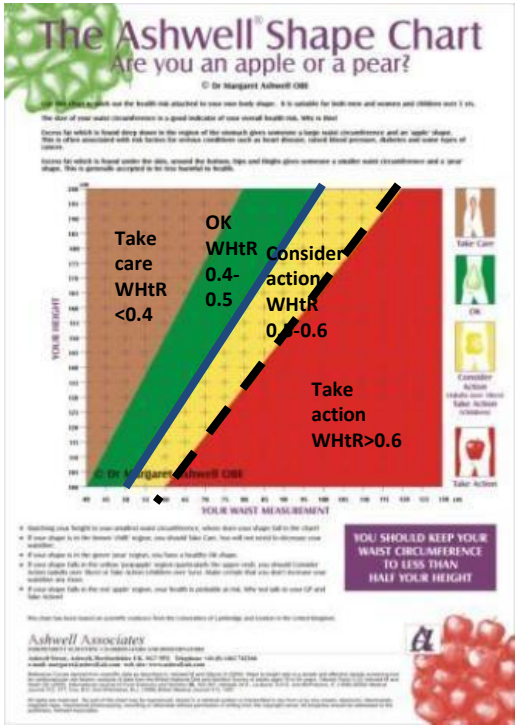
YLL data for men lends supports to the boundary values on Ashwell (R) Shape Chart

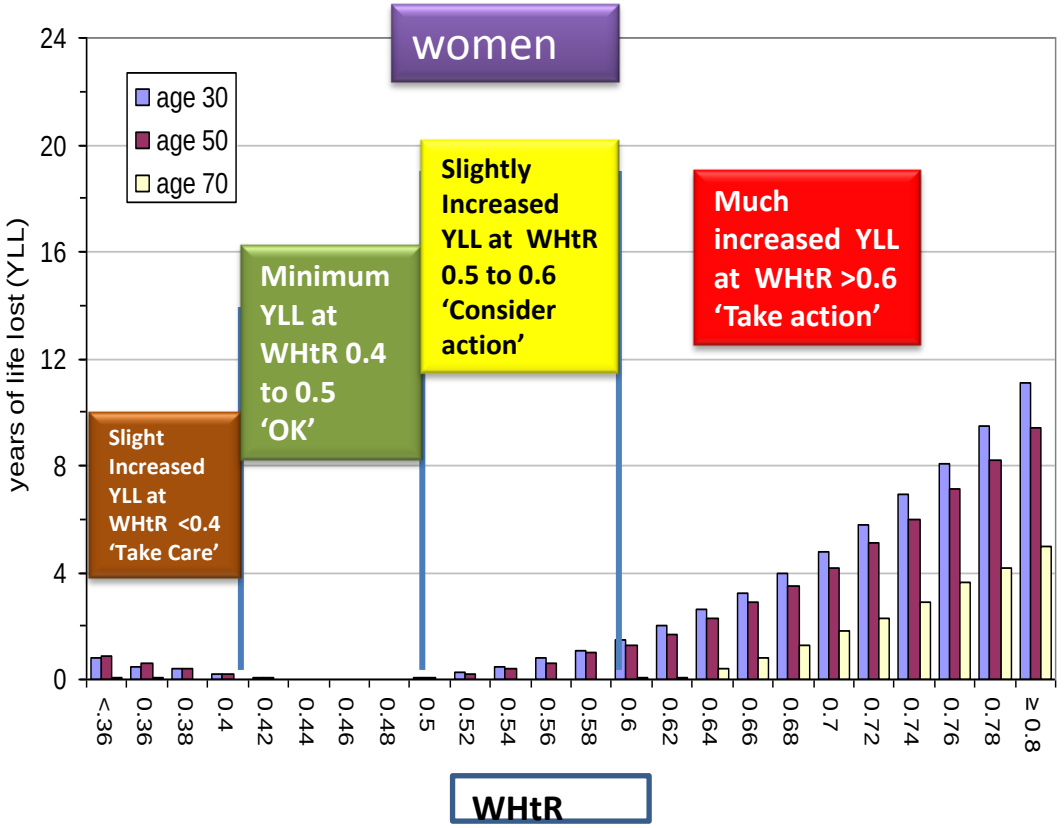


men



YLL data for women lends supports to the 'unisex' boundary values on Ashwell (R) Shape Chart





Questions relating to choice of screening: BMI or WHtR or the 'NICE matrix'?

1. What proportion of the UK population with 'normal' BMI have WHtR >0.5 (missed by BMI screening)?
2. What proportion of the UK population with increased BMI have WHtR <0.5 (need reassurance they are OK)?
3. What proportion of the UK population fall into the different categories of BMI and WHtR and the new NICE dual system (BMI plus waist circumference)?
4. What proportion of the UK population are 'missed' using the dual system (BMI plus waist circumference)?

Latest research shows BMI misclassifies ~28% of 'normal' population

Ashwell and Gibson *BMC Medicine* 2014, **12**:207
http://www.biomedcentral.com/1741-7015/12/207

Obesity: exploring the causes, consequences and solutions

BMC Medicine

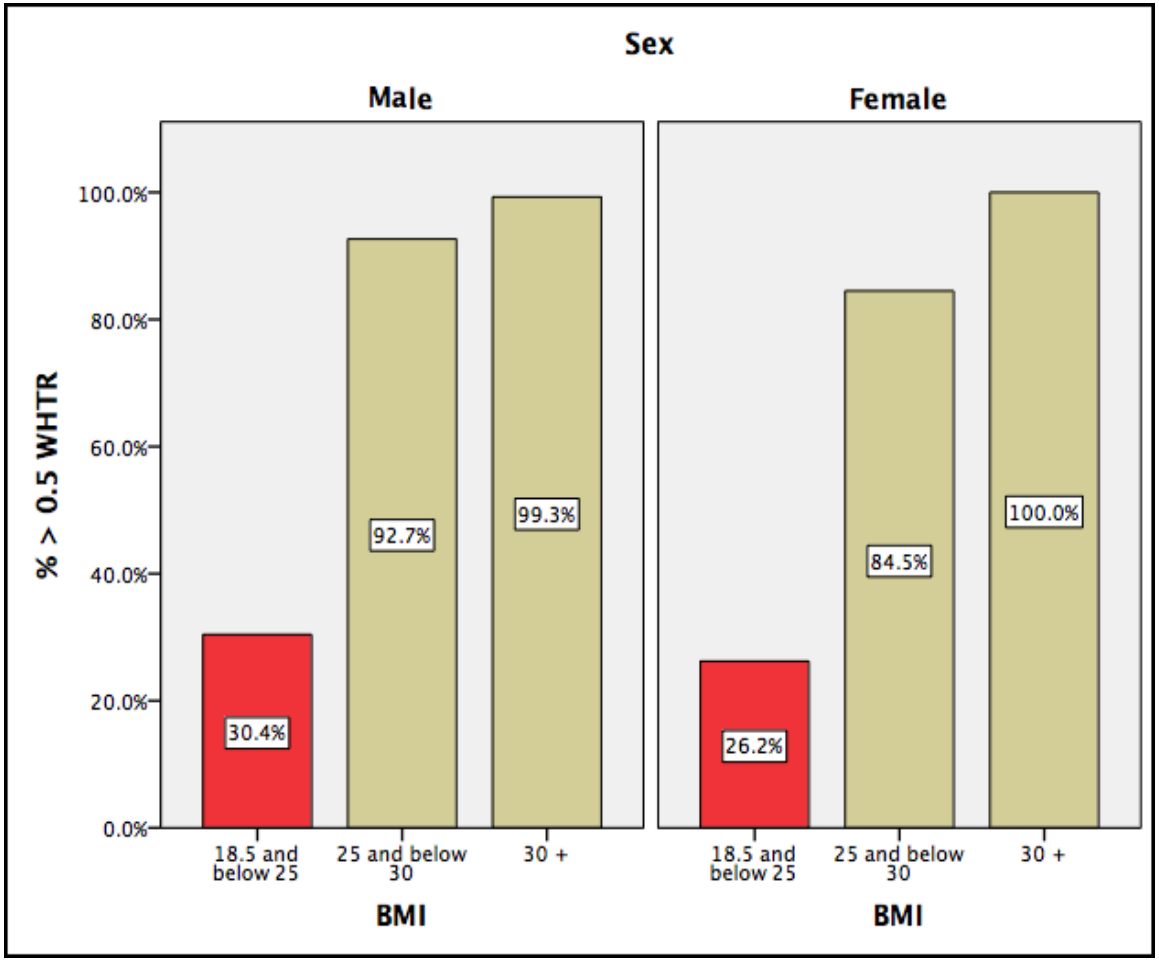
OPINION **Open Access**

A proposal for a primary screening tool: 'Keep your waist circumference to less than half your height'

Margaret Ashwell[1,2*] and Sigrid Gibson[3]

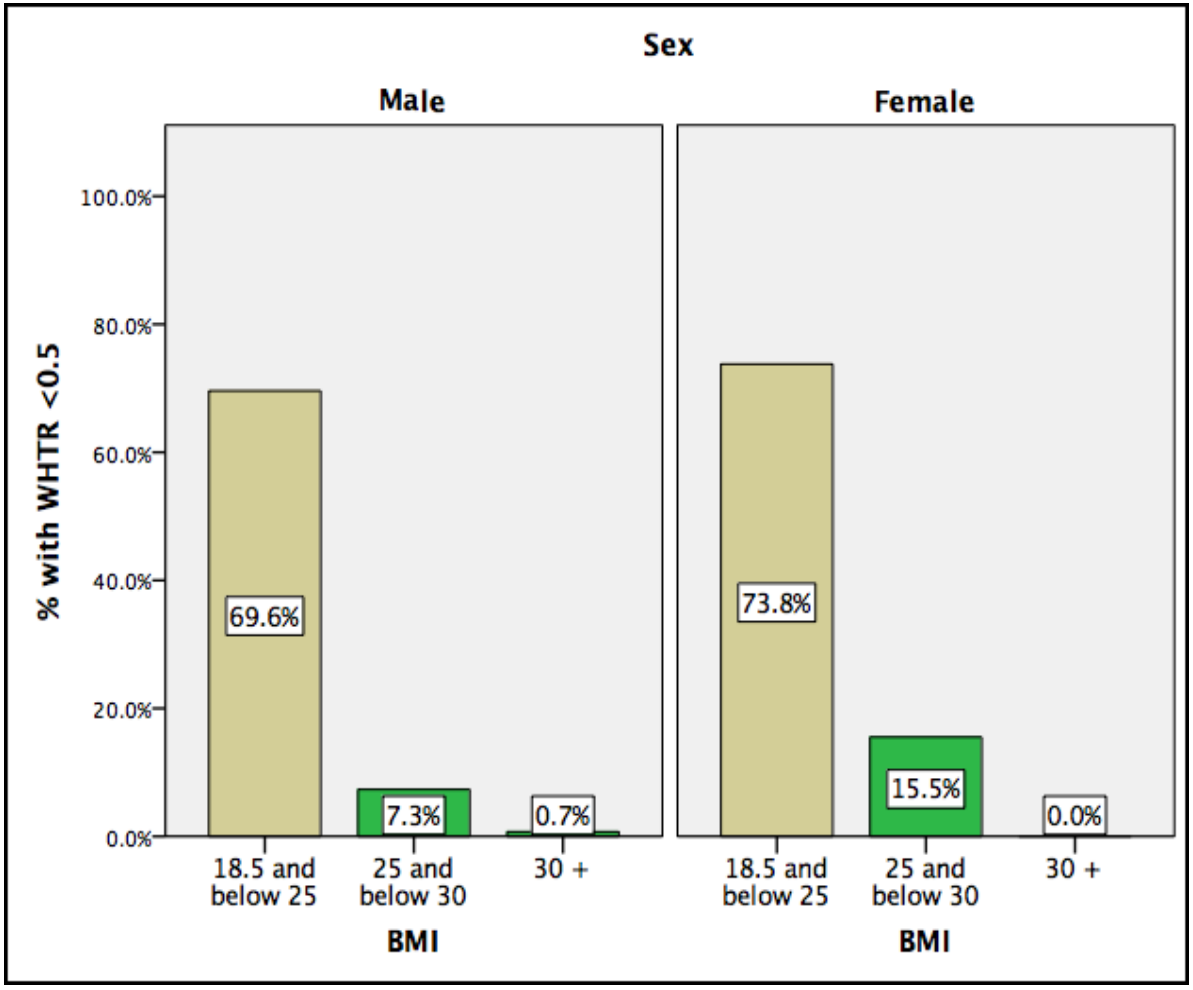
- National Diet and Nutrition Survey (NDNS) rolling survey – 4yr data
- Data collected 2008-2012
- Total sample n=4156 (aged 4-99y)
- N= 1655 adults aged 19-64y
- Of whom, 1170 had measures of Wt, Ht, and waist circumference

Answer to Question 1:
28% of adults classified as 'normal' by BMI have WHtR>0.5
They would be misclassified as 'not at risk' by BMI screening



Gibson and Ashwell (BMC Medicine (2014)

Answer to Question 2:
11% of adults classified as 'overweight' or 'obese' by BMI have 'normal' WHtR (<0.5)
They can be reassured they are currently 'not at risk'



Gibson and Ashwell (BMC Medicine,2014)

Questions relating to choice of screening: BMI or WHtR or the 'NICE matrix'?

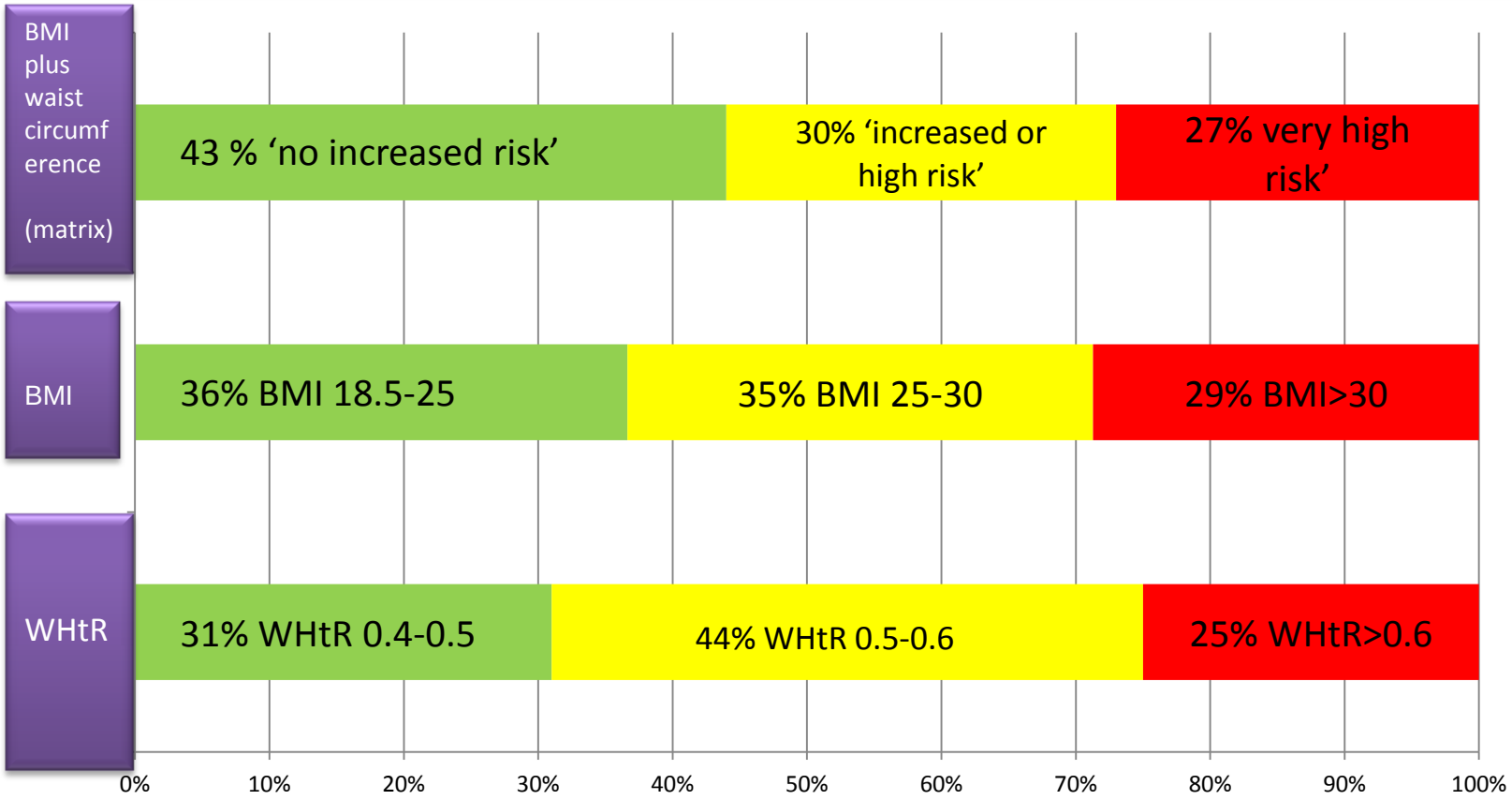
1. What proportion of the UK population with 'normal' BMI have WHtR >0.5 (missed by BMI screening)?
2. What proportion of the UK population with increased BMI have WHtR <0.5 (need reassurance they are OK)?
3. What proportion of the UK population fall into the different categories of BMI and WHtR and the new NICE matrix (BMI plus waist circumference)?
4. What proportion of the UK population are 'missed' using the NICE matrix (BMI plus waist circumference)?

The NICE matrix -BMI plus waist circumference (NICE,2011)

	Waist circumference		
	Low	**High**	**Very high**
BMI	**Men: <94cm Women: <80cm**	**Men: 94-102cm Women: 80-88cm**	**Men: >102cm Women: >88cm**
Underweight ($<18.5 kg/m^2$)	Underweight (Not Applicable)	Underweight (Not Applicable)	Underweight (Not Applicable)
Healthy weight ($18.5\text{-}24.9 kg/m^2$)	No increased risk	No increased risk	Increased risk
Overweight ($25\text{-}29.9 kg/m^2$)	No increased risk	Increased risk	High risk
Obese ($30\text{-}34.9 kg/m^2$)	Increased risk	High risk	Very high risk
Very obese ($\geq 40 kg/m^2$)	Very high risk	Very high risk	Very high risk

Answer to Question 3

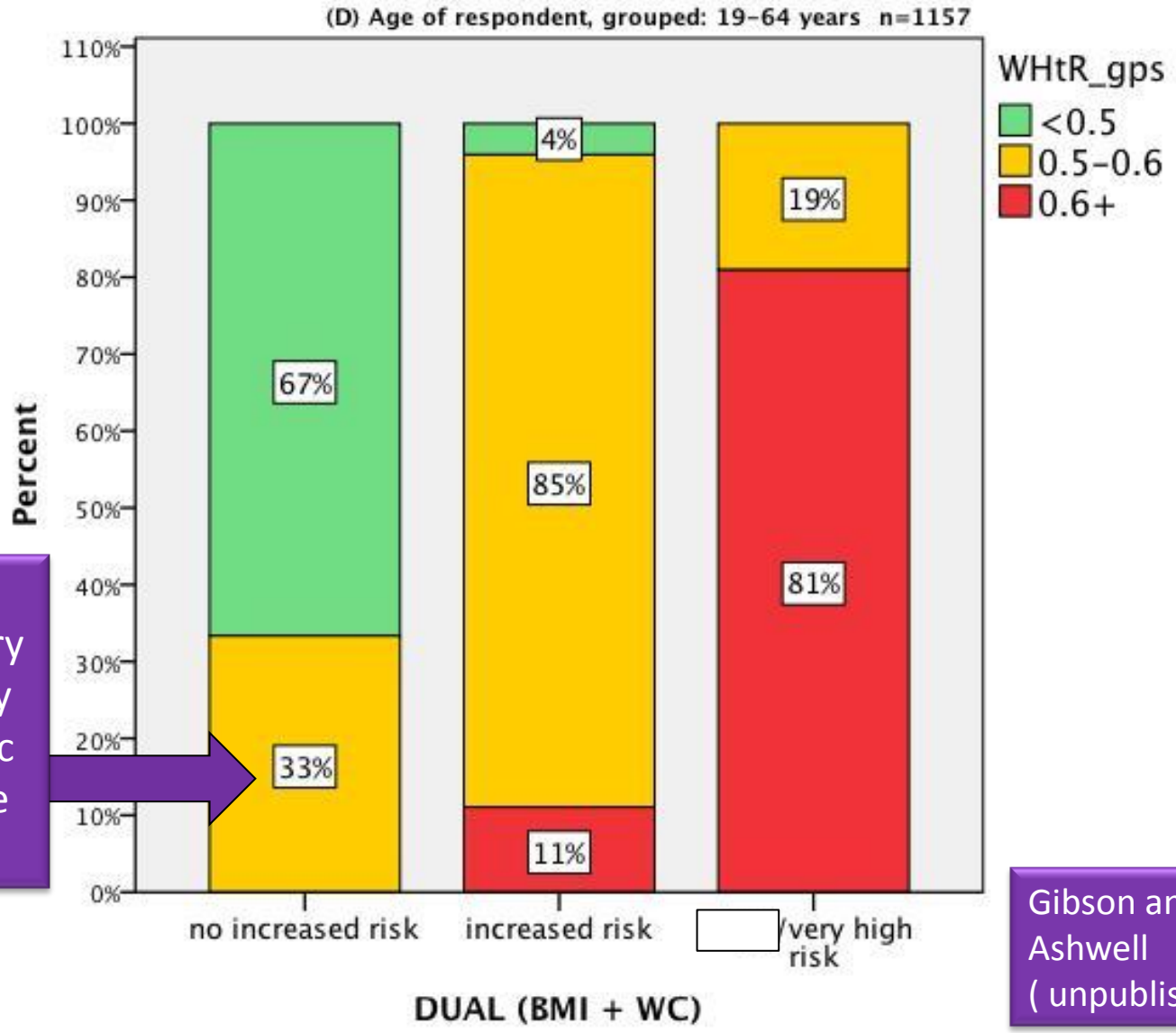
All three measures show more than one quarter of the UK population in the highest risk category. WHtR shows fewer people at 'no increased risk' than using BMI <25 or using the 'matrix'



Gibson and Ashwell (confidential and unpublished)

Answer to question 4: One third of those classified as “no increased risk” by ‘matrix’ (BMI+WC) are at early risk by WHtR

Cross tabs analysis



Using the simple WHtR measurement for primary screening could identify those at early metabolic risk and potentially save many years of life

Gibson and Ashwell (unpublished)

Answers relating to choice of primary screening: BMI or WHtR or the NICE 'matrix'?

1. What proportion of the UK population fall into the different categories of BMI and WHtR and the 'NICE matrix' (BMI plus waist circumference)?

   All three measures show more than one quarter of the UK population in the highest risk category.

   WHtR shows fewer people at 'no increased risk' than using BMI or using the 'matrix'

2. What proportion of the UK population are 'missed' using the 'NICE matrix' (BMI plus waist circumference)?

   One third of those classified as "no increased risk" by 'matrix' (BMI+WC) are at slight risk by WHtR

Conclusions

The ‘NICE matrix’ system picks up less people at risk than BMI. Waist-to-height ratio picks up more people at early risk.

NICE should investigate the use of waist-to-height ratio(WHtR), along with BMI, for primary screening.

New Zealand National Health Survey 2015 also shows WHtR detects early obesity better than NICE matrix

Understanding Excess Body Weight

New Zealand Health Survey

Table 11: Comparison of measures of excess body weight, by sex, 2011–2013

Sex	Risk level	BMI (%)	WC (%)	BMI/WC matrix (%)	WHtR (%)
Male	Increased	69	53	52	71
	Very high	29	29	23	n/a
Female	Increased	61	62	56	59
	Very high	31	42	28	n/a

New Zealand Health S

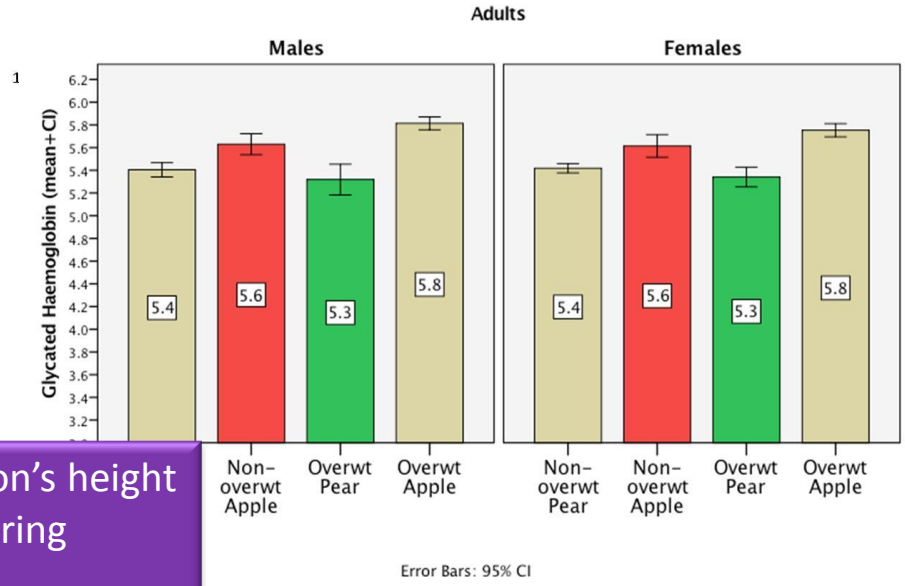
3 BMI: increased risk = overweight or obese; very high risk = obese.
WC: increased risk = high or very high WC; very high risk = very high WC.
BMI/WC matrix: increased risk = increased, high or very high risk; very high risk = very high risk.
WHtR: increased risk = WHtR of ≥0.5 (there is no cut-off equivalent to very high risk for WHtR).

Non-overweight ‘apples’ have higher cardiometabolic risk factors than overweight ‘pears’.
Waist-to-height ratio is a better screening tool than BMI
for blood levels of cholesterol and glycated haemoglobin

Sigrid Gibson and Margaret Ashwell, UK
Obesity Facts (2015) *8, 139.*

A piece of string = a simple, cheap, primary screening tool

Central obesity (apples, WHtR>=0.5) carries greater health risks than peripheral obesity (pears, WHtR <0.5)



- Health Survey for England (HSE)
- Population divided into 4 groups (2x2)
- Standard boundary values of BMI (<>25kg/m^2) and WHtR (<>0.5)

Cardiometabolic risk factors:
- total cholesterol (TC)
- glycated haemoglobin (HbA1c)

- Measure a person’s height with a piece of string
- Fold it in half
- Check this fits around the person’s waist
- If it doesn’t, do more screening!

“Keep your waist circumference to less than half your height”

…and finally..keep it simple, stupid!

Many attempts made to get better and better correlations of anthropometric indices with visceral fat or with cardiometabolic risk factors.

It all gets very complicated due to :

- Trying to improve the indices
- Trying to improve the boundary values for indices

Examples of tweaking the Shape indices

Conicity index, CI (Valdez,1991)

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

Lipid accumulation product LAP (Kahn , 2005)
Males, LAP = (WC [cm]–65)x(triglyceride concen [mmol/L])
Females, LAP = (WC [cm]–58)x(triglyceride ntration[mmol/L]).

Visceral adipose index, VAI (A et al(2010))
Males, VAI = (WC/36.58 BMI)x(TG/0.81)x(1.52/HDL)
Females, VAI = (WC +(1.88xBMI)x(TG/1.03)x(1.31/HDL).

WHtR = waist circumference /height could replace all of these

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

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

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

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

Examples of tweaking boundary values for waist circumference

Caucasian adults	Other Ethnic groups	Japan	Caucasian children
^94cm (M); ^80cm (F) *102cm (M); *88cm(F) **94cm (M); **80cm(F) ***94cm (M);***80cm(F)	***90cm (M),***80 cm (F)	90cm (M),***80 cm (F) # 85 (M), 90cm (F)	based on centiles age specific

WHtR = 0.5 could replace all of these

^ example given by WHO Expert Consultation on Obesity (2000)
* Adult Treatment Panel (ATPIII) under the aegis of the National Cholesterol Education Program (NCEP) of the NIH's National Heart, Lung, and Blood Institute(NHLBI) (2000)
** 2006 NICE guidance on obesity ;
***2006 International Diabetes Federation
#Japan Society of Obesity,2006

Example of tweaking cut-off values for BMI and waist circumference

Use of ~500,000 Biobank subjects to define age-adjusted BMI and waist circumference cut-offs equivalent to conventional thresholds, relating to the rate of diabetes, by ethnic group and sex (Ntuk et al, 2014).

	White (reference)	South Asian (Pakistani)	South Asian (Indian)	Chinese	Black
Men					
BMI	30	21.5	22		26
Waist	102cm/40ins	78/30.7	/31.5	88/34.6	88/34.6
Women					
BMI	30	21.6	22.3	24	26
Waist	88cm/34.6ins	68/26.7	70/27.5	74/29	79/31

WHtR = 0.5 could replace all of these

Keep it even simpler, stupid!

How long is a piece of string?

Exactly half a child's height if we want to prevent global obesity !

SHINE Health Academy Sheffield take up the idea of simplicity!

DON'T WAIST TIME

Measure your health

Carrying too much fat around the waist can lead to serious illnesses such as type 2 diabetes, heart disease, high blood pressure and cancer. Your waist for best health should be half the length of your height so do this simple string test.

Measure your height with a piece of string

cut the string in half

Place this around your waist. The wider the gap the bigger the health risks.

Here are 5 tips to help you lose inches from your middle...

Move more - do at least 30 minutes of physical activity a day such as dancing, cycling, swimming or fast walking. Get a pedometer and try to walk 10,000 steps per day.

Be happy - stress and worry produces a hormone called cortisol which increases fat absorption around your tummy. If something is bothering you talk it through with an adult you trust.

Watch your portion sizes - eat portions that are right for your age. Avoiding supersize portions is not easy. Get used to measuring your portions and recording them on your portion chart.

Lower sugary snacks and drinks - be aware of how much sugar is hidden in what you eat and drink. 1 teaspoon = 5-6g. A bar of chocolate with 56 grams of sugar in it is 10 teaspoons! Measure it out - do you really want to eat that much sugar?

Eat your "5 a day" - 80g (1 handful) makes up a portion and you need 2 fruit and 3 vegetables portions a day. Eat a variety which will contain different vitamins, minerals and nutrients.

For more information visit www.shinehealthacademy.org.uk

illustrations and design by helen cocker

References

- ASHWELL, M. & GIBSON, S. 2014. A proposal for a primary screening tool: "'Keep your waist circumference to less than half your height". *BMC Medicine, 12**, 207-214.***
- ASHWELL, M., MAYHEW, L., RICHARDSON, J. & RICKAYZEN, B. 2014. Waist-to-height ratio is more predictive of years of life lost than body mass index. *PLOS One, 9 e103483*
- ASHWELL, M., GUNN, P. & GIBSON, S. 2012. Waist-to-height ratio is a better screening tool than waist circumference and BMI for adult cardiometabolic risk factors: systematic review and meta-analysis. *Obes Rev, 13**, 275-86.***
- ASHWELL, M. 2012. Plea for simplicity: use of waist-to-height ratio as a primary screening tool to assess cardiometabolic risk *Clinical Obesity, 2**, 3-5.***
- .

Three ‘Take Home Messages’

1. Waist- to- height ratio (or of central obesity and better predictor of cardiometa ı waist circumference (WC) *and* BMI.

2. Using the simple WHtF screening instead of BMI, or even th nd save many years o

Use a piece of string to measure child’s height.
Cut it in two and see if it goes around the child’s waist .
If it does OK.
If it does not- take care and do further screening.

3. Keep it health.

WHtR 0.5 i fe lost. It is probably suitable all ethnic groups and children

A piece of string is the simplest public health tool!.

www.ashwell.uk.com