



Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

BMST4004

Metabolic Conditions and Cancer/HIV

Trawsnewid Addysg; Trawsnewid Bywydau
Transforming Education; Transforming Lives



www.uwtsd.ac.uk



Alison

- 31 years old
- Two kids
- Factory worker
- Weight 122kg, BMI 44
- Low self esteem, depression, humiliation
- Socially isolated

WHO classification of obesity

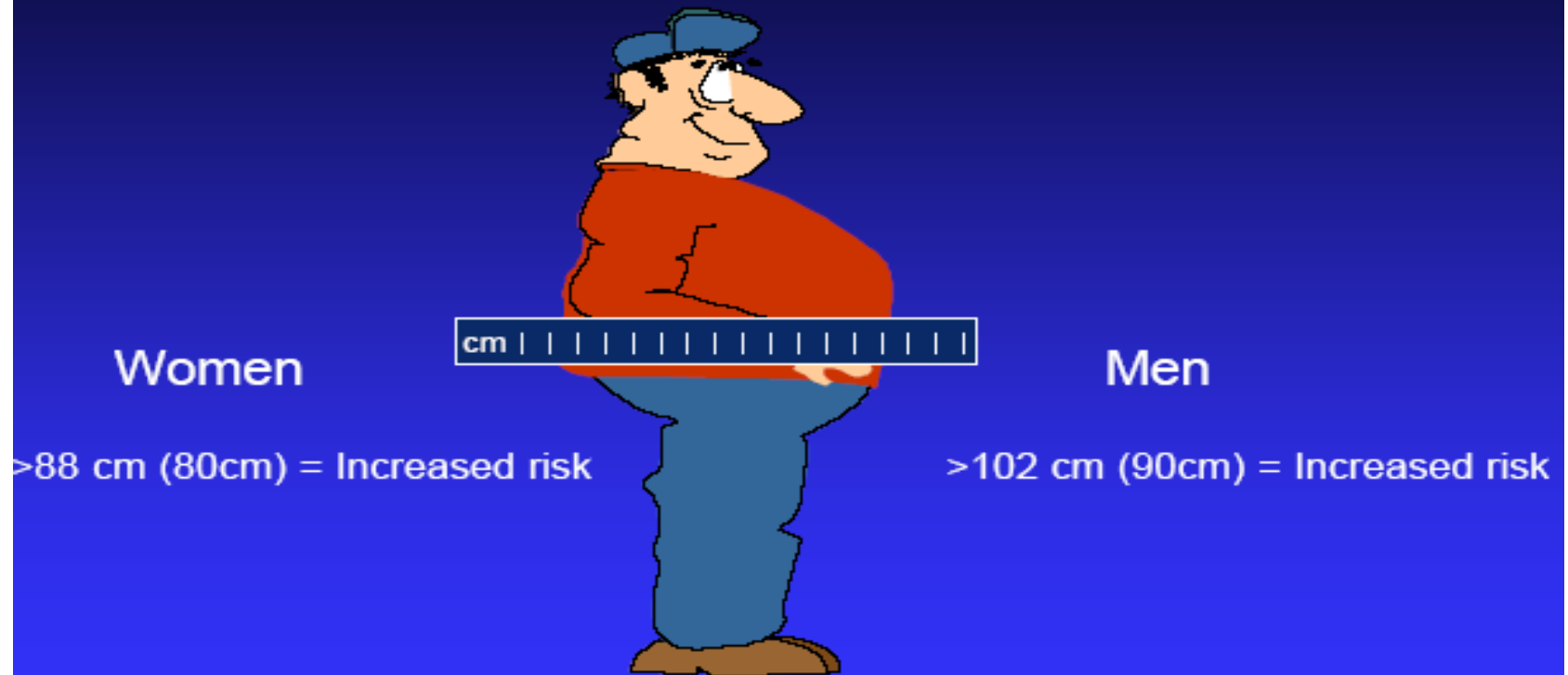
$$\text{BMI} = \text{weight(kg)} / \text{height(m)}^2$$

WHO Classification	BMI	Risk of Comorbidity
Underweight	Below 18.5	Low
Healthy weight	18.5-24.9	Average
Overweight (grade 1 obesity)	25.0-29.9	Mild increase
Obese (grade 2 obesity)	30.0-39.0	Moderate/severe
Morbid/severe obesity(grade 3)	40.0 and above	Very severe

World Health Organisation. Obesity: Preventing and Managing the Global Epidemic. Geneva: WHO, 1997 [3]

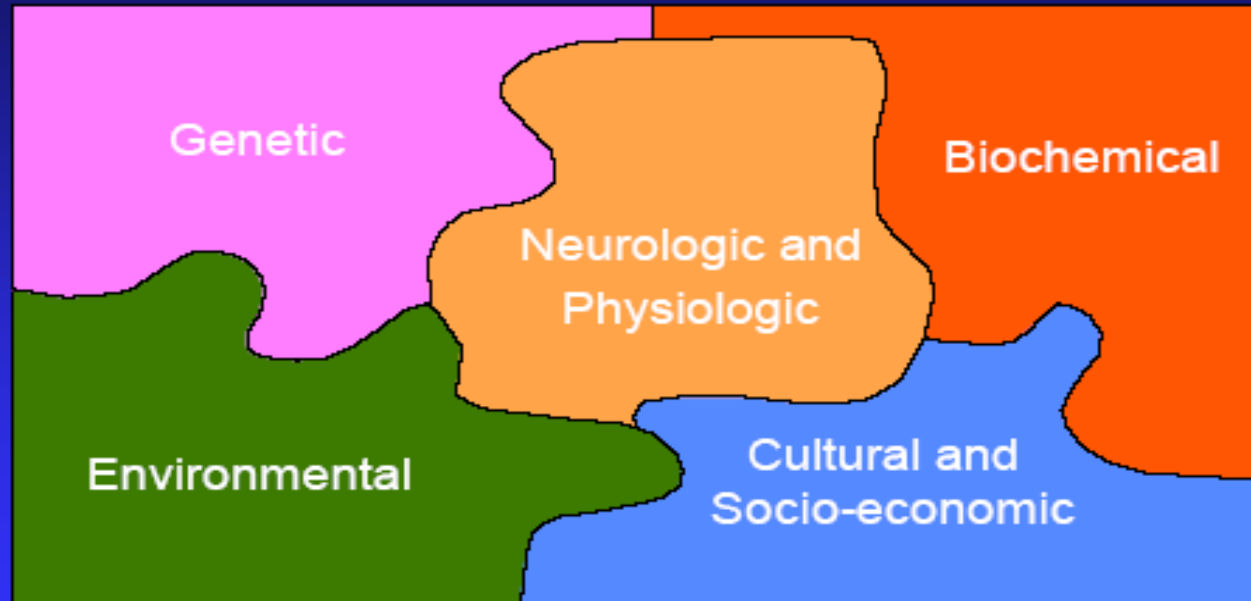
Body fat distribution

Apple shaped obesity



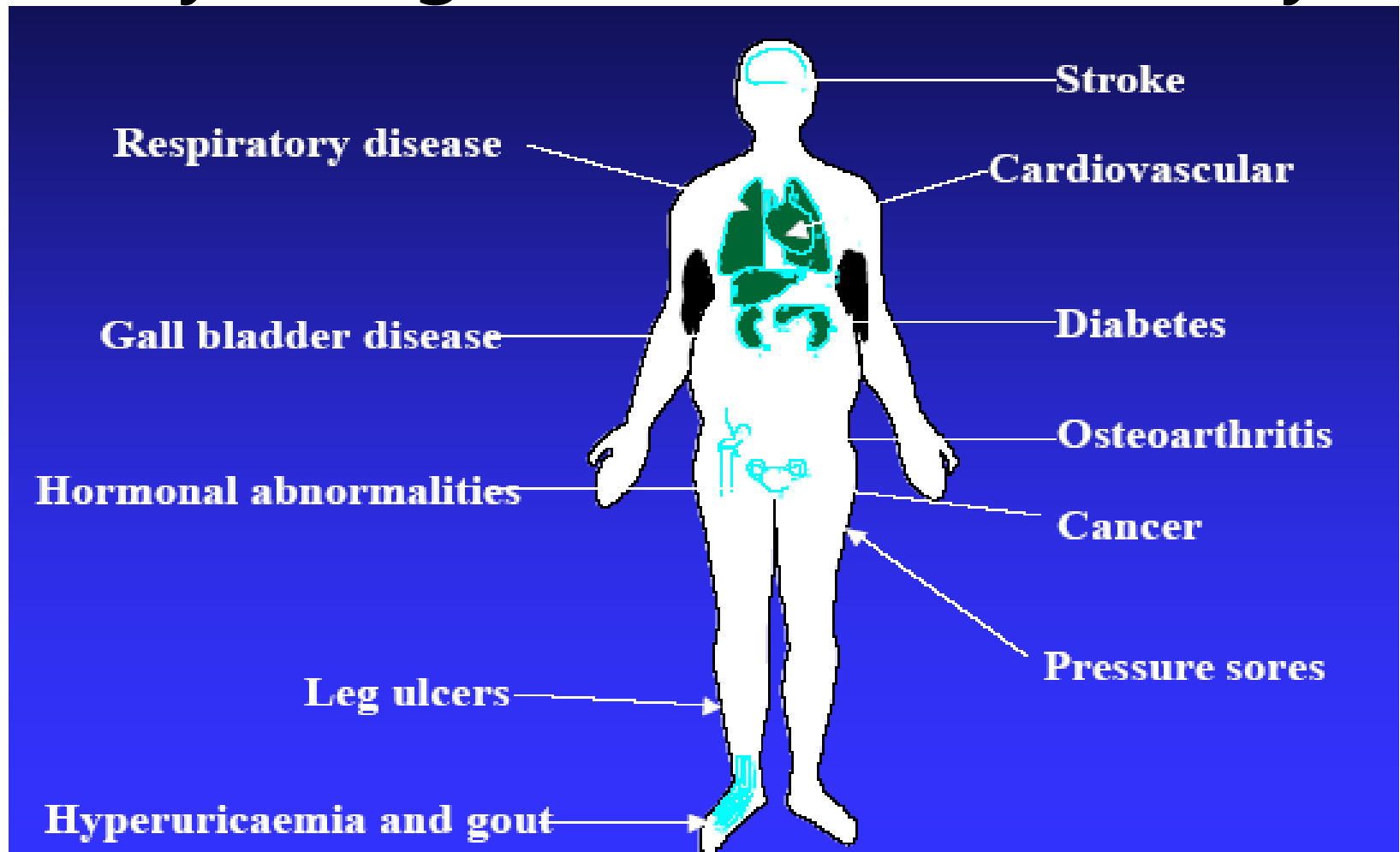
Lean MEJ et al. Lancet; 1998; 351:853-6

Aetiology of obesity: numerous complex and inter-related factors^{1,2}



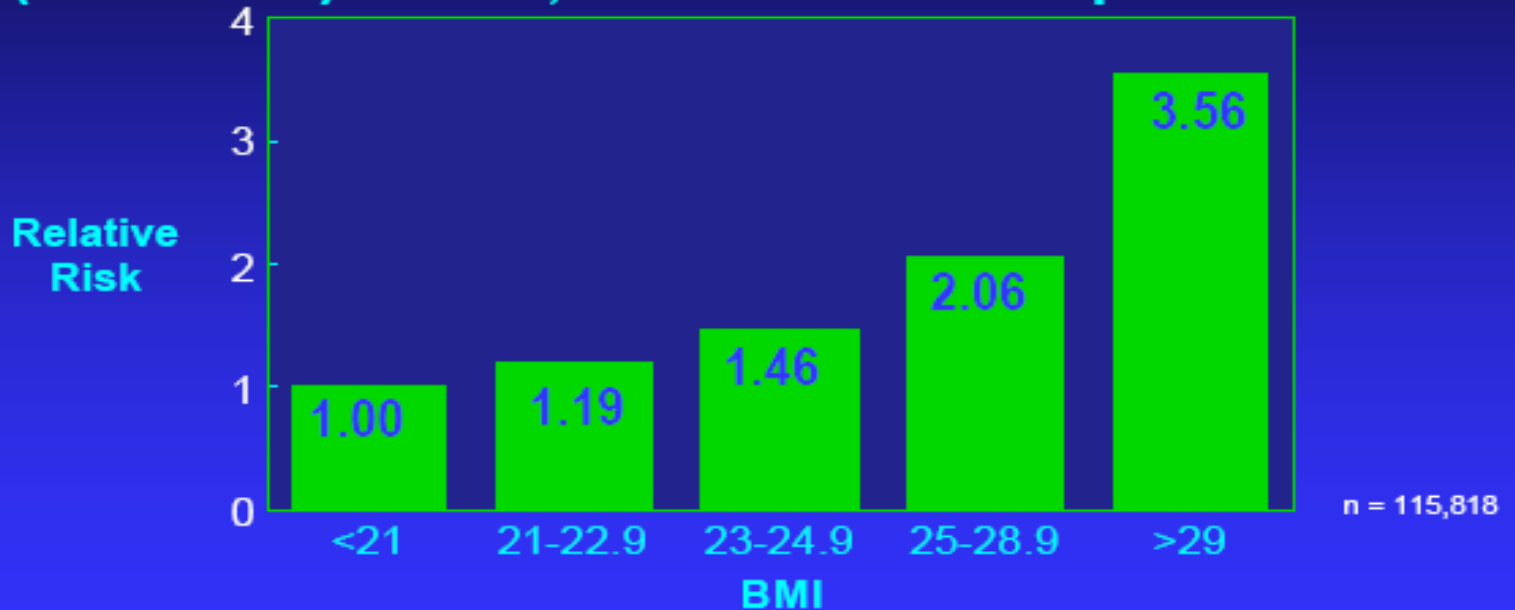
1. Adapted from *Weighing the Options*; 1995:52. 2. Clinical guidelines. National Heart, Lung, and Blood Institute Web site. Available at: http://www.nhlbi.nih.gov/guidelines/obesity/ob_home.htm. Accessed March, 2001.

Physiological Effects of Obesity



Obesity and Cardiovascular Disease

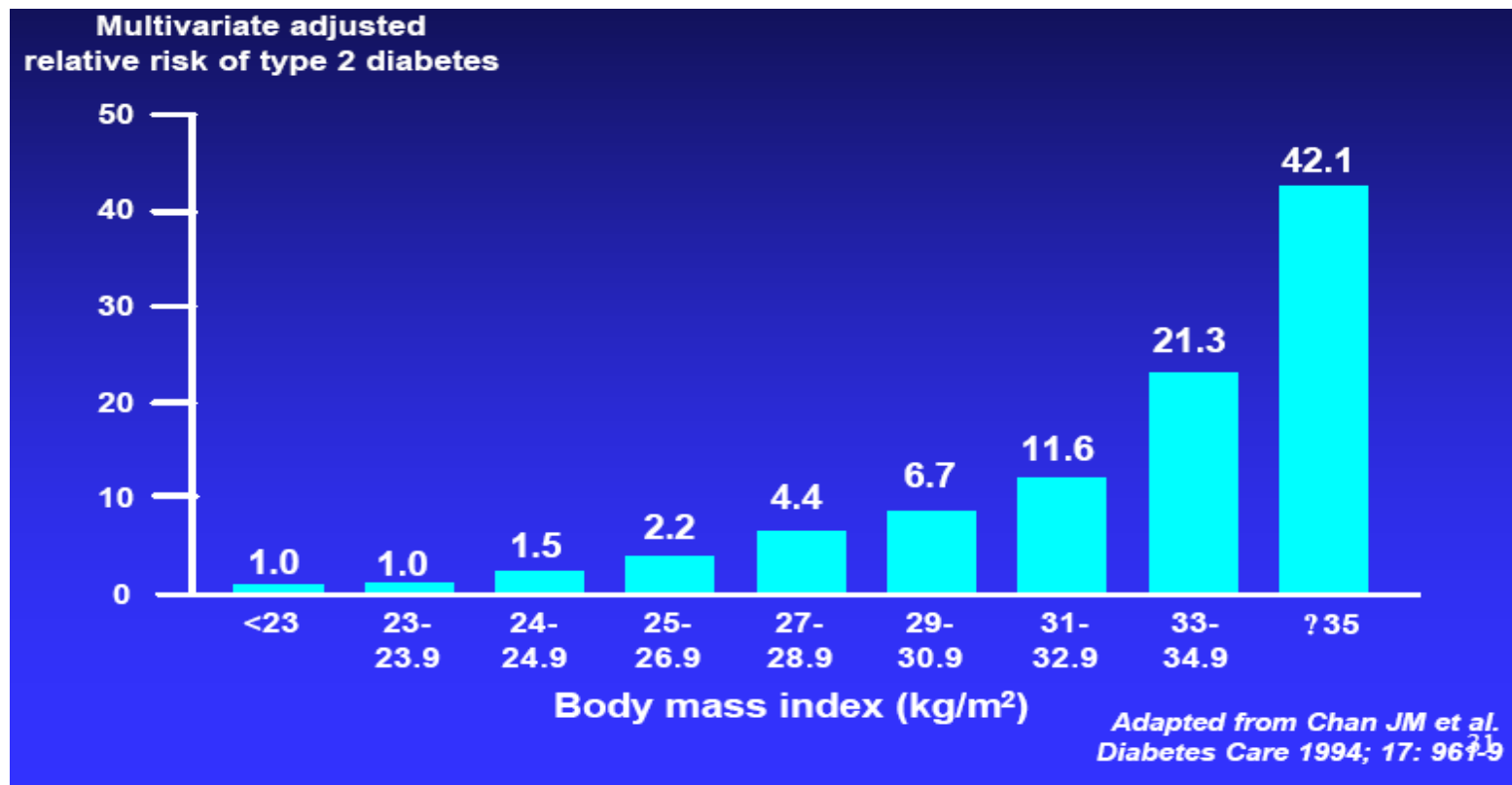
**Relative risk of non-fatal MI and fatal CHD
(Combined) vs BMI, in women with no previous CHD**



MI = myocardial infarction; CHD = coronary heart disease.

Adapted from Willett et al. *JAMA*. 1995;273:461-465 (Nurses Health Study).

Obesity is a risk factor Type II Diabetes in Men



Guidelines for Exercise and Obesity

- 30 minutes moderate intensity 5 days per week
- 10,000 steps per day
- Combination of cardiovascular exercise (Fat Burn?)
- Strength/Resistance training aswell (increased muscle % = increased BMR)
- Suitability of exercise

Type I Diabetes

- Millions of individuals worldwide have type 1 diabetes mellitus
- Pancreas produces far too little insulin or none at all.
 - Insulin controls the blood glucose levels.
- The disorder usually develops suddenly in childhood or adolescence and results in hyperglycaemia - abnormally high blood glucose levels.
- Individuals with type 1 diabetes must use exogenous (external sources) insulin to control their blood glucose levels
- Their glycaemic control is an hourly challenge, requiring constant attention to blood glucose monitoring, carbohydrate intake and physical activity.
- With exercise as an added, and often unpredictable, variable, diabetes management can be even more complex.
- However it need not be a barrier to fitness and reveals the benefits of exercise and the variables that people with diabetes need to manage when exercising.

What are the Symptoms of Diabetes?

The main symptoms of diabetes are

- increased thirst
- going to the loo all the time – especially at night
- extreme tiredness
- weight loss
- genital itching or regular episodes of thrush
- blurred vision.

Causes of Type 1 Diabetes

- Type 1 diabetes is usually caused by an abnormal reaction in which the immune system destroys insulin-secreting cells in the pancreas.
- The demise of these cells leaves the individual unable to manufacture insulin, a hormone essential for the glucose uptake into many cells.
- The cause of this reaction is unknown, but it may be triggered by a viral infection.
- Because patients with diabetes have to manually control their blood glucose levels through the use of insulin injections this means they have to be finely tuned at predicting their body's requirements.
- Incorrect intake of insulin can lead to either hyper- glycaemia (too much blood glucose) or hypoglycaemia (too little blood glucose).

Hyperglycaemia

- This occurs when there is abnormally high blood glucose levels.
 - Normal blood glucose within 4-7mmol/l
- Insulin is required to transport glucose from the blood to the muscle so it can be used by the muscle as fuel to carry out contractions
 - this is how insulin exerts its glucose lowering effect on blood levels
- If there is not enough insulin to carry this glucose to the muscles, chemical messengers in the muscle continue to relay requests for glucose to fuel their work and with no vehicle (insulin) to transport the glucose out of the blood to the muscle, levels in the blood just continue to rise.
 - It is important to remember that these messages are sent irrespective of how much insulin is available.
- If the activity is prolonged or intense, more messages for glucose are then translated into a need to break down glycogen (glucose which is stored in the liver).
- This is why it is extremely important for people with diabetes to carefully control their insulin levels to satisfy their activity requirements

Hypoglycaemia

- This occurs when there is too little blood glucose
 - an injection of too much insulin and/or
 - insufficient intake of carbohydrates meaning there is no glucose to be supplied to the muscles.
- The correct response to a hypoglycaemic attack is to eat fast-acting carbohydrate such as a chocolate bar followed by slower-releasing carbohydrate.
- However, a natural response is to eat until the symptoms disappear; this may be a lot more food than is required to counter the hypoglycaemia, especially during activity if you are eating to get enough fuel to finish.
- Hypoglycaemia may also impair your judgement of how much and what sort of food you need. After intense activity, blood glucose levels can take up to 36 hours to be predictable as the muscles and liver are replenishing their stores.
- Hypoglycaemia is more likely during this period because of the increased need for carbohydrates.
- However, additional carbohydrate needs insulin for the transfer but not too much.
- The only way to know is to monitor blood glucose levels.

Benefits of exercise

- Regular exercise affords individuals with type 1 diabetes many of the same benefits as their non-diabetic counterparts including a lower risk of obesity, hypertension, heart disease, certain cancers and mortality.
- Research has also shown that exercise training increases health-related quality of life in individuals with type 1 diabetes
- Another benefit usually experienced is improvements in insulin sensitivity
- Type 1 diabetes cannot be prevented or reversed with exercise but enhanced sensitivity to the effects of insulin-stimulated glucose uptake can result in lower insulin requirements, leaving less room for dosing errors.
- Regular exercise can also result in an improvement in blood glucose regulation but only as long as type 1 exercisers make appropriate regimen changes to control glycaemia

Exercise Risks

- Most precautions revolve around the need for acute and chronic glycaemic management .
- For example, when exercise is undertaken under certain hyperglycaemic (high blood glucose) conditions it can actually worsen metabolic control leading to a further increase in blood glucose levels
- A greater immediate concern is the risk of hypoglycaemia - when blood glucose levels fall to an abnormally low level (blood glucose level < 3.6 mmol/L).
- Elevated levels of plasma insulin, due to the mobilisation of injected insulin, can attenuate or prevent the normal mobilisation of glucose and other substrates and increase muscle uptake of glucose.
- The risk of hypoglycaemia during or following exercise is substantial when appropriate precautions are not taken.

Insulin, regimens and exercise effects

- Because insulin and exercise increase muscle glucose uptake, insulin types and the timing of their injection can have a big effect on glycaemic control during exercise.
- Most individuals use a combination of short- and longer-acting insulin injections given two to four (or more) times a day.
- The types of insulin used vary by 'time to peak action' and 'total duration of effect' (Table 1).
- Other individuals receive a continuous insulin infusion through a portable insulin pump, which delivers self-programmed basal amounts of insulin and food boluses via a subcutaneous catheter.
- Exercise during insulin peak times increases the risk for hypoglycaemia, unless insulin doses are reduced and/or carbohydrate intake is increased.
- For example, NPH is an intermediate-acting insulin, so if given at breakfast it will begin peaking around noon and exert its effects late into the afternoon.
- In contrast Lantus (a long-acting insulin) provides basal insulin coverage; a separate dose of short-acting insulin must be taken for the noon meal. The NPH-user is much more likely to experience hypoglycaemia during exercise in the late morning compared to a user of the long-acting insulin whose breakfast short-acting insulin peaked and waned before then (see table 1).
- If only basal doses of insulin are circulating during an activity, the physiological response is more similar to a non-diabetic individual. Insulin pump users can have the most normal response to exercise, because the pump can either be disconnected or the basal rate reduced during physical activity.

Type of insulin	Onset (hr)	Peak (hr)	Duration (hr)	Max. dur.(hr)
Humalog & Novolog	< 15 min	0.5 - 1.5	2 - 4	4 - 6
Regular	0.5 - 1	2 - 3	3 - 6	6 - 10
NPH	2 - 4	4 - 10	10 - 16	14 - 18
Lente	3 - 4	4 - 12	12 - 18	16 - 20
Ultralente & Lantus	6 - 10	18 (minimum to no peak)	18 - 20	20 - 24

Note: Individual action times may vary. In general, animal (beef/pork) versions of insulins have slower onset and longer duration times than the synthetic human types.

Table 1: Insulin action and peak times

Timing

- Many other variables can confound the glycaemic response to exercise
- For example, morning exercise, especially if done before any insulin injection, usually has less of a blood glucose-lowering effect than the same exercise done later in the day due to glucose-raising hormones present after fasting overnight that increase insulin resistance.
- So an activity may still require some regimen changes but usually lesser ones for early morning exercise.
- Evening exercise generally conveys the highest risk of hypoglycaemia, especially overnight, but can be done safely if precautions are taken to prevent it.

Sensitivity

- Trained individuals also generally have a heightened sensitivity to insulin, which allows glucose to enter muscle cells more efficiently, both acutely and chronically with exercise
- Training adaptations usually result in lower insulin needs overall regardless of the insulin regimen used.
- Exercise must be consistent, though, as increases in insulin sensitivity are short-lived and begin to decline in only 1-2 days

Variables affecting glycaemic control in acute exercise sessions

- Type, intensity, and duration of activity
- Starting blood glucose level
- Circulating insulin levels, determined by:
 - - Types of insulin(s) used
 - - Timing of last insulin injection or bolus
 - - Insulin dosage given
- New or unaccustomed versus usual exercise
- Carbohydrate ingestion before and
- Time of day exercise is done
- Previous recent exercise

Variables affecting glycaemic control in chronic exercise training

- Type of training done (mainly aerobic versus anaerobic)
- Fitness for a given physical activity
- Heightened insulin sensitivity
- Reductions in overall insulin doses
- Change in fuel utilisation (from carbohydrate to greater fat use)
- Dietary status (energy balance, carbohydrate and fat intake)
- Body composition changes (metabolically-active muscle mass)
- Frequency of glycogen-depleting exercise
- Attenuation of hormonal response to submaximal workloads

Current Recommendations

- **1. Metabolic control before exercise**
 - Avoid exercising if fasting glucose levels are 14 mmol/L and ketosis is present, or if glucose levels are >17 mmol/L, irrespective of whether ketosis is present
 - Ingest added carbohydrates if glucose levels are <5.5 mmol/L.
- **2. Blood glucose monitoring before and after exercise**
 - Identify when changes in insulin or food intake are necessary
 - Learn the glycaemic response to different exercise conditions
- **3. Food intake**
 - Consume added carbohydrate as needed to avoid hypoglycemia
 - Carbohydrate-based foods should be readily available during and after exercise.

Other recommendations

These are quite general and intuitive:

- Prevention of hypoglycaemia or hyperglycaemia during exercise is essential for optimal exercise performance
- The key to prevention is frequent blood glucose monitoring and appropriate corrective actions
- For new or unusual activities, more frequent blood glucose monitoring may be needed to establish a response pattern
- Frequent testing among athletes with diabetes (before, during, and after) is common and leads to corrective regimen changes

Common exercise hypoglycaemic symptoms

- **Double or blurred vision**
- **Mental confusion**
- **Weakness**
- **Fatigue**
- **Tingling of hands or tongue**
- **Hand tremors/shakiness**
- **Abnormally elevated pulse**
- **Poor physical coordination**
- **Headache**

Precautions

- Hypoglycaemia, both during and following exercise, should be prevented, if possible - stop to test blood glucose levels if any symptoms arise during an activity (see table 3)
- Individuals with diabetes longer than 15 years, or those over 35 should see their GP and, preferably, take a graded exercise test before doing moderate or vigorous exercise training to rule out cardiovascular problems
- Individuals with proliferative retinopathy (eye disease) should avoid any exercise that increases blood pressure significantly (eg. heavy weight lifting) as well as jumping, jarring or head-lowered activities
- If end-stage renal disease is present, exercise is allowed, but should be moderate.
- Exercisers with peripheral neuropathy (nerve damage) should also be wary as the loss of sensation in the feet can lead to undetected blisters, calluses, or injuries. Use of proper socks and footwear is recommended and non-weight bearing activities such cycling or swimming may be preferable to avoid trauma to the lower extremities
- Individuals with central nervous system (autonomic) neuropathy may be more prone to post-exercise hypotension (low blood pressure) and impaired temperature regulation.

Duration	Intensity ^b	Blood glucose prior to exercise (mmol/L)			
		<5.5	5.5-8.3	8.3-11.1	>11.1 ^c
15 min	Low	0-5	none	none	none
	Moderate	5-10	0-10	0-5	none
	High ^d	0-15	0-15	0-10	0-5
30 min	Low	5-10	0-10	none	none
	Moderate	10-25	10-20	5-15	0-10
	High	15-35	15-30	10-25	5-20
60 min	Low	10-15	10-15	5-10	0-5
	Moderate	20-50	15-40	10-30	5-15
	High	30-45	25-40	20-35	15-30
90 min	Low	15-20	10-20	5-15	0-10
	Moderate	30-60	25-50	20-35	10-20
	High	45-70	40-60	30-50	25-40

Table 2: General carbohydrate increases for endurance activities - carbohydrate)

^a(grams of rapidly absorbed

STORIES

<http://www.nhs.uk/Conditions/diabetes-type2/Pages/steveredgrave.aspx>

https://www.diabetes.org.uk/About_us/News/Gary-Mabbutt-I-almost-had-a-leg-amputated-because-of-diabetes/

<http://www.englandrugby.com/news/features/real-rugby-stories-tackling-diabetes/#>

References

- Colberg S. (2001) *The Diabetic Athlete*. Champaign, IL: Human Kinetics
- American Diabetes Association: Clinical Practice Recommendations (2001). Diabetes Mellitus and Exercise (Position Statement). *Diabetes Care* ;24(Suppl. 1):S51-S55
 - www.diabetes.org.uk
 - www.diabetes-exercise.org

Type II Diabetes NIDD

- Type II diabetes is a metabolic disorder in which the amount of blood glucose is too high because the body cannot *use* insulin effectively
- The body makes and secretes insulin but becomes insensitive to its effects
- Today there are over 1.8 million people in the UK who are diagnosed as having diabetes.
- However, it is predicted that there are at least another 1 million people who have diabetes but are unaware of it.

People at risk of developing Type 2 diabetes are:

- White people aged over 40
- People from black and minority ethnic groups aged over 25 years with:
- A first degree family history of diabetes (mother, father or sibling)
- People who are overweight (BMI of 25-30 kg/m² and above), and who have a sedentary lifestyle
- People who have ischaemic heart disease, cerebrovascular disease, peripheral vascular disease (problems with circulation, including heart attack or stroke) or hypertension (high blood pressure)
- Women who have had gestational diabetes (diabetes during pregnancy)
- Diabetes UK recommends screening at one year after delivery and then three yearly
- Women with polycystic ovary syndrome who are obese
- Those known to have impaired glucose tolerance or impaired fasting glycaemia.

Benefits of Exercise in Type II Diabetics

- Physical activity is a cornerstone treatment for the prevention and management of type 2 diabetes
- DPPRG (2002) among individuals at risk of diabetes, a lifestyle programme that included 30 minutes of moderate activity every day, reduced risk by 58%
- In comparison, drug therapy reduced risk by 31%

Benefits of Exercise for Type II Diabetes

- ADA and ACSM each promote physical activity including
 - Aerobic
 - Endurance
 - Resistance training
- Estimated that 1 death in 61 every year could be prevented for people who walk 2 hours per week.

Mechanisms of Effect

- Increased endothelial vasodilator function
- Improved left ventricular diastolic function
- Decreased arterial stiffness
- Decreased systematic inflammation
- Lowered blood pressure
- Reduced total and abdominal visceral fat

Exercise Recommendations

- Patients should accumulate a minimum expenditure of 1000 calories per week in aerobic exercise and also partake in resistance training
- This can be met via 3 exercise sessions per week
- Exercise should be daily when weight loss is also a goal

Exercise recommendations

- Each session should include:
 - Warm up (5-10mins)
 - Cool down (5-10mins)
 - Callisthenics
 - Flexibility
 - Low intensity aerobic exercise
 - Aerobic exercise: walking, cycling, swimming
 - Aim to increase from 30mins to 45mins

Exercise Recommendations

- Use heart rate data
- Target hr 55-79% of HRmax (tested not estimated)
- Resistance training to supplement aerobic exercise
- Low weight high reps
 - Benefit lean body mass, glucose and cholesterol metabolism, bone density, osteoarthritis symptoms, mobility impairment, independence

Exercise recommendations

Resistance training

- Twice per week
- Large muscle groups
- 8-10 exercises
- 10-15 repetitions (30-50% 1RM)
- Increments of 5-10lbs
- Machines weights preferred

Exercise Precautions

- Risk to benefit ratio is favourable
- But caution needed: patients with type II diabetes often have
 - Coronary artery disease
- Adverse cardiovascular and physiological responses to exercise

Specific exercise precautions

Blood Pressure	SBP>160 or DBP>100mmHg requires treatment
Resting BG	Defer if <3.3mmol/L Eat if <5.6mmol/L

- Check blood glucose levels after every session for the first few sessions, then periodically
- Monitor blood glucose, if it falls too low during or after exercise diet should be adjusted
- Make supplementary food available for vigorous and prolonged exercise sessions

References

- Ruderman, N. D., Devlin, J., and Schneider, S. (2001). *Handbook of Exercise in Diabetes*. American Diabetes Association
- Ibright, A., *et al.*, (2000). American college of sports medicine position stand: exercise and type 2 diabetes. *Medicine and Science in Sports and Exercise*. 32(7) pp. 1345-1360

Water based exercise



Advantages of water based exercise

- Buoyancy – reduces compressive joint forces
- Water resistance – stimulus for muscular development
- Warm temperature – encourages blood circulation
- Supportive – assists balance, promotes core stability

- LEADS TO
Neuromuscular rehabilitation
Weight Management
Balance retraining
Peripheral Vascular disease

Physiological Responses to Immersion

Right Arterial Pressure	+ 8-12 mmHg
Mean Pulmonary Artery pressure	+ 12 mmHg
Heart Blood Volume	+ 180 – 150 mls
Q	+ 25%
Central Venous Pressure	+ 300-700mls
SV	+ 30-50%
HR	- Slight
Left Ventricular EDV	+

Physiological Responses to Immersion

At rest

- Pulmonary System
 - ❖ Vital Capacity – 5-10%
 - ❖ ERV – 62-70%
 - ❖ FRC – 30-54%
 - ❖ RV – 16%
 - ❖ Load on respiratory muscles +
- Renal System
 - Increase in Renal Output
 - Decrease in Plasma Volume

Physiological Considerations: Setting Exercise Intensity

- HR alterations mean exercise intensity should not be made using % HR max
- RPE
- METS

Considerations of water-based exercise in CVD patients

- Pre-inclusion screening and monitoring
- Be cautious in clients with angina, impaired ventricular and exercise induced arrhythmias
- Avoid facial immersion
- Consideration of water temperature and exercising depths
- Adjust training intensities
- Qualified instructors (aqua and cardiac)

What is Cancer?

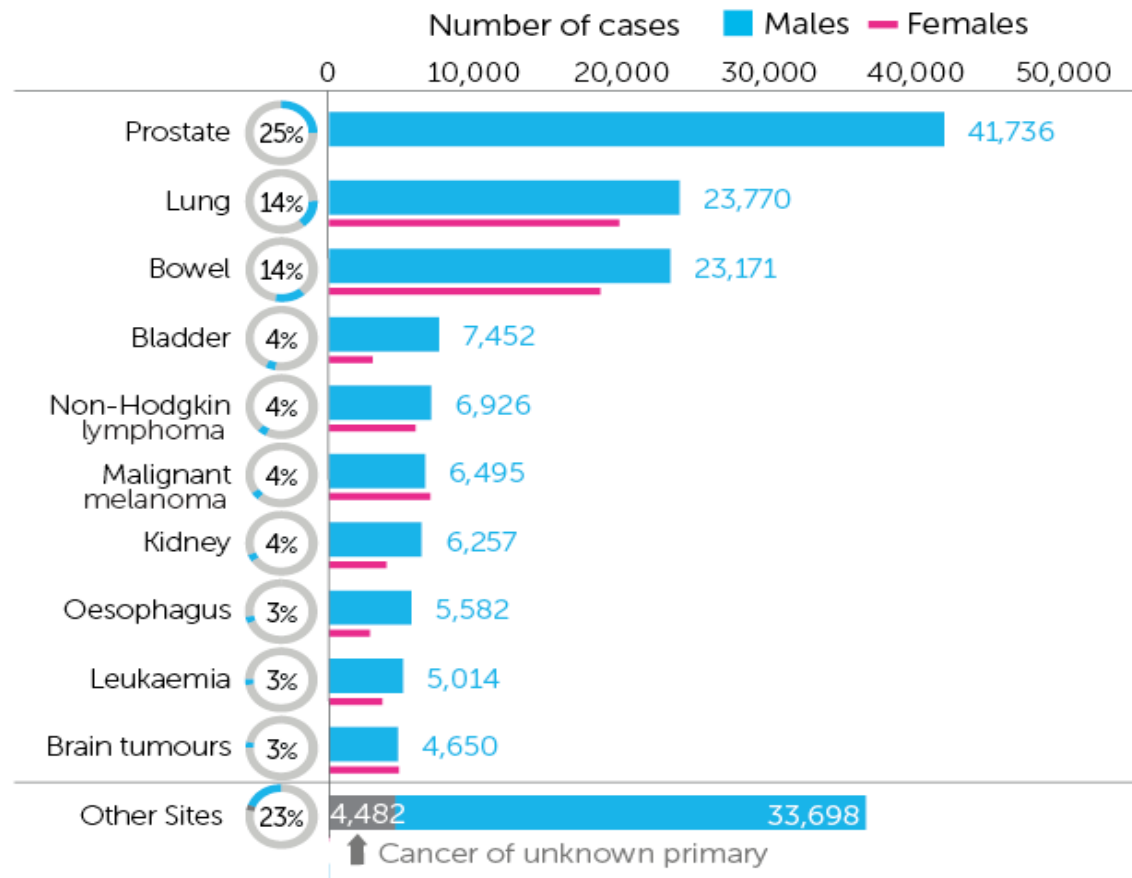
- Cancer is a set of diseases characterised by unregulated cell growth leading to invasion of surrounding tissues and spread to other parts of the body
- There are over 200 different types of cancer
- CRUK: more than 1 in 3 of us will be diagnosed with cancer at some point in our lives
- 740 diagnosis per day: 270,000 cases per year

Causes of Cancer

- Estimated that half of all cancers could be prevented (135,000 cases per year)
- Genetic
- Environmental
- Family history

The 10 Most Common Cancers in 2011

Numbers of New Cases, Males, UK



3% of all male cases are registered without specification of the primary site.

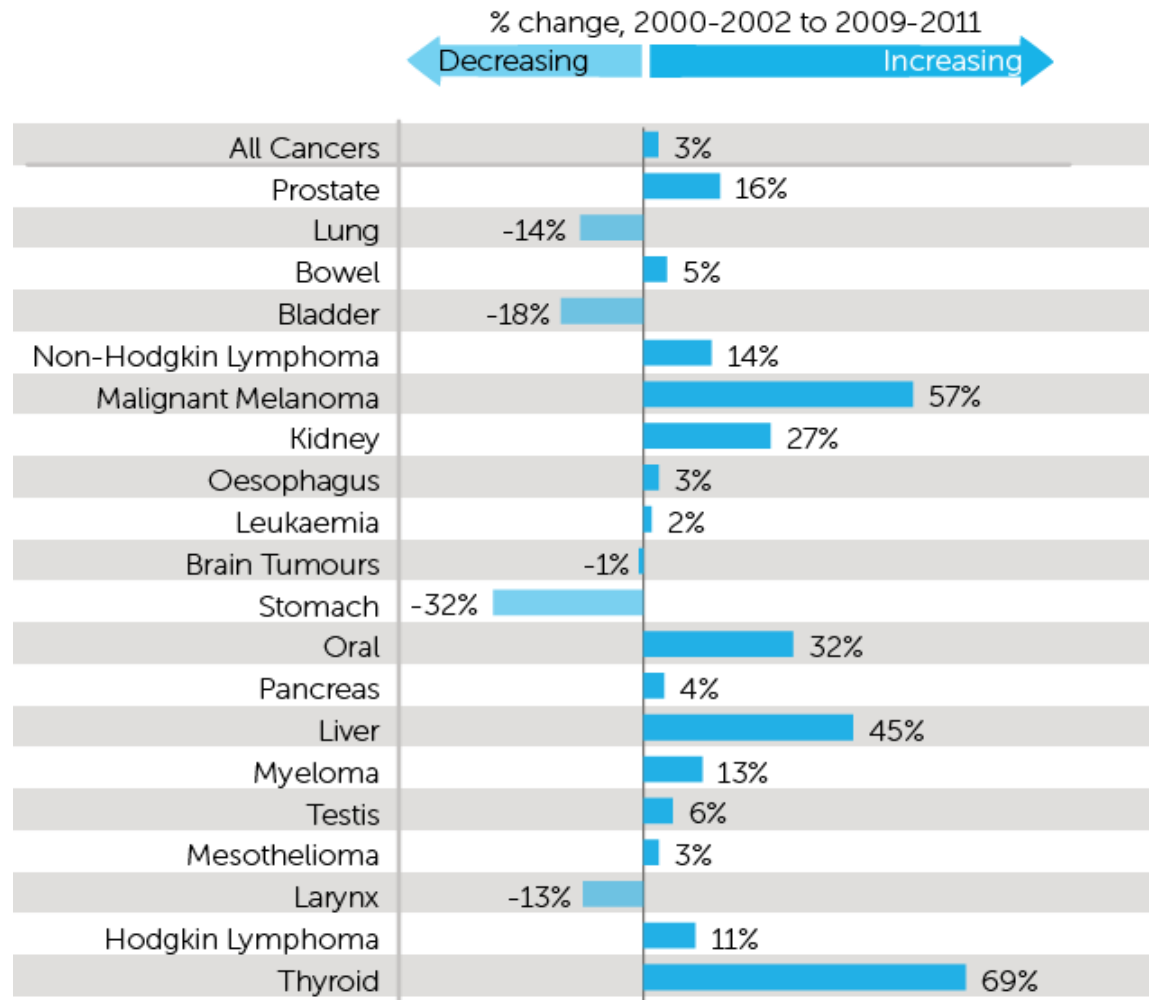
Excluding non-melanoma skin cancer. Brain tumours: brain, other central nervous system (CNS) and intracranial tumours, including malignant, benign and uncertain or unknown behaviour tumours.

Data in this chart do not sum to 'all cancers combined' total provided elsewhere, because 'Brain, other CNS (central nervous system) and intracranial' includes tumours that are malignant, benign and of uncertain or unknown behaviour, but only the malignant tumours are included in 'all cancers combined' total.

Please include the citation provided in our Frequently Asked Questions when reproducing this chart: <http://info.cancerresearchuk.org/cancerstats/faqs/#How>

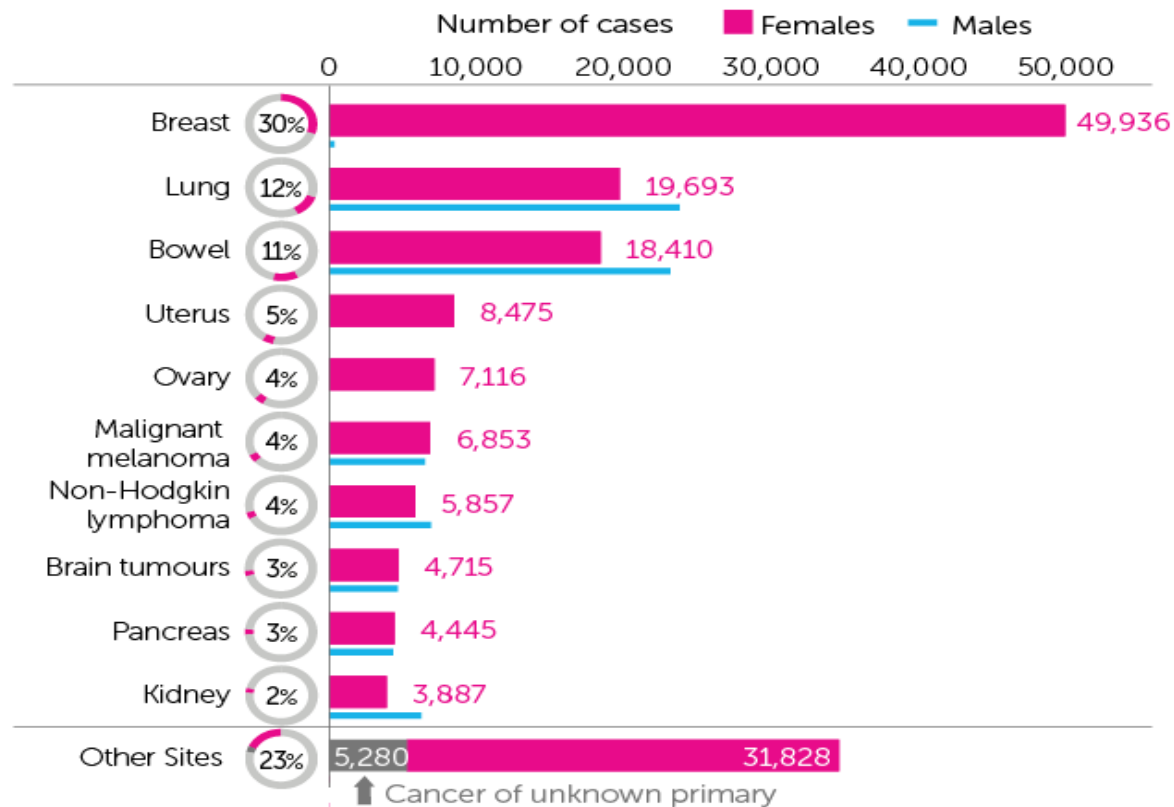
The 20 Most Commonly Diagnosed Cancers: 2000-2002 and 2009-2011

Percentage Change in European Age-Standardised Incidence Rates per 100,000 Population, Males, UK



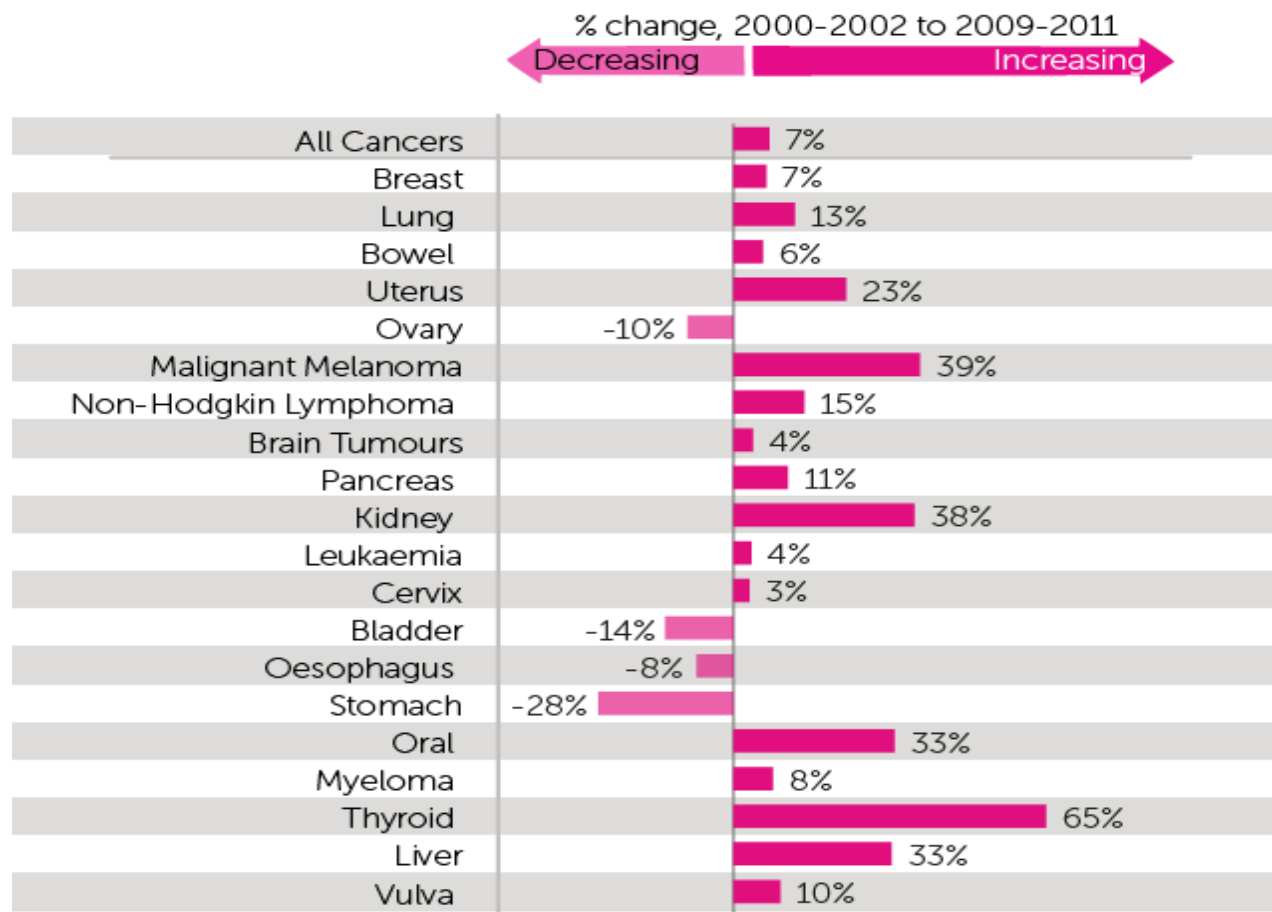
The 10 Most Common Cancers in 2011

Numbers of New Cases, Females, UK



The 20 Most Commonly Diagnosed Cancers: 2000-2002 and 2009-2011

Percentage Change in European Age-Standardised Incidence Rates per 100,000 Population, Females, UK



UK Variations

- The incidence of stomach cancer in males is significantly lower in England (11 per 100,000)
 - The **highest incidence being 15 per 100,000 in Wales.**
- Other types with the lowest incidence rates in England include lung cancer in males, bowel cancer in females and cervix in situ.
- The **incidence rate of ovarian cancer is significantly higher in Wales (20 per 100,000)**
 - The lowest incidence being 14 per 100,000 in Northern Ireland.
- The high prevalence of smoking in Scotland means that smoking-related cancers have particularly high incidence rates there.
- Lung cancer incidence is significantly higher in Scotland (76 and 59 per 100,000 in males and females, respectively)
 - the lowest incidence rates for males is in England, at 56 per 100,000,
 - For females it is in Northern Ireland, at 37 per 100,000

Physical Activity reduces risk of Cancer

- Parkin et al, (2011)
 - 1% of cancers in the UK, around 3,400 cases every year, are linked to people doing less than government guidelines for physical activity each week
- AICR (2007) and IARC (2002)
 - Regular physical activity helps to keep body weight at a healthy level, and being overweight or obese can greatly increase the risk of cancer.
 - Activity itself also has a protective effect, which is independent of its effects on bodyweight

Physical activity reduces the risk of Bowel and Colon Cancer

Physical activity can reduce the risk of bowel cancer in many different ways

- Physical activity leads to regular bowel movements.
 - Cancer-causing substances in undigested food pass through the bowel more quickly.
- Physical activity reduces the levels of insulin, some hormones and some growth factors.
 - At high levels, these substances can encourage the growth of tumours.
- Physical activity can change the levels of chemical messengers called prostaglandins, which are involved in inflammation.
 - Reducing inflammation in the bowel could mean cells aren't multiplying as quickly, so there's less chance of the mistakes during cell replication that could lead to cancer

Breast Cancer and Physical Activity

- Meta analysis of 31 studies on physical activity and breast cancer found that the women who did the most activity had a 12% lower risk of developing breast cancer compared with the least active women (Wu, 2013)
- The analysis also showed that the more activity a woman does, the more she can reduce her risk of breast cancer.
 - For example, for every 2 hours a week a woman spends doing moderate to vigorous activity, the risk of breast cancer falls by 5%.
- Research has also shown that being physically active after the menopause can reduce breast cancer risk by 10%, no matter what a woman's fitness, weight or waist circumference (Fournier, 2014)
- Heavier chores such as ironing, gardening and cleaning can help reduce the risk of breast cancer too.
 - Research including the EPIC study, which includes over a quarter of a million European women, consistently shows that household activity can reduce a woman's risk of developing breast cancer.
 - Housework reduced the risk of breast cancer by itself and in combination with leisure time activity like walking, cycling or playing sport (Wu, 2013)
- As with bowel cancer, physical activity probably reduces breast cancer risk by lowering levels of insulin, hormones and growth factors (Wu, 2013)

Physical Activity and other Cancers

- 30% lower risk of womb cancer
- Lung cancer
- Prostate cancer (workplace)

How active should you be?

- Doing at least 30 minutes of moderate physical activity on five or more days a week can help your health.
- Split this up into shorter bursts, for example 10 minutes at a time.
- Reduce cancer risk even further by being active more often and for longer.
- Moderate physical activity is any movement that makes you feel warm and slightly out of breath.
- It does not have to cost money or involve complicated exercise programmes!

- CRUK 2014

The UK guidelines for physical activity are:

- Early years (under five years):
 - After beginning to walk, under-fives should be physically active for at least 180 minutes (3 hours) a day;
 - Children and young people (5 - 18 years):
 - At least 60 minutes (1 hour) of moderate to vigorous physical activity per day. Vigorous intensity activities that strengthen muscle and bone should be carried out on at least three days a week;
 - Adults (19+ years):
 - At least 150 minutes (2 1/2 hours) of moderate intensity physical activity over a week, in bouts of 10 minutes or more.
 - Physical activity to improve muscle strength should be carried out on at least two days per week.
- Start Active (2011)

Cancer Recovery Programme

- Diagnosis effects
 - Emotional response
 - Physiological responses
- Programme goals
 - Maximise functional capacity
 - Restore daily routine
 - Promote healthy lifestyle
 - Quality of life

Cancer Recovery Programme

- Treatment toxicities
 - Immune system
 - CV system
 - Pulmonary toxicity
 - Gastrointestinal toxicity
 - Musculoskeletal toxicity
 - Hepatotoxicity
 - Neuroendocrine toxicity
 - Nephrotoxicity

Exercise Prescription (remission only)

- Aerobic exercise
 - Walking, cycling, rowing, cross-trainer, water based
 - 3-4 days per week
 - 12minutes duration
 - Low to moderate intensity
- Resistance exercise
 - Machine weights progressing to free weights
 - Circuit training?
 - 3 days per week
 - 20minutes
 - 1 set of 6-12 reps

Physical activity and HIV

- Highly Active Antiretroviral Therapy (HAART) introduction now means less mortality resulting from AIDS
- Instead the longer term effects of living with Human Immunodeficiency Virus and the side effects of HAART are increasingly impacting on morbidity

Physical Activity and HIV

- Metabolic abnormalities
 - Dyslipidaemia
 - Insulin resistance
 - Body fat redistribution (lipodystrophy)
- Cardiovascular disease
- Biomechanical changes

Benefits of exercise

- Improve muscle mass, strength and endurance
- Improve heart and lung endurance
- Improve energy level/ reduce fatigue
- Reduce stress
- Enhance sense of well-being.
- Increase bone strength
- Decrease LDL cholesterol and triglycerides
- Increase good (HDL) cholesterol
- Decrease fat in the abdomen
- Improve appetite
- Improve sleep
- Improve the way the body uses and controls blood sugar (glucose) which reduced the risk of Type II diabetes

Risks of exercise

- Dehydration
- Injuries may take more time to heal
- Loss of lean body mass if exercise excessively
- Exercise may aggravate underlying conditions

HIV exercise programme

- Training effect v immuno-suppression
- Continuous or interval training 3-5 x per week increasing to at least 30 minutes
- Effective resistance training 2-3 x per week at 70-80% 1RM
- Core stability component addressing transverse abs and glutes e.g. pilates, yoga, swiss ball

HIV exercise programme precautions

- Contact/infection
- Confidentiality
- Deterioration
 - Unexplained weight loss
 - Night fevers and sweats
 - Increasing shortness of breath
 - Productive cough
 - Increasing HR with exercise
 - Unexplained pain
 - Sudden onset weakness, dizziness, headaches, bladder or bowel dysfunction