

WHAT CAUSES OBESITY?

GPCME meeting Rotorua, June 2012

The Bottom Line

- The difference between a fat person and a thin person is their genes
- The change in the number of people who are fat now compared to 30 years ago is due to the change in the environment
- The geno-environmental interaction has resulted in genetically susceptible individuals consuming more calories and becoming obese
- Genes and the environment cannot be countered by education
- We need to change the environment in order to decrease the prevalence of obesity



Am J Clin Nutr 2010;91:1172-9.



The NEW ENGLAND JOURNAL of MEDICINE

**Volume 322:1483-
1487**

**May 24,
1990**

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The body-mass index of twins who have been reared apart

AJ Stunkard, JR Harris, NL Pedersen, and GE McClearn

Study of 247 identical and 426 non-identical twin pairs reared together and apart...

- The intra-pair correlation coefficients of identical twins reared apart were 0.70 for men and 0.66 for women...only very slightly different to those for identical twins reared together.
- Authors Conclusion: genetic influences on body-mass index are substantial, whereas childhood environment has little or no influence.

Jane Wardell, University College, London

- Mathematical modeling of 2,500 UK twin pairs shows that
 - Weight at the age of 4 years is 60% genetically determined and at the age of 11 it is 77% genetically determined.
- Having two overweight parents increased the risk of you being overweight ten times – independent of any environmental effect

Identifying the responsible genes...

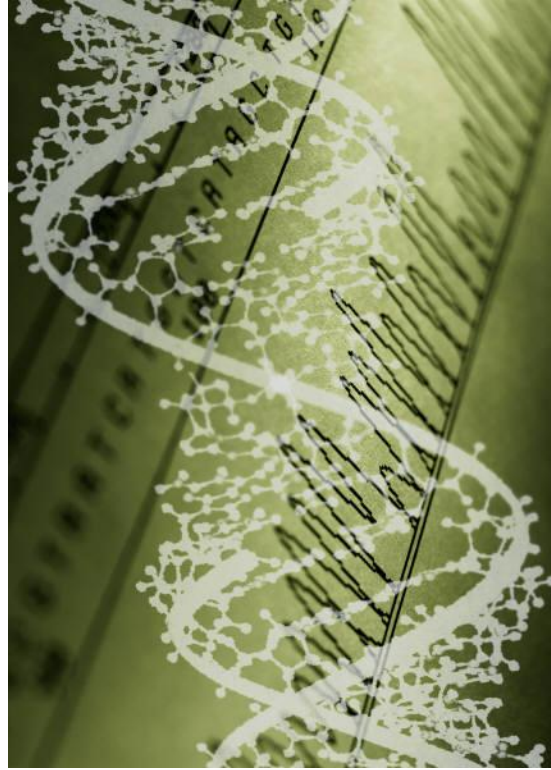
- Monogenic Causes of Obesity
 - Studies of families in which children have developed marked obesity in infancy
- Polygenic Causes
 - Candidate gene approach
 - Genome wide scanning

Examples of Monogenic Causes of Obesity.....

- Leptin deficiency in the ob/ob mouse
 - Very rare cases of human equivalent. Affected individuals have hypogonadism, obesity and hyperphagia.
- Melanocortin 4 receptor deficiencies
 - May be as common as 1% of the population
- Pro-opoid melanocortin abnormalities

Genome Wide Scanning...

- A study of 2,000 people with diabetes led to the discovery of the FTO gene a variant of which confers susceptibility to diabetes and even more strongly, predisposition to obesity
- 16% of Europeans are homozygous for the variant and on average they are 3kg heavier than those with no copies of the gene variant
- Heterozygotes are 1.2 kg heavier on average
- *Science* Published Online April 12, 2007.
DOI:10.1126/science.1141634.



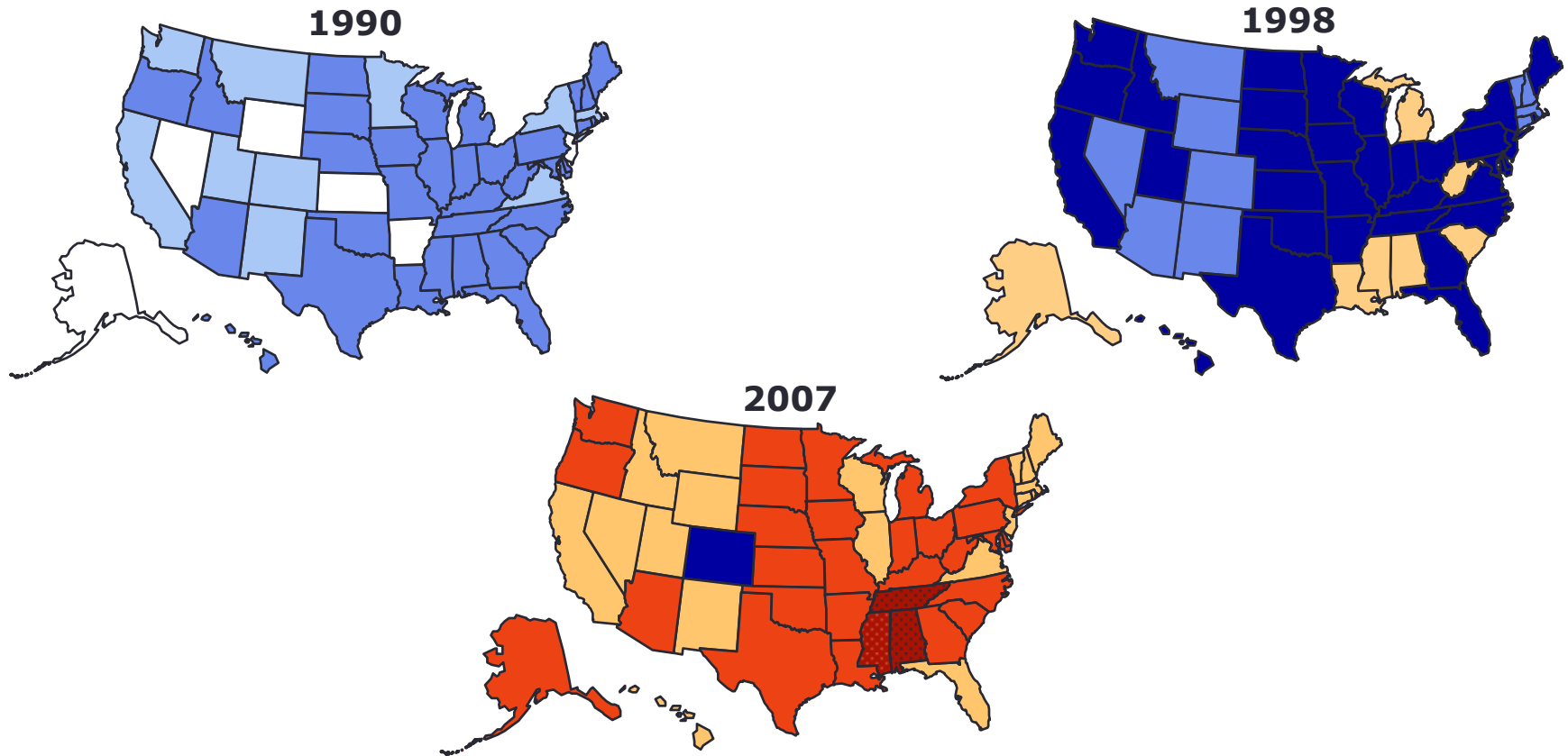
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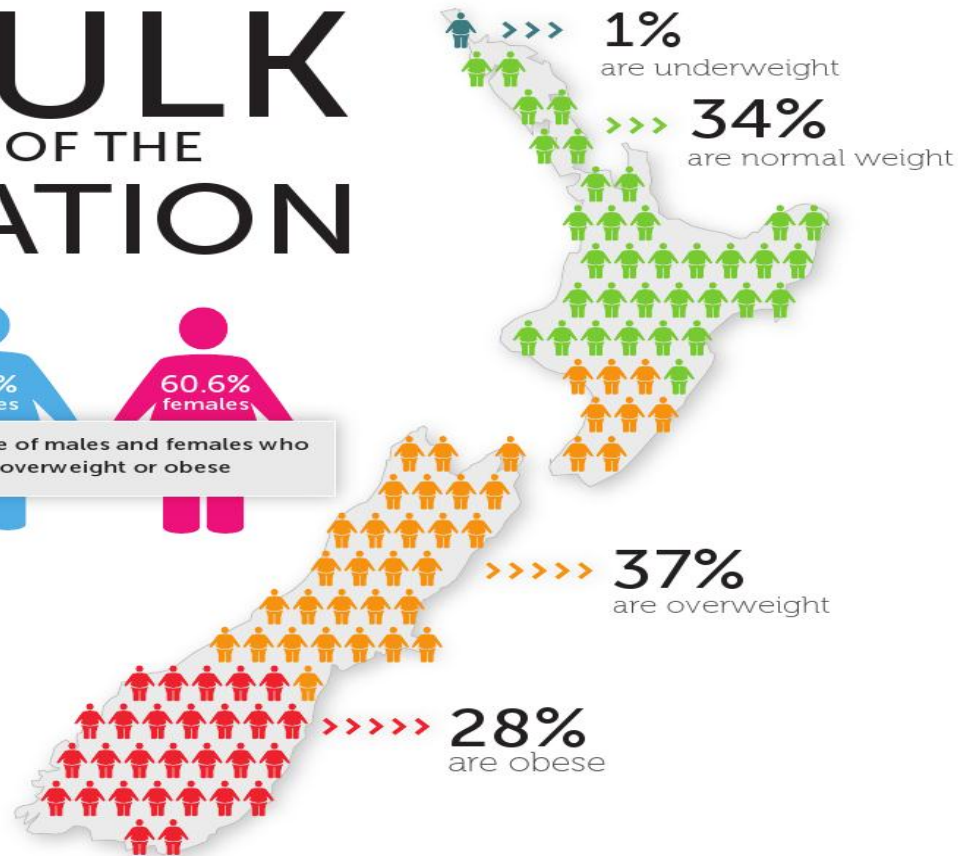
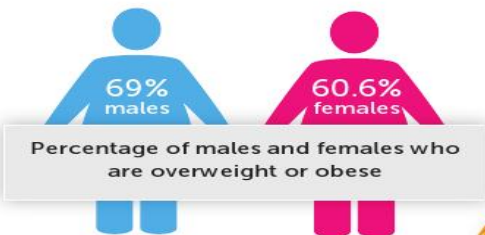
Obesity Trends* Among U.S. Adults

BRFSS, 1990, 1998, 2007

(*BMI ≥ 30 , or about 30 lbs. overweight for 5'4" person)



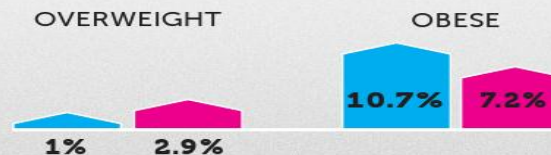
BULK OF THE NATION



TRENDS

1997 -
2008/09

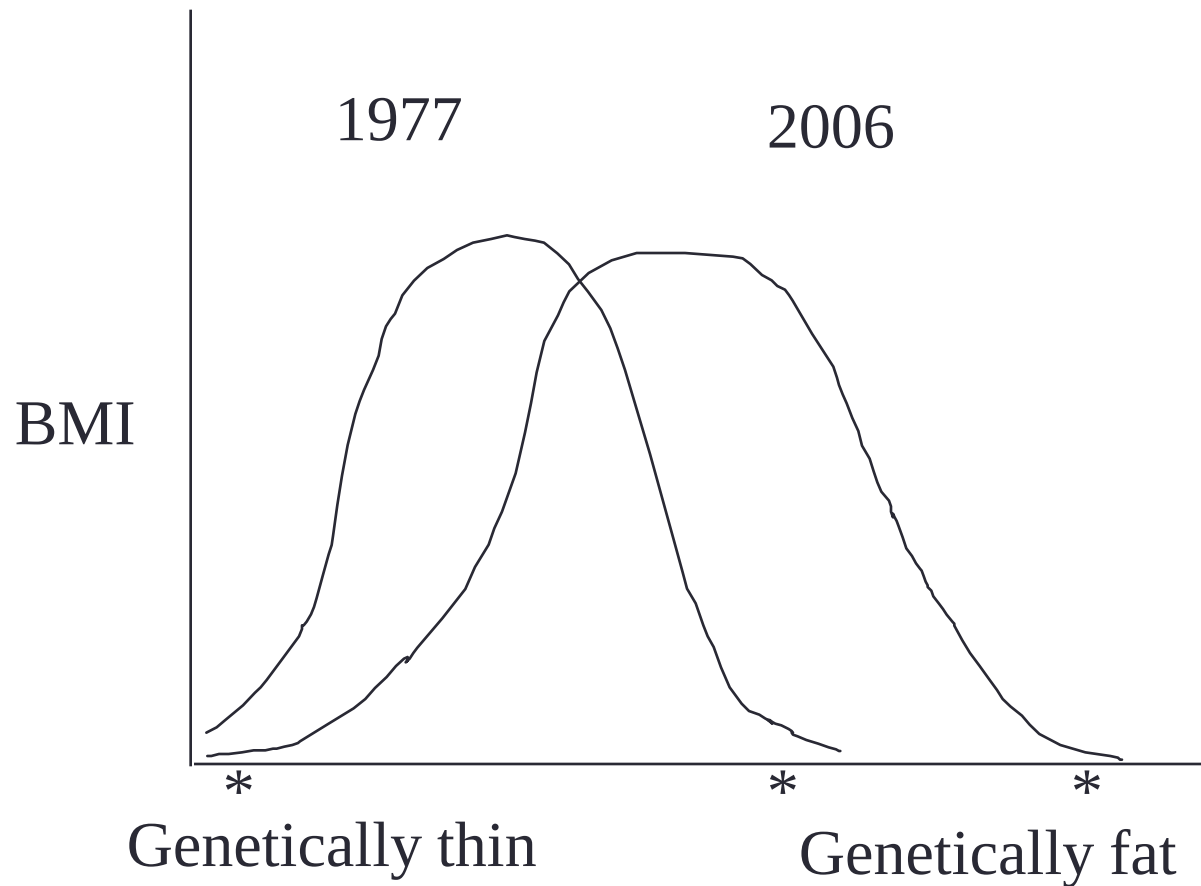
(Percentage points)



SCIENCE MEDIA CENTRE
DATA: NEW ZEALAND ADULT NUTRITION SURVEY (2011)

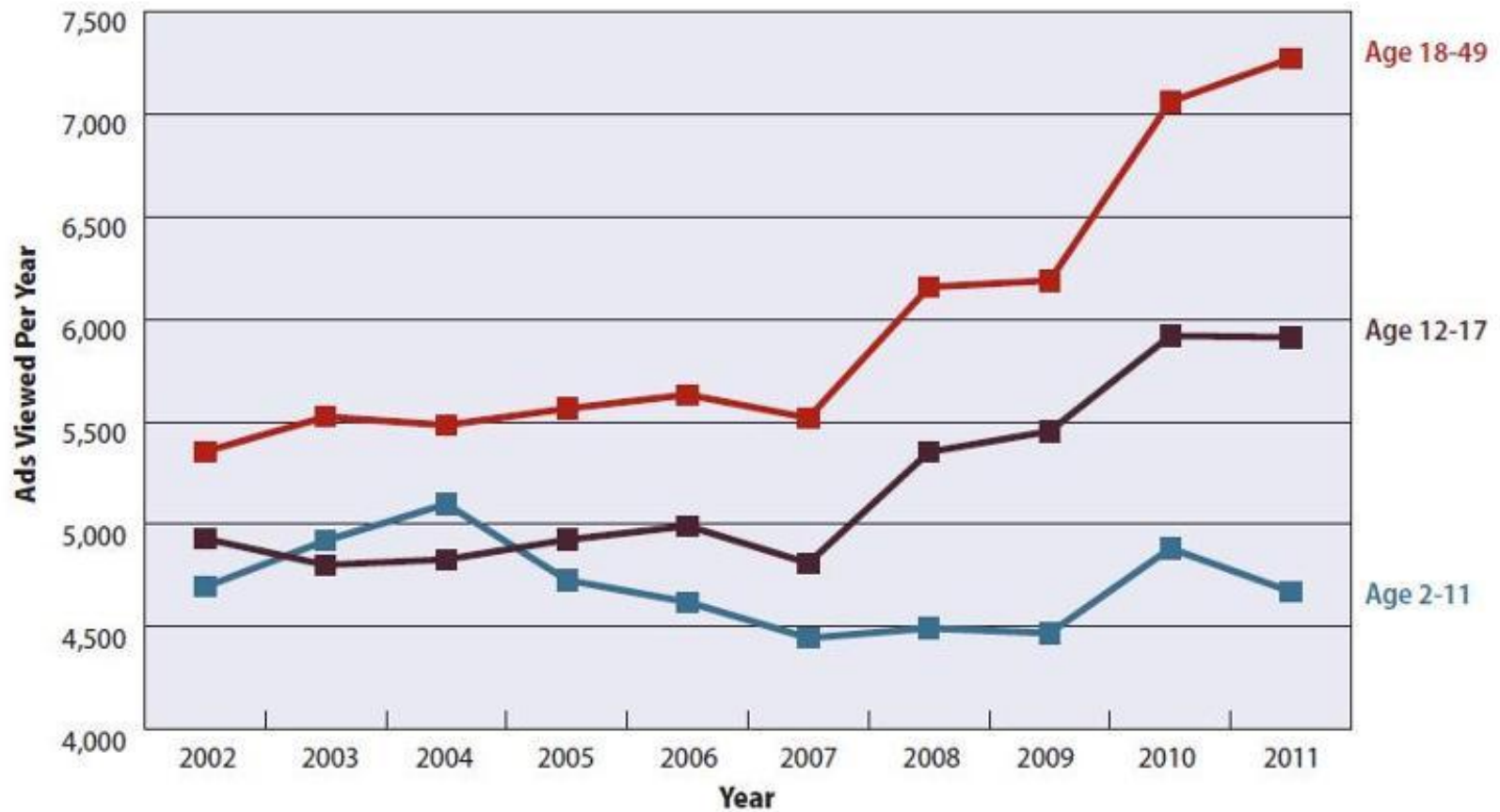
BASED ON BMI FOR ADULTS +15 YEARS

Genes and the Environment



The environment....

- Unhealthy food (high in fat, sugar and salt) is heavily promoted, cheap and widely available.
- between 1990 and 2007 the real price of a two-litre bottle of Coca-Cola fell 34.89 percent ... The real price of fruit and vegetables rose 17 percent between 1997 and 2003,



US television food and beverage advertising exposure by age: 2002-2011

The single biggest change in our diet is the increased consumption of soft drinks



BONUS POINT BONANZA



MULTI BUY
Coca-Cola
Bottles 1.5L
Excludes L&P

**+8
POINTS**

4 for

\$6

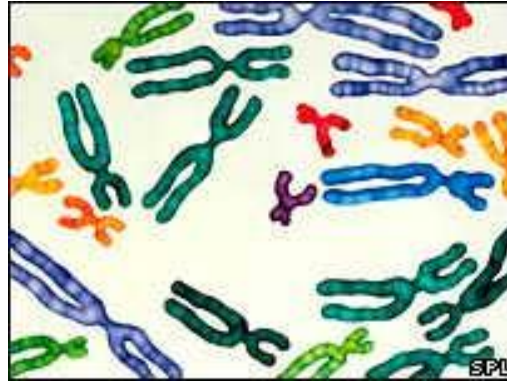
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Valid Monday 20 May to Sunday 3 June 2012. While stocks last. Oneworld bonus points apply only when you merge your Oneworld.
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HOW DOES THE
GENOTYPE LINK
TO PHENOTYPE?

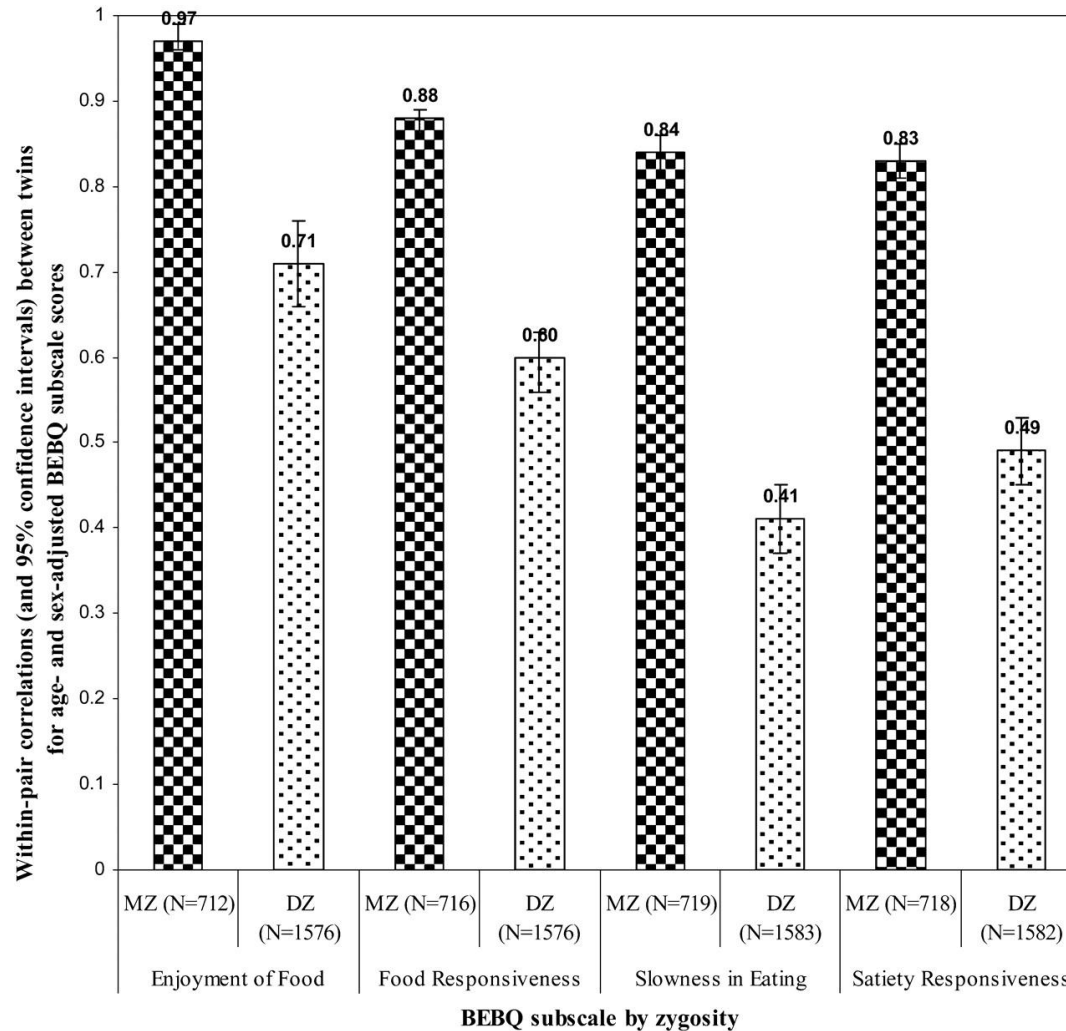
All monogenic causes of obesity thus far have been associated with an increase in appetite



Aspects of appetite...

- Responsiveness to food cues
 - Fatter children work harder for food rewards than for other types of reward
 - When presented with ice cream of varying palatability, fatter children eat proportionately more of the nicer ice cream
 - Fatter children don't decelerate their rate of eating as they approach satiety

Correlations (and 95% CIs) between monozygotic (MZ) and dizygotic (DZ) twin pairs for Baby Eating Behavior Questionnaire (BEBQ) subscale scores by zygosity.



Llewellyn C H et al. Am J Clin Nutr 2010;91:1172-1179

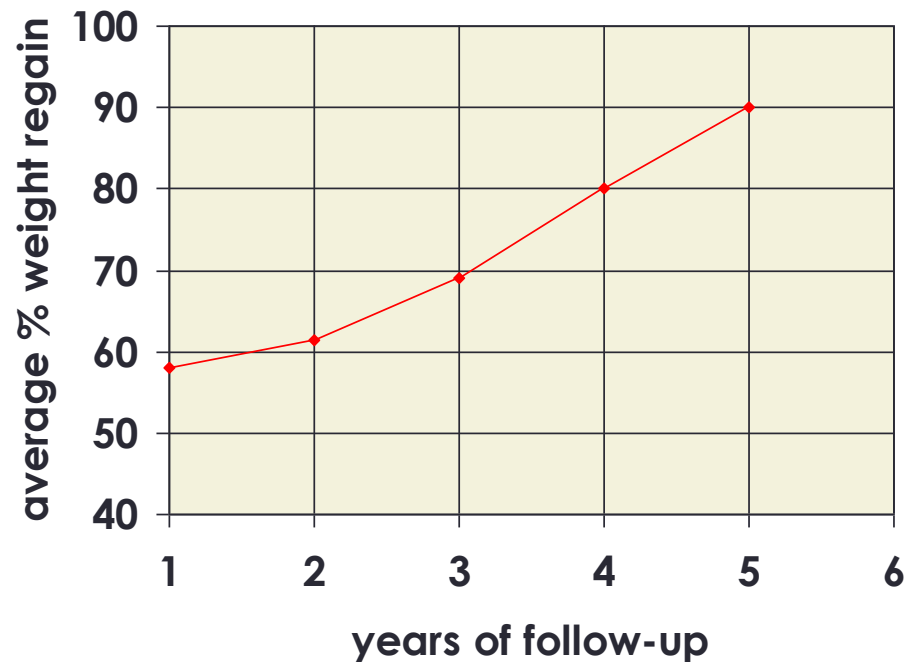


Genes and the environment cannot be countered by education

- Highly educated, well resourced individuals fail to lose significant amounts of weight and keep it off.

Robyn Toomath, decades of private practice experience

Diet, Behaviour Modification, and Exercise: A Review of Obesity Treatments from a Long-Term Perspective



Southern medical Journal; 84;1470-1474,1991

Even “effective” dietary and exercise treatments for adult obesity produced modest weight loss (about 3-5 kg) compared with no treatment or usual care.

Although the weight loss of 3-5 kg was statistically significant and had some health benefits, its clinical significance was not shown—that is, it may not have been enough to improve the health or quality of life of patients. In most studies with long term follow-up, the weight lost initially gradually came back.

So what should we be doing to prevent obesity?

- taxing unhealthy products;
- regulating foods high in saturated fats, salt and sugar;
- cracking down on junk food advertising;
- overhauling misguided agricultural subsidies that make certain ingredients cheaper than others; and
- supporting local food production so that consumers have access to healthy, fresh and nutritious foods.

Olivier De Schutter, the United Nations Special Rapporteur

With Whom Should Bariatric Surgery be Discussed?

- BMI > 40
- Obesity > 5 years
- Age 20 – 49 years
- Non-smoker
- Type II Diabetes Mellitus
- An obesity related condition that results in recurrent hospitalisation
- Failed non-surgical attempts at weight loss for more than 2 years
- Understanding of and motivated for surgery
- Accepts long term to follow-up
- Weight < 200kg or BMI < 55