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What if there was a cure for obesity?

Dr Matthew S Capehorn

GPwSI and Bariatric Physician
Clinical Manager, Rotherham Institute for Obesity
Board member, Association for the Study of Obesity (ASO)

Nay Wynn

Research Actuary, Hannover Re

22 May 2018

Overview of the presentation

- What is obesity and how is it measured?
- Current obesity statistics
- What causes obesity?
- What are the consequences of obesity?
- How can we tackle obesity?

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- Impact on the Protection business
- Concluding remarks

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BMI classification of obesity

BMI = weight(kg) / height(m)^2

WHO Classification	BMI	Risk of Comorbidity
Underweight	Below 18.5	Low (but risk of other clinical problems increased)
Healthy weight	18.5-24.9	Average
Overweight	25.0-29.9	Mild increase
Obese	**>30.0**	
Grade 1 obesity	30.0-34.9	Moderate increase
Grade 2 obesity	35.0-39.9	Severe increase
Grade 3 obesity (morbid obesity)	>40.0	Very severe

Source: Adapted from WHO, 1995, WHO, 2000 and WHO 2004

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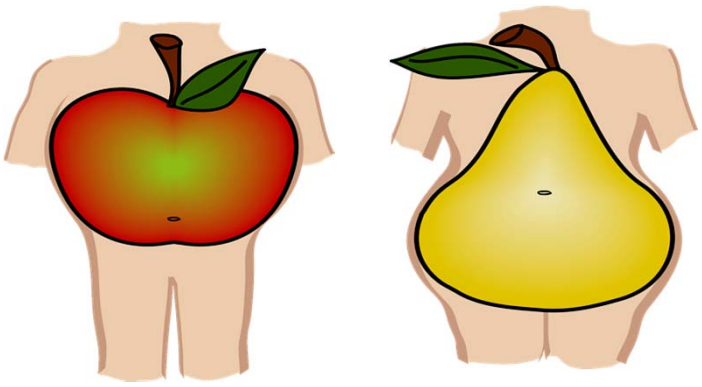
Android (*apple*) vs. gynoid (*pear*) obesity



A tribute to a pioneer: Jean Vague (1947)

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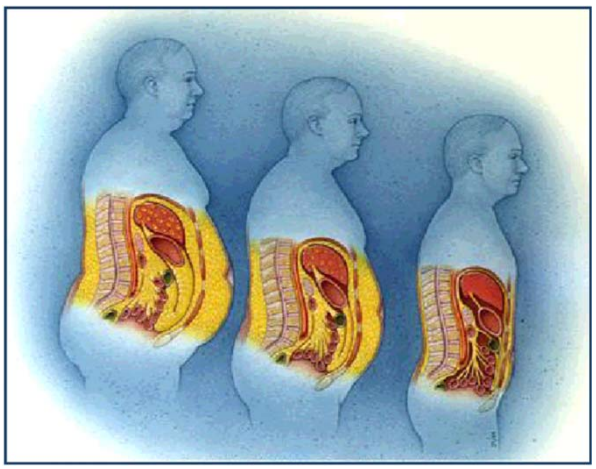
Not all types of fat are the same

Visceral fat is the target



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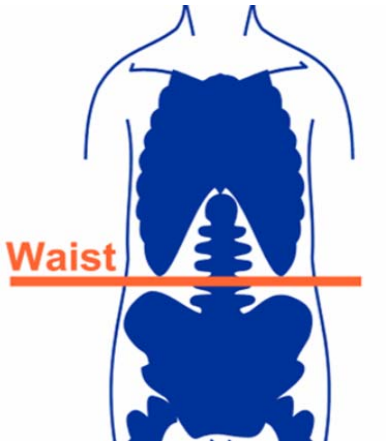
Measuring waist circumference



- A practical guide from the NIDDK/NIH
  - Place a tape measure around the bare abdomen, just above the hip bone
  - Be sure the tape is snug, but does not compress the skin
  - The tape should be parallel to the floor, midway between the top of the iliac crest and the lower rib margin on each side
  - the patient should relax and exhale while the measurement is made

NIDDK = National Institute of Diabetes and Digestive and Kidney Diseases; NIH = National Institutes of Health

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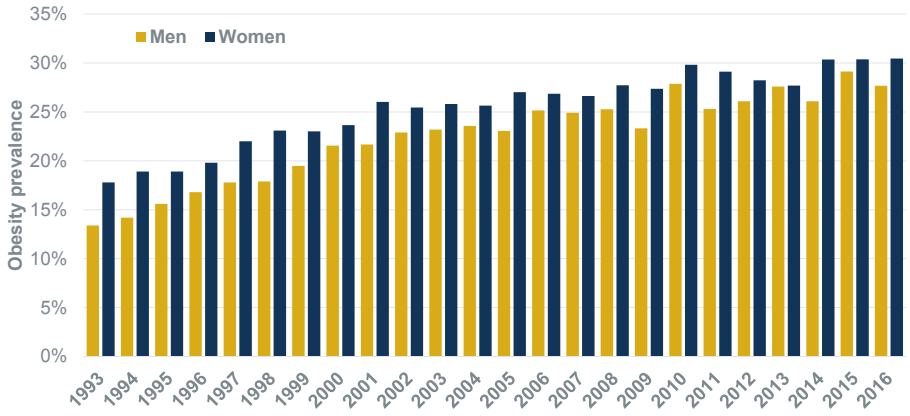
Prevalence of obesity among adults aged 16+ years



Health Survey for England 2016; Adult health trends

Obesity defined as BMI ≥ 30kg/m^2

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Obesity

- It is not that we don't see weight problems!
- 2017 NHS Digital stats for England (2016 data):
  - 26% of men and 27% of women are obese (BMI >30)
  - Increasing numbers are morbidly obese (BMI >40) and 'super obese' (BMI >50)
  - 66% men and 57% women are obese or overweight
- Foresight report (Oct 2007):
  - estimates on current trends >50% of the UK will be obese by 2050
  - Currently 2/3 adults and 1/3 children overweight or obese
  - Without action 9/10 and 2/3 by 2050
  - By 2050 the total direct & indirect costs of obesity may increase to £49.9bn

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… but what causes obesity?

- Gluttony (eating too much)?
- Laziness (not enough physical activity)?
- Food Industry?
- Technology (less manual labour, etc.)?
- Comfort eating or habit eating?
- Lack of cooking skills?
- Genetics and/or epigenetics
- Microbiota

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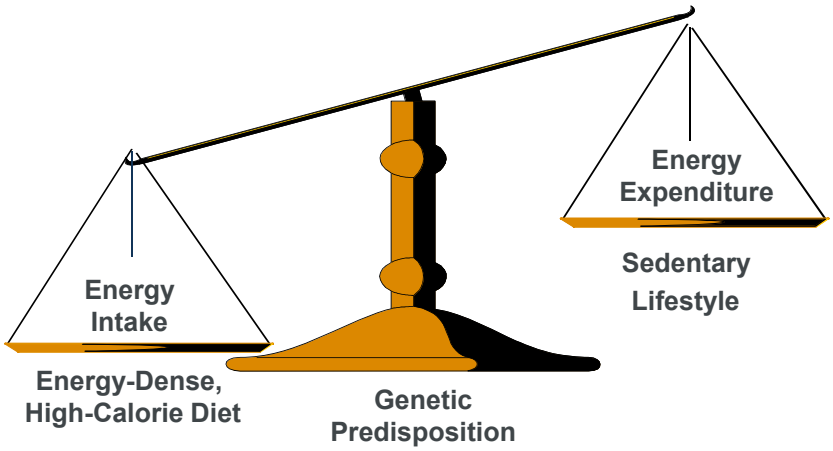
Obesity: the traditional view



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Obesity: the revised view

Foresight. Tackling Obesities: Future Choices. Gov.UK. 2007

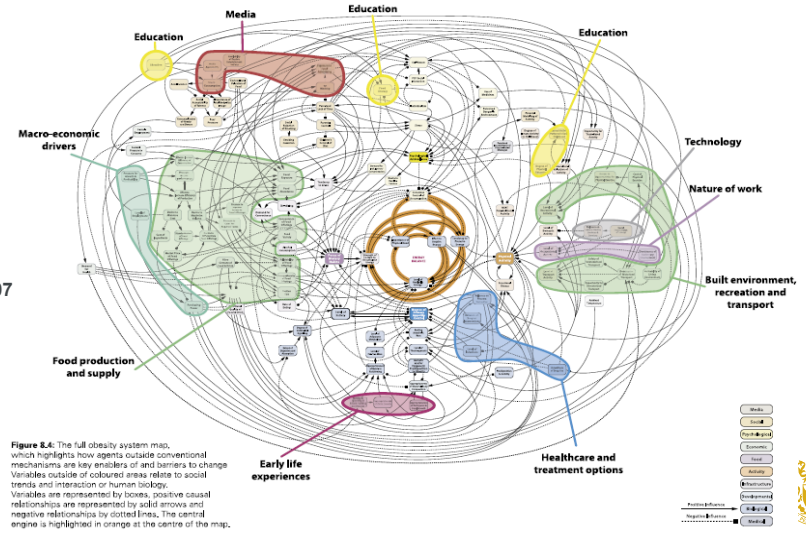

Figure 8.4: The full obesity system map, which highlights how agents outside conventional mechanisms are key enablers of and barriers to change. Variables outside of coloured areas relate to social trends and interaction or human biology. Variables are represented by boxes, positive causal relationships are represented by solid arrows and negative relationships by dotted lines. The central engine is highlighted in orange at the centre of the map.

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Why do we care about obesity?

Or do we care too much?

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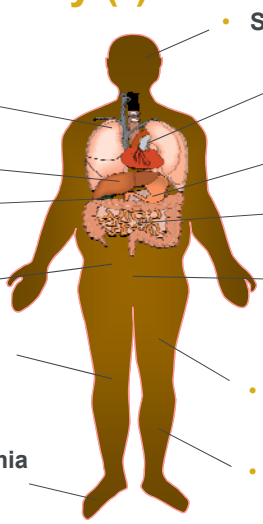
Diseases related to obesity (*)



- **Pulmonary disease**
  - obstructive sleep apnea
  - Asthma/COPD
- **Nonalcoholic fatty liver disease**
  - steatohepatitis
  - cirrhosis
- **Gynaecologic abnormalities**
  - abnormal menses
  - infertility
  - polycystic ovarian syndrome
- **Stroke**
- **Coronary heart disease**
  - Dyslipidemia
  - Hypertension
- **Diabetes**
- **Gall bladder disease**
- **Cancer**
  - breast, uterus, cervix
  - colon, esophagus, pancreas
  - kidney, prostate
- **Stress incontinence**
- **Osteoarthritis**
- **Phlebitis**
  - venous stasis
- **Hyperuricaemia and Gout**
- **Leg ulcers**
  - pressure sores

*** Speakers own opinion**

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Relative risk of health problems associated with obesity

Disease	Women	Men
Type II Diabetes	12.7	5.2
Hypertension	4.2	2.6
Myocardial infarction	3.2	1.5
Colon cancer	2.7	3.0
Angina	1.8	1.8
Gall bladder disease	1.8	1.8
Ovarian cancer	1.7	-
Osteoarthritis	1.4	1.9
Stroke	1.3	1.3

National Audit Office Report. Tackling Obesity in England. London, 2001

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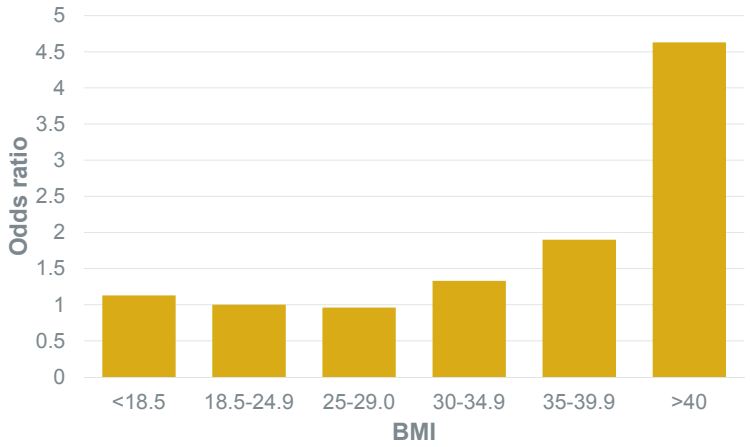
Risk of Major Depression with Extreme Obesity



Source: Onyike, et al. Amer J Epidemiology 2003;158:1139-1147.

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Weight loss reduces mortality

Weight loss of 10 kg produces a marked improvement in mortality

Mortality	Blood pressure	Diabetes	Lipids
• > 20-25% fall in mortality • > 30-40% fall in diabetes-related deaths • > 40-50% fall in obesity-related cancer deaths	• Fall of approximately 10 mmHg systolic and diastolic blood pressure	• Fall of 50% in fasting glucose	• Fall of 10% in total cholesterol • Fall of 15% in LDL-C • Fall of 30% in triglycerides • Rise of 8% in HDL-C

Betteridge DJ and Morrell JM. Clinicians' Guide to Lipids and Coronary Heart Disease Second edition Arnold, London 2003 p173; (based on Jung R. Obesity as a disease. Br Med Bull 1997; 53 (2): 307-321).

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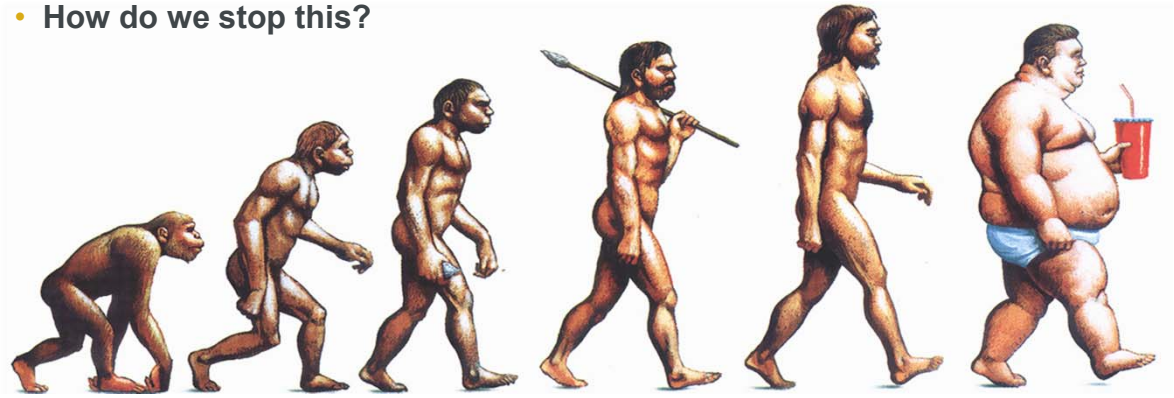
The evolution of man

- How do we stop this?



The cover of "The Economist", December 13-19, 2003

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Obesity: the revised view - revisited

Foresight. Tackling Obesities: Future Choices. Gov.UK. 2007

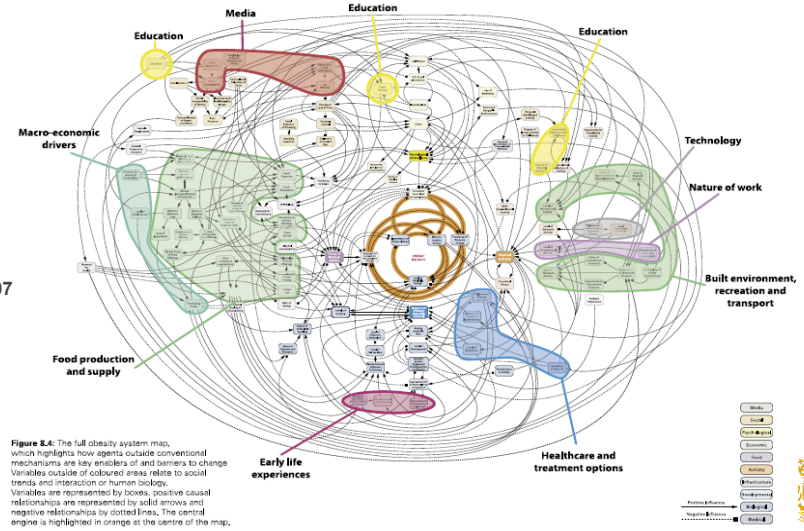

Figure 8.4: The full obesity system map, which highlights how agents outside conventional mechanisms are key enablers of and barriers to change. Variables outside of coloured areas relate to social trends and interaction or human biology. Variables are represented by boxes, positive causal relationships are represented by solid arrows and negative relationships by dotted lines. The central engine is highlighted in orange at the centre of the map.

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How can we solve a problem like obesity?

- 1) Tackle all 100+ causes
  - Nanny state or “nudge”
  - Increase physical activity
  - Decrease food consumption
  - Food tax/subsidy
  - Where is the evidence that we can “prevent” obesity?
- 2) Treat the overweight/obese
  - “Treating” the overweight “prevents” more obesity.
  - NICE Recommends (for adults):
    - Diet
    - Exercise
    - Behavioural therapy
    - Drug treatment
    - Surgery (if BMI >40, or >35 with co-morbidities)

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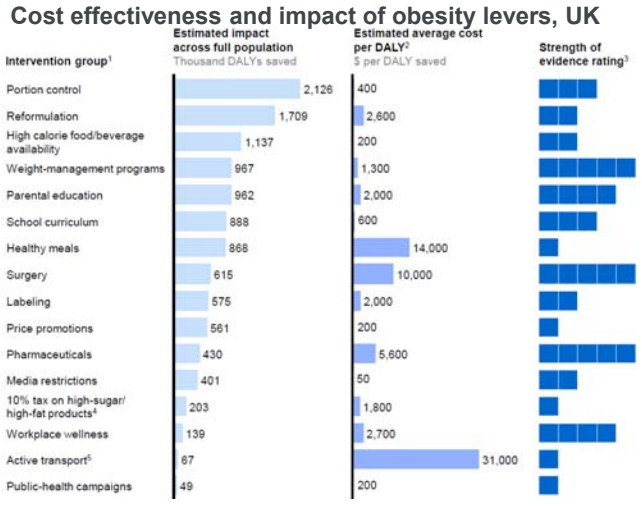
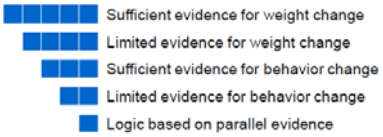
Where should we focus our attentions?



- Mckinsey Report 2014



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So, what are the potential "cures" for obesity?

- NICE Recommends (for adults):
  - Diet
  - Exercise
  - Behavioural therapy
  - Drug treatment
  - Surgery (if BMI >40, or >35 with co-morbidities)

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Diet – Eatwell guide, March 2016

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Diet – common pitfalls

- **All** sugars are the same **(4kcal/g)** i.e. sucrose = fructose, etc.
  - Coco pop straws 34g/100g = 2 finger KitKat
  - Fruit juice approximately 9g/100mls
- **All** fats (satd/polyunsatd/monounsatd) are the same **(9kcal/g)**
  - Jordan's Country Crisp Cereal: 28.5g/100g = McDonalds McBacon Roll
  - Thick pork sausages: 20.3g/100g
- Alcohol (think of each drink as a chocolate bar!)
- High fat foods vs Low fat foods
- Premium vs Economy ranges vs Home cooked food
  - Premium - likely to have high fat and high sugar (high calories)
  - Economy - likely to have high salt
  - Home cooked - likely to have high fat (depends on how it is cooked) – better?

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Diet – explaining calories

Dr M Capehorn
June 2007

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Relationship between physical activity and health

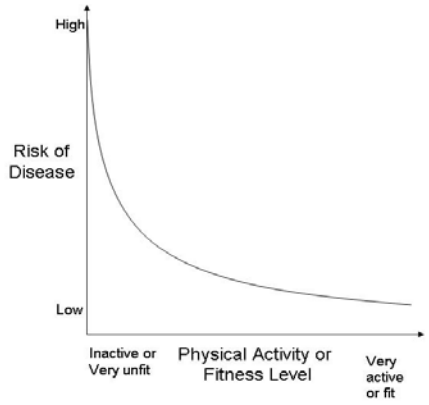

Figure *. The dose-response curve demonstrating the relationship between physical activity and risk of chronic disease – The more you exercise the less likely you are to develop a chronic disease

Physical

- Metabolic Syndrome
  - Insulin resistance
  - Type II Diabetes
- Asthma (pulmonary disease)
- Orthopaedic incl.
  - abnormal bone growth
  - degenerative disease
  - pain

Psychological

- Low Self-Esteem
- Substance abuse

- CVD
- Stroke
- Cancer
- Hypertension
- Hyperlipidemia
- Depression

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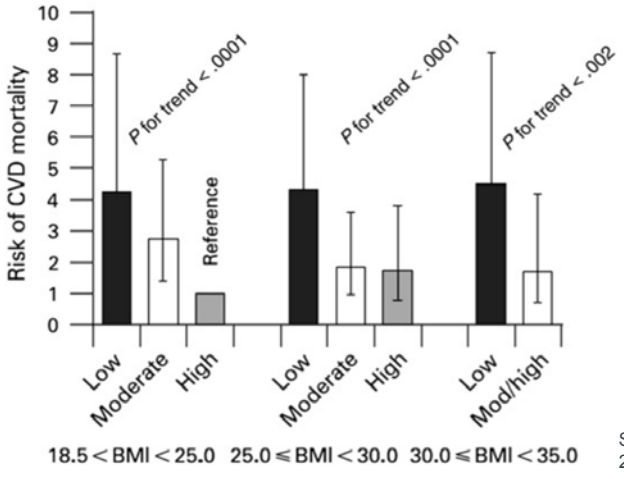
Physical Inactivity



- Risk of CVD mortality by cardiovascular fitness and BMI, 2,316 men with Type 2 diabetes

Source: Church et al. Arch Int Med 2005;165:2114-20

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Can you be "fit and fat"

- The concept of metabolically healthy obese (MHO) is not unreasonable given that we have metabolically unhealthy thin people
- Meta-analysis (8 studies, 61,000 patients) in Annals of Internal Medicine found:
  - CVD lowest in metabolically healthy normal weight individuals
  - being metabolically unhealthy increased risks of CVD (even if normal BMI)
  - little difference between MHO and metabolically healthy normal weight
  - However, in those with 10yrs+ follow up, MHO had increased risk of death

  (Kramer et al, 2013)
- Other smaller studies also favour the idea that "simple obesity" (or MHO) still increases long-term risks of CVD/mortality
- **For now, do NOT allow our patients to believe they are/can be "fit and fat"**

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Comfort eating and binge eating

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Behavioural therapy

- Talking Therapies examples include:
  - Life coaching
  - Cognitive Behavioural Therapy (CBT)
  - Neurolinguistic Programming (NLP)
  - Emotional Freedom Techniques (EFT)
  - Hypotherapy
  - Hypnobanding.

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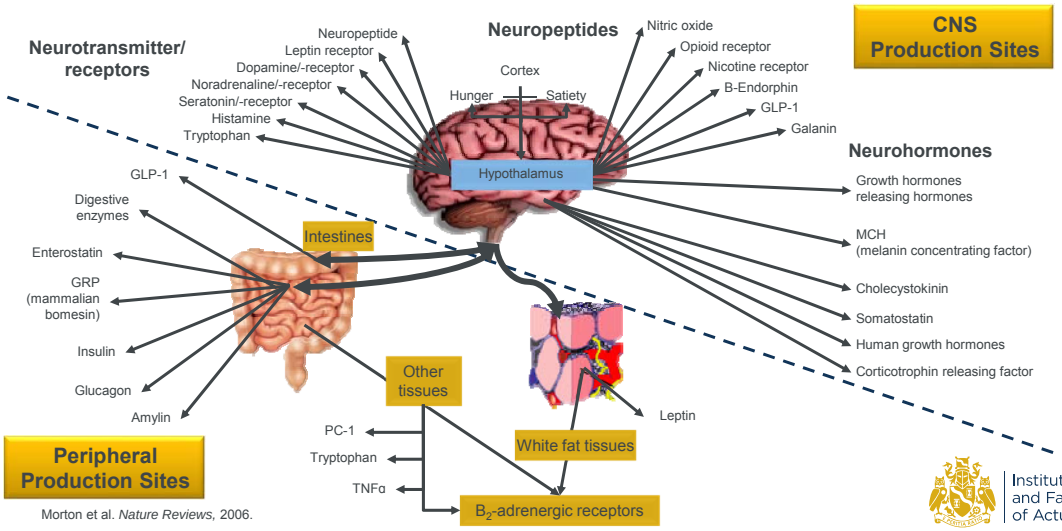
Can we ever control appetite?



Morton et al. *Nature Reviews*, 2006.

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Which drugs work best for obesity?

Association of Pharmacological Treatments for Obesity with Weight Loss & Adverse Events: A systematic review and meta-analysis - Khera R et al. *JAMA*, 2016

- 28 RCTs (29,018 patients)
- Mean age 46 (74% women), weight 100.5kg, BMI 36.1

- Those reaching 5% weight loss:
  - Placebo 23%
  - Phentermine/topiramate 75% 8.8kg (7.42 – 10.20)
  - Liraglutide 63% 5.3kg (4.52 – 6.06)
  - Naltrexone/bupropion 55% 5.0kg (3.96 – 5.94)
  - Lorcaserin 49% 3.2kg (2.46 – 3.97)
  - Orlistat 44% 2.6kg (2.16 – 3.04)

- Liraglutide (OR 2.95) and Naltrexone/bupropion (OR 2.64) were associated with the highest odds of adverse event-related treatment discontinuation

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But what about the miracle cures?

- Raspberry ketones
- Hydroxycut
- Garcinia Cambogia
- XLS Medical
- Meratrim
- Green coffee bean extract
- Alli (orlistat at a lower dose!)
- **What do you think?**

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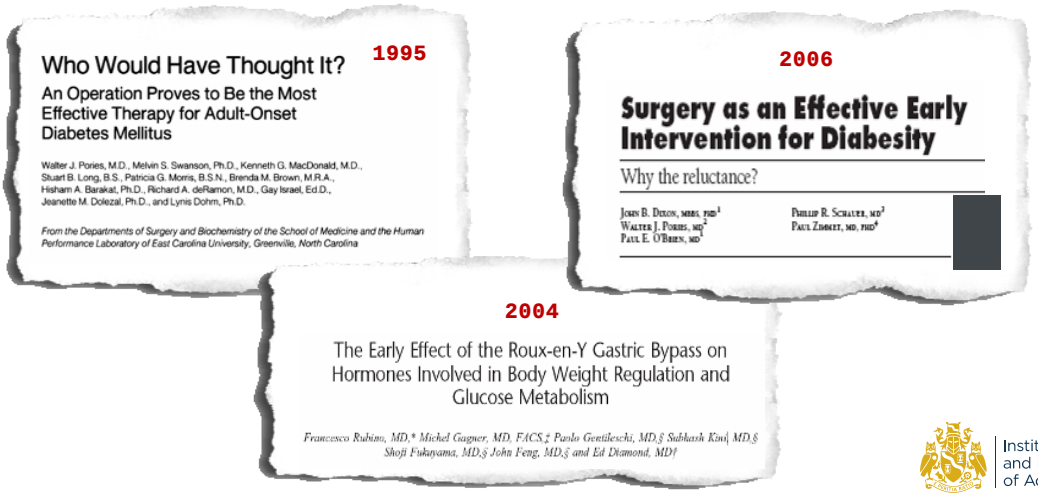
The next surgical frontier



1995

Who Would Have Thought It?

An Operation Proves to Be the Most Effective Therapy for Adult-Onset Diabetes Mellitus

Walter J. Pories, M.D., Melvin S. Swanson, Ph.D., Kenneth G. MacDonald, M.D., Stuart B. Long, B.S., Patricia G. Morris, B.S.N., Brenda M. Brown, M.R.A., Hisham A. Barakat, Ph.D., Richard A. deRamon, M.D., Gay Israel, Ed.D., Jeanette M. Dolezal, Ph.D., and Lynis Dohm, Ph.D.

From the Departments of Surgery and Biochemistry of the School of Medicine and the Human Performance Laboratory of East Carolina University, Greenville, North Carolina

2006

Surgery as an Effective Early Intervention for Diabesity

Why the reluctance?

2004

The Early Effect of the Roux-en-Y Gastric Bypass on Hormones Involved in Body Weight Regulation and Glucose Metabolism

Francesco Rubino, MD, Michel Gagner, MD, FACS,† Paolo Gentileschi, MD,§ Subhash Kini, MD,§ Shoji Fukuyama, MD,§ John Feng, MD,§ and Ed Diamond, MD‡*

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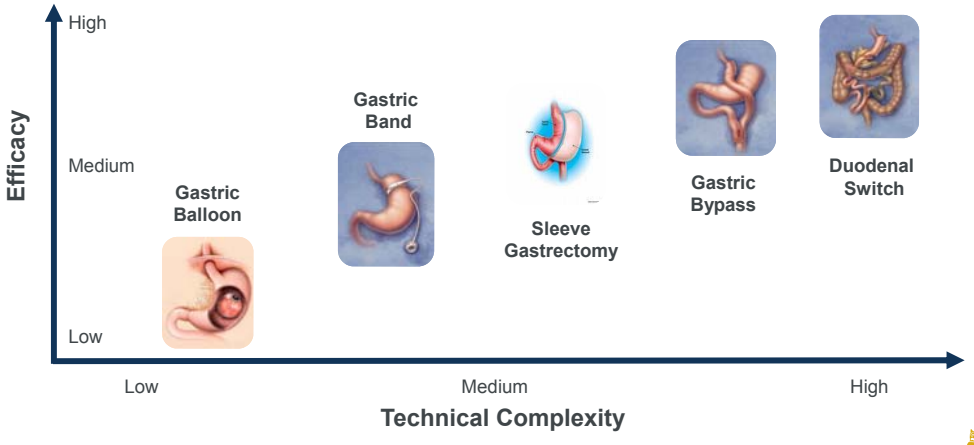
Obesity surgical interventions



Adapted from http://www.nbsr.co.uk/. The United Kingdom National Bariatric Surgical Register.

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Bariatric surgery and diabetes resolution

Author	Intervention	Resolution
Pories et.al. 1995	Gastric Bypass	89%
Torquati et al 2005	Gastric Bypass	74%
Schauer et.al. 2003	Gastric Bypass	82%
Sugerman et al 2003	Gastric Bypass	86%
Dixon et.al 2003	Lap Band	64%
Gagner (unpublished)	Sleeve Gastrectomy	65%

- The improvement or resolution of diabetes is thought to be due to:
  - decreased caloric intake, leading to decreased stimulation of incretins and insulin release
  - weight loss that occurs from the changes in fat mass and release of adipocytokines,
  - weight loss that occurs from the decrease of gut hormones(GLP1), resulting from the bypass of the distal stomach and proximal small intestine[1]
- **Results from NBSR showed that two years after primary surgery:**
  - 65.1% of patients with type 2 diabetes returned to a state of no indication of diabetes, meaning, in practice, that they were able to stop their diabetic medications

Roslin et al. 2009. Welbourn, R., Small, P., & Finlay, I. (2014). The United Kingdom National Bariatric Surgical Register, Second Registry Report.

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Homeostatic Adaptation

- Following weight loss:
  - Actual energy requirements may be up to 300kcals less than predicted
  - Gut hormones (+/- genes) encourage us to put weight back on
  - Increased hunger/cravings?
  - Supports the idea of a “SET POINT THEORY”
- Following weight gain:
  - Increased “NEAT” (Non Exercise Activity Thermogenesis)
  - Decreased hunger cravings?
- Influenced by “ENDOCRINE DISRUPTORS”
  - Eg, BPA in milk bottles, ?Viruses, ?Nature

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Obesity – it's a social problem, isn't it?

- Yes... but, we treat social problems all the time
  - e.g. sporting injuries, smoking problems, common infections, etc.
- We treat the consequences of obesity anyway
  - e.g. dyslipidaemia, T2DM, hypertension
  - So why not treat the cause?
- Cost effective – prescribing savings
- Even a few kilos makes a difference to individuals
- Any weight loss reduces morbidity and mortality
- Weight regain is inevitable (whatever intervention)
- **Obesity is a chronic relapsing condition**

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Overview of the presentation - revisited

- What is obesity and how is it measured?
- Current obesity statistics
- What causes obesity?
- What are the consequences of obesity?
- How can we tackle obesity?

Matt Capehorn

- Impact on the Protection business
- Concluding remarks

Nay Wynn

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What is the issue?

- Policies underwritten at the outset
  - what is their health status in 10, 20, 30 years time?
  - it is still an issue for policies that keep in touch with the policyholders
  - the current direction of obesity trends means experience is likely to deteriorate
- Anti-selective lapsing
- Obesity is particularly an issue for:
  - policies with long term
  - policies on guaranteed rates
  - when policyholders can increase cover without further underwriting

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Modelling the impact on CI

- Hannover Re trends for CI vary by condition, however to simplify:
  - Base scenario: zero trends
  - Starting point: 100% of lives with normal BMI
  - End point: 50% of lives with normal BMI and 50% obese
- Run 1: allow for increase in rates over 30 years (~2050)
- Run 2: allow for increase in rates over 20 years (~2040)
- The impact is determined by calculating levelised rates by age and term for various sex/smoker splits
- Summarise using a typical business mix to get a single percentage

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Run 1: assumptions and impact

- Run 1 (obesity impact over 30 years) assumes the following increase in trends:

Disease	Male	Female
Heart attack	+0.7%	+2.5%
Stroke	+0.5%	+0.5%
Other digestive cancers	+0.5%	+0.5%
Breast cancer	N/A	+0.2%
Upper aerodigestive cancers	+1.4%	+1.4%

- Slide 14 shows that the relative risk for female heart attack for someone obese was 3.2; assuming 50% at this rate and 50% at normal 1 rate, the average is 2.1.
- The compound rate over 30 year works out at 2.5%.
- For cancers, the estimates comes from National Cancer Institute but we follow a similar methodology to heart attack and stroke

- Overall impact:

Run 1	MN	MS	FN	FS	Overall
Impact	2%	2%	3%	3%	**2%**

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Run 2: assumptions and impact

- Run 2 (obesity impact over 20 years) assumes the following increase in trends:

Disease	Male	Female
Heart attack	+1.1%	+3.8%
Stroke	+0.7%	+0.7%
Other digestive cancers	+0.7%	+0.7%
Breast cancer	N/A	+0.4%
Upper aerodigestive cancers	+2.0%	+2.0%

- Slide 14 shows that the relative risk for female heart attack for someone obese was 3.2; assuming 50% at this rate and 50% at normal 1 rate, the average is 2.1.
- The compound rate over 20 year works out at 3.8%.
- For cancers, the estimates comes from National Cancer Institute but we follow a similar methodology to heart attack and stroke

- Overall impact:

Run 1	MN	MS	FN	FS	Overall
Impact	3%	4%	5%	5%	**4%**

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Improving the model

- You can improve the model by allowing for:
  - Obesity prevalence differences by age, socioeconomic status, ethnicity
  - anti-selective lapse risk
  - severity based pay-outs
- Your own results be different if you:
  - place difference weights on the CI condition
  - a different starting point for trends
  - a different methodology for setting trends and evaluating the impact
  - different CI conditions covered in your 'standard CI' product

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Impact on Term Assurance

- Historic reductions in smoker prevalence has had an impact on reducing mortality from cardiovascular diseases, stroke and cancers
  - would the rise of obesity prevalence reverse this?
  - could see start projecting mortality deteriorations in the future?
- NHS (June 2016) estimates that:
  - obesity reduces life expectancy by an average of 3 to 10 years, depending on severity
  - obesity and being overweight contribute to at least 1 in every 13 deaths in Europe
- Impact on TA may be less than CI?
  - you could be diagnosed with a heart attack/stroke as a result of your obesity (get a pay-out under CI) but still take preventative measures to delay death

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Summary

- Obesity is a social problem
- Very cost-effective to treat obesity and it makes a huge difference physically and psychologically
- Obesity is a chronic relapsing condition – we cannot expect to cure it
  - instead we need a lifelong management plan
- Rising obesity prevalence is a concern for insurance products that underwrite at the outset
- Impact on CI of around 2% to 4% but could be higher
- Have you allowed for obesity prevalence for setting future trends?

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Questions

Comments

Expressions of individual views by members of the Institute and Faculty of Actuaries and its staff are encouraged.

The views expressed in this presentation are those of the presenter.

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