

BMSH4302

Introduction to Chronic Disease

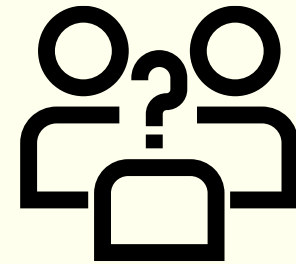
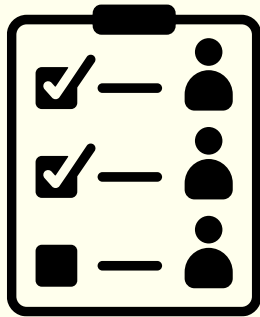
Level 4



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BMSH4302 Introduction to Chronic Disease

Housekeeping:



Kahoot! Recap

Week 6: Neurological Conditions

Cancer as a Chronic Disease

The origins of "Cancer"

Greek karkinos = crab

Hippocrates observed tumour vessels spreading outward like crab claws

Latinised as: cancer = crab

- **"Carcinoma"**: Greek karkinos + -oma (growth or tumour)
- **"Malignant"**: Latin malignus = born of evil kind; disposed to cause harm

What is Cancer?

- **Uncontrolled cell division:** normal cell cycle regulation fails
- **Loss of apoptosis:** cells stop responding to the instruction to die
- **Tumour formation:** abnormal cell mass develops (benign vs malignant)
- **Malignant tumours:** invade surrounding tissue; can metastasise
- **Metastasis:** cancer cells travel to distant sites via blood or lymph

Cancer as a Chronic Disease

- **WHO:** cancer is one of the four main non-communicable diseases (NCDs)
- **Duration:** most solid cancers develop over years or decades
- **Survivorship:** approximately 3 million people in the UK live with or beyond a cancer diagnosis
- **Relapsing and remitting:** remission, recurrence, further treatment
- Survivorship as a long-term condition requires ongoing management

Cancer Globally

~**20 million** new cancer cases diagnosed worldwide in 2022 (GLOBOCAN/IARC)

~**9.7 million** cancer deaths globally in 2022

Top 5 by new cases: lung (12.4%), breast (11.6%), colorectal (9.6%), prostate (7.3%), stomach (4.9%)

1 in 5 people globally will develop cancer during their lifetime

- Low- and middle-income countries increasingly affected as populations age

Cancer in the UK

~390,000 new cancer cases diagnosed in the UK each year (Cancer Research UK)

2021 figures: breast (59,517), prostate (51,575), colorectal (49,914), lung (48,904)

- These four cancers account for 53% of all new UK cases

~3 million people in the UK living with or beyond a cancer diagnosis

40% of UK cancers are estimated to be preventable (Cancer Research UK)

Cancer in Wales

~21,000 new cancer cases diagnosed in Wales each year (WCISU, 2022 data)

Four most common: prostate, breast, lung, colorectal (same as UK pattern)

Lung cancer causes 2 in every 10 cancer deaths in Wales (most of any cancer type)

Cancer incidence is 20% higher in the most deprived fifth of communities (WCISU 2002-2022)

- This deprivation gap has remained largely unchanged since 2006

Today's Session

1. **Lung cancer:** the biggest cancer killer in Wales and the UK
 2. **Breast cancer:** the most common cancer by new cases in the UK
 3. **Colorectal (bowel) cancer:** strong preventable fraction; IBD connection
 4. **Prostate cancer:** most common cancer in men; major survivorship condition
- All four cancers appear in the global and UK top five

The Four Cancers: Where They Sit

Top 5 in Men (UK, 2021)		Top 5 in Women (UK, 2021)	
1.	Prostate	1.	Breast
2.	Colorectal	2.	Lung
3.	Lung	3.	Colorectal
4.	Bladder	4.	Uterus
5.	Melanoma	5.	Melanoma

Source: Cancer Research UK (2021)

Lung Cancer

Lung Cancer

ETYMOLOGY AND DEFINITION

Lung: Old English "lungen" (light organ; lungs float due to air)

Cancer: Latin/Greek karkinos/cancer = crab (spreading growth)

Definition: malignant tumour arising from cells lining the airways or lung tissue

Two main groups: Non-small Cell Lung Cancer (NSCLC) (~85%) and Small Cell Lung Cancer (~15%)

NSCLC subtypes: adenocarcinoma, squamous cell carcinoma, large cell carcinoma

Lung Cancer

PREVALENCE AND INCIDENCE

Global: ~2.48 million new cases in 2022 (12.4% of all cancers); GLOBOCAN

UK: ~48,900 new cases per year; 4th most common cancer by diagnosis

UK: lung cancer causes more deaths than any other cancer (~35,000 per year)

Wales: lung cancer is the leading cause of cancer death; 2 in every 10 cancer deaths

- Incidence rising in women; falling in men in the UK (reflecting historical smoking patterns)

Lung Cancer

AETIOLOGY

Tobacco smoke contains chemicals that attach to DNA and cause copying errors when cells divide

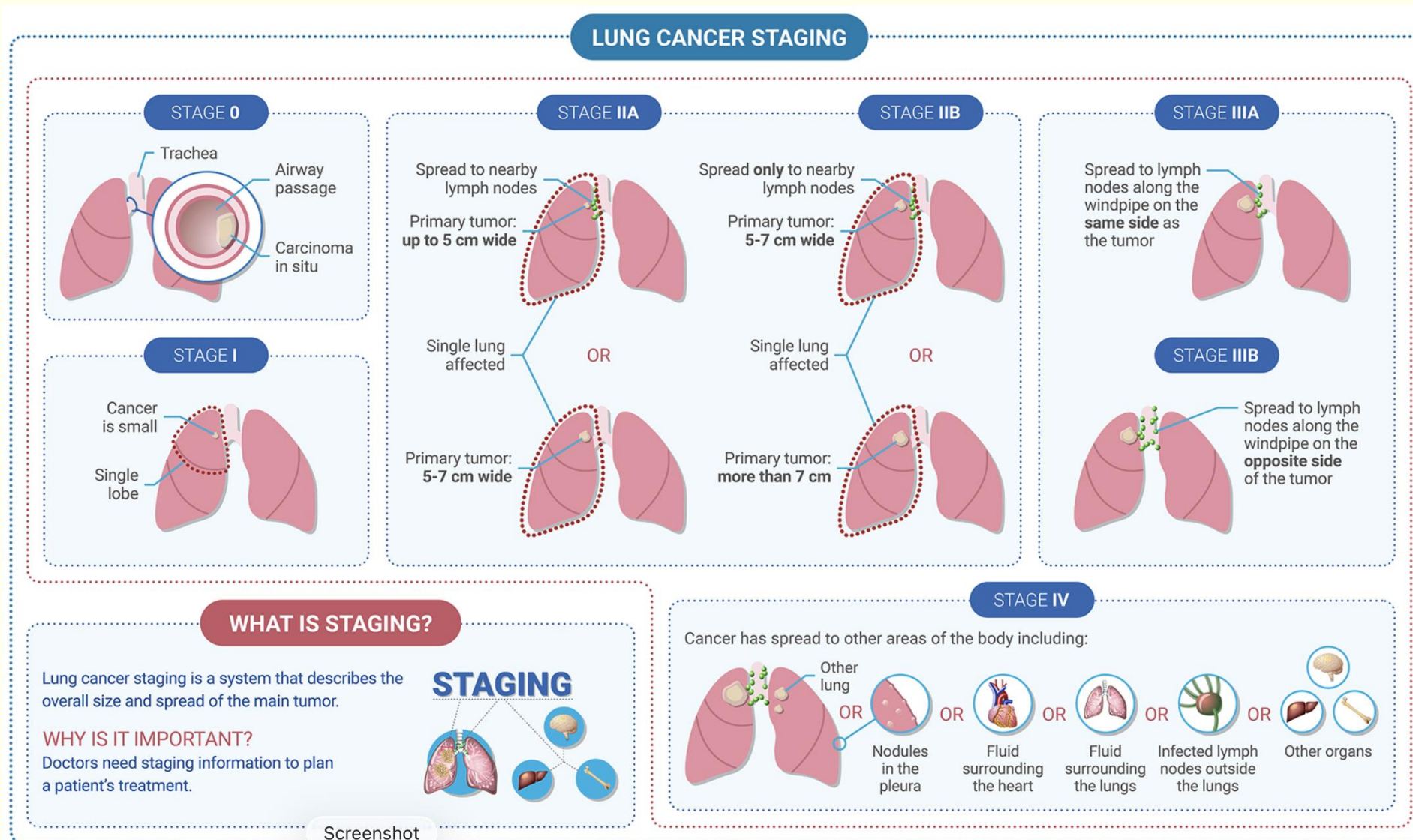
Radon gas and asbestos cause DNA damage through different mechanisms but the same outcome

Air pollution triggers sustained airway inflammation, promoting abnormal cell growth over time

Lung Cancer

PATHOLOGY

- Carcinogens damage DNA in cells lining the airways
- The cell's own braking system fails: damaged cells are no longer told to stop dividing
- Signals that tell cells to divide get stuck in the "on" position: division becomes uncontrolled
- Cells lose the ability to self-destruct; a mass begins to grow within the lung
- Angiogenesis: the tumour grows its own blood supply to sustain itself
- Late stage: cells invade the lymphatic system and bloodstream and spread to the brain, bone, and liver



Lung Cancer

SIGNS AND SYMPTOMS

- Persistent cough (more than 3 weeks), or change in a chronic cough
- Breathlessness or wheeze
- Coughing up blood (haemoptysis)
- Chest pain, particularly on breathing
- Unexplained weight loss and fatigue
- Hoarseness; recurrent chest infections

Lung Cancer

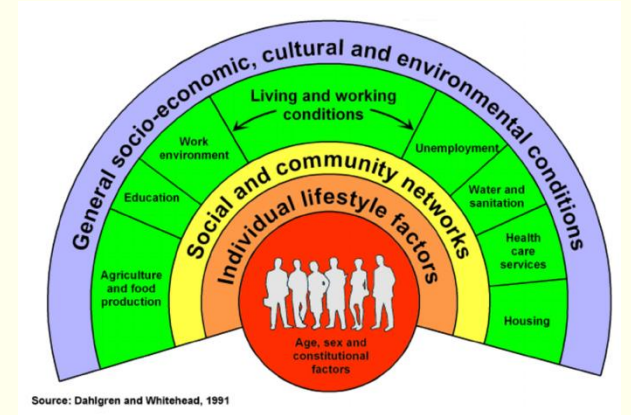
NON-MODIFIABLE RISK FACTORS

Genetics:

- Certain genetic variants

Age: (most diagnosed over 70)

Family history



Lung Cancer

MODIFIABLE RISK FACTORS

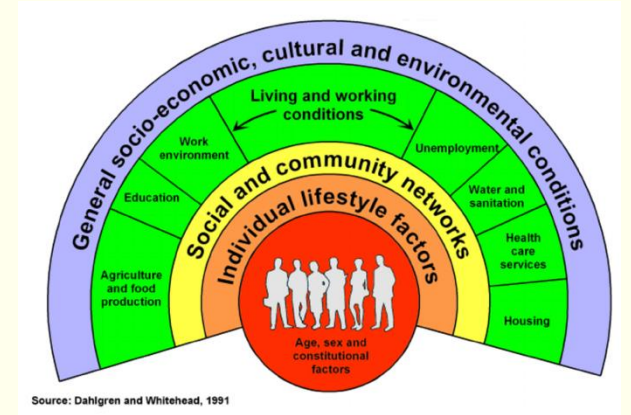
Smoking: by far the strongest single risk factor)

- stopping before age 30 avoids more than 90% of the risk attributable to tobacco; stopping by age 40 reduces risk by around 80%
- Passive smoking

Occupational exposures: asbestos, silica, diesel

Radon gas exposure: can be tested and mitigated in homes

Air pollution



Lung Cancer

QUALITY OF LIFE

HRQoL significantly impaired at diagnosis: breathlessness, fatigue, pain

Treatment effects: surgery reduces lung capacity; chemotherapy causes fatigue and nausea

Psychological impact: high levels of anxiety and depression; stigma around smoking history

Survivorship: five-year survival in UK ~10 to 20% (late-stage diagnosis common)

Exercise rehabilitation improves fatigue, breathlessness, and psychological wellbeing

Breast Cancer

Breast Cancer

ETYMOLOGY AND DEFINITION

Breast: Old English "breost" (chest, front of the body)

Cancer: Latin/Greek = crab (malignant spreading growth)

Definition: malignant tumour arising from breast tissue, most often the milk ducts or lobules

- Predominantly affects women, but also found in men

Breast Cancer

PREVALENCE AND INCIDENCE

Global: ~2.30 million new cases in 2022 (11.6% of all cancers); GLOBOCAN

UK: ~59,500 new cases per year; most common cancer by new cases

UK: 10-year survival exceeds 75% (Cancer Research UK); one of the most survivable cancers

Wales: breast cancer is the most common cancer in women; Breast Test Wales screens from age 50

- Global incidence rising, particularly in low- and middle-income countries

Breast Cancer

AETIOLOGY

Oestrogen stimulates breast cells to divide; each division carries a small risk of a DNA copying error

- The longer breast tissue is exposed to oestrogen, the greater the accumulated risk

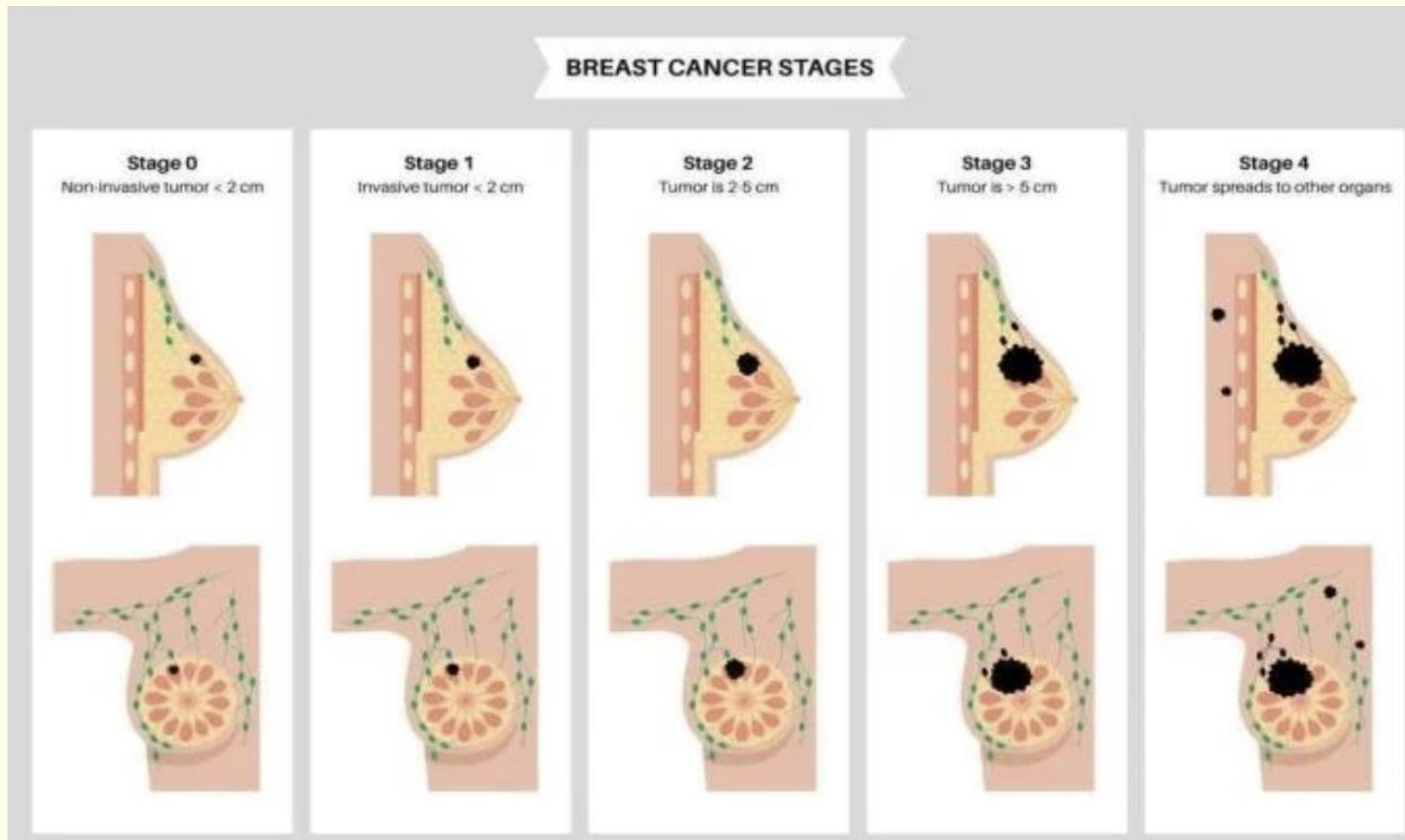
BRCA1 and BRCA2 are DNA repair genes; when faulty, copying errors go uncorrected and accumulate

Some breast cancers are driven by **HER2** gene overactivity rather than oestrogen

Breast Cancer

PATHOLOGY

- Malignant transformation of ductal or lobular epithelial cells
- Oestrogen drives cell proliferation via oestrogen receptor signalling
- Early stage: ductal carcinoma in situ (DCIS) - contained within the duct, not invasive
- Invasive ductal/lobular carcinoma: cells breach the duct wall, invade surrounding tissue
- Metastasis routes: lymphatic (axillary nodes first); blood (to bone, lung, liver, brain)



Breast Cancer

SIGNS AND SYMPTOMS

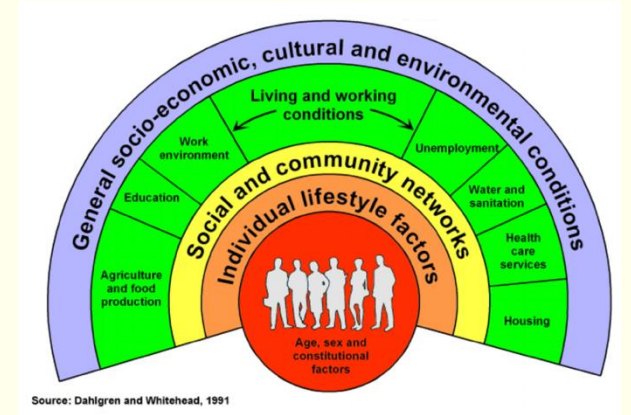
- Lump or thickening in the breast or armpit (most common presentation)
- Change in breast size, shape, or skin texture (dimpling, puckering)
- Nipple changes: inversion, discharge, or rash
- Redness or persistent warmth in the breast
- Pain in breast or nipple (less common as first symptom; majority of breast pain is benign)

Breast Cancer

RISK FACTORS

Non-modifiable:

- Female sex
- Increasing age
- Family history
- BRCA1/BRCA2 mutations
- Dense breast tissue
- Previous breast cancer or DCIS
- Chest irradiation in youth

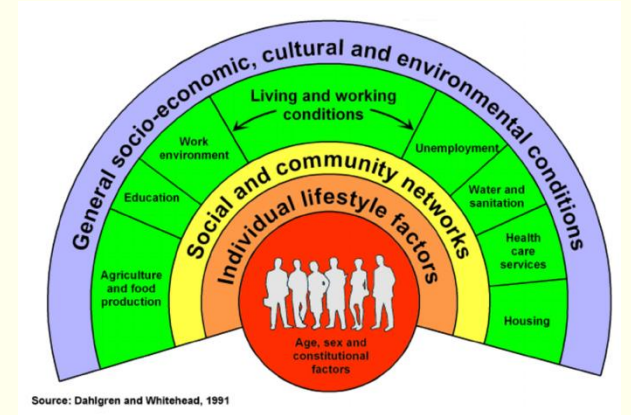


Breast Cancer

RISK FACTORS

Modifiable:

- Alcohol consumption (risk increases linearly with each unit per day)
- Physical inactivity
- Obesity (particularly post-menopausal)
- Combined HRT use (increased risk; does not apply to oestrogen-only HRT)



Breast Cancer

QUALITY OF LIFE

Treatment effects: surgery (body image, sensation changes), radiotherapy, chemotherapy

Hormone therapy: menopausal symptoms (hot flushes, joint pain, fatigue) lasting years

Lymphoedema: arm swelling after axillary surgery; affects function and appearance

Psychological: anxiety about recurrence; changes in sexuality and identity

- Exercise improves fatigue, emotional wellbeing, and reduces recurrence risk

Colorectal (Bowel) Cancer

Colorectal Cancer

ETYMOLOGY AND DEFINITION

Colon: Greek "kolon" = large intestine

Rectal: Latin "rectum" = straight (the final segment of the large intestine)

Colorectal groups cancers of the colon and rectum under one clinical category

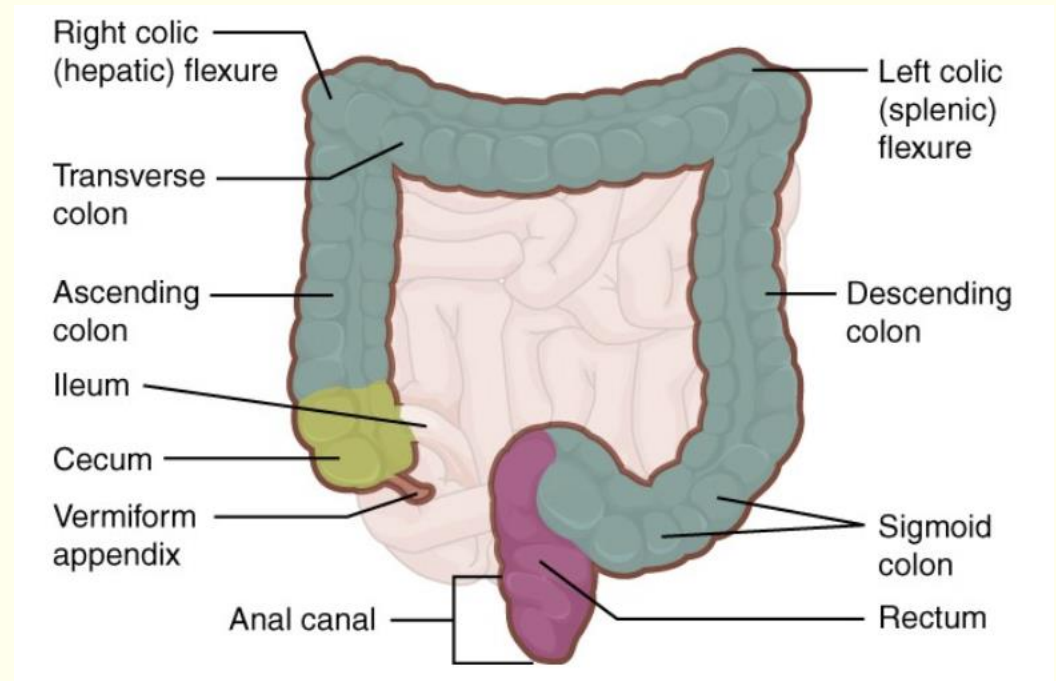
- Also called bowel cancer in everyday language; the terms are interchangeable

Definition: malignant tumour arising from the lining of the colon or rectum

The Large Intestine:

WHAT IT DOES AND WHY IT MATTERS

- The large intestine (colon and rectum) absorbs water and moves waste toward the body's exit
- The inner lining produces mucus to lubricate the passage of waste
- This lining is packed with millions of tiny mucus-producing glands

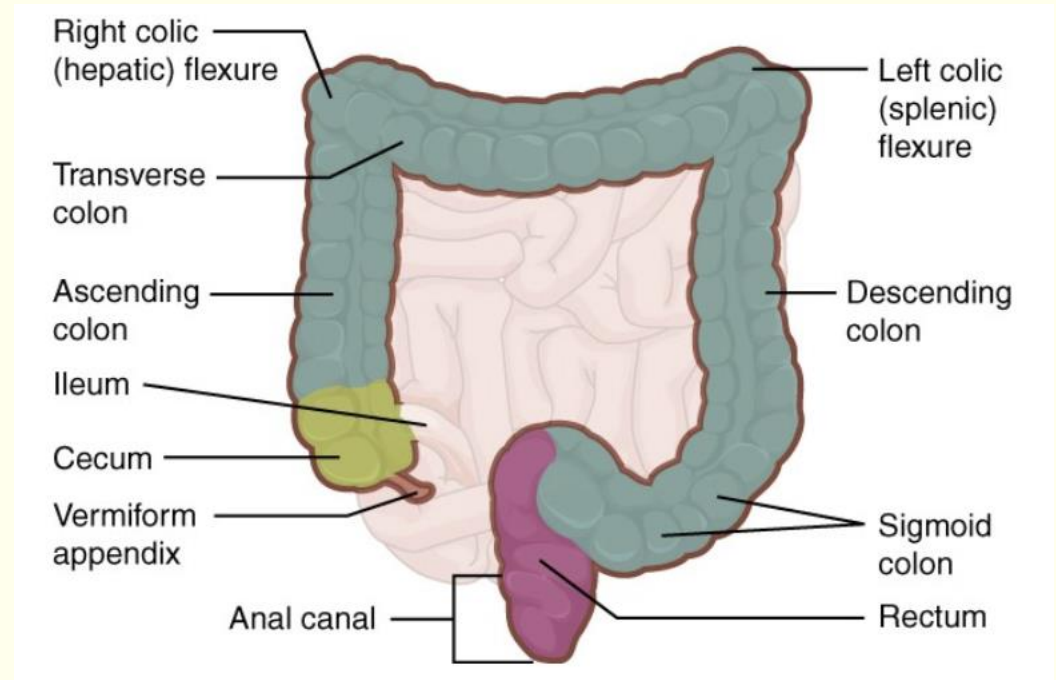


Source: <https://courses.lumenlearning.com/suny-ap2/chapter/the-small-and-large-intestines/>

The Large Intestine:

WHAT IT DOES AND WHY IT MATTERS

- These glandular cells divide regularly to renew the bowel lining; frequent division means more opportunity for faults to accumulate
- When those faults build up in a single cell over time, a polyp can form. A polyp is where colorectal cancer begins



Source: <https://courses.lumenlearning.com/suny-ap2/chapter/the-small-and-large-intestines/>

Colorectal Cancer

PREVALENCE AND INCIDENCE

Global: ~1.93 million new cases in 2022 (9.6% of all cancers); GLOBOCAN

UK: ~49,900 new cases per year; third most common cancer

Wales: above-average incidence; bowel cancer rising in people under 55

UK: five-year survival ~55 to 60%; strongly dependent on stage at diagnosis

- Incidence rising in younger adults globally, including Wales (WCISU 2022 data)

Colorectal Cancer

AETIOLOGY AND IBD-AUTOIMMUNE LINK

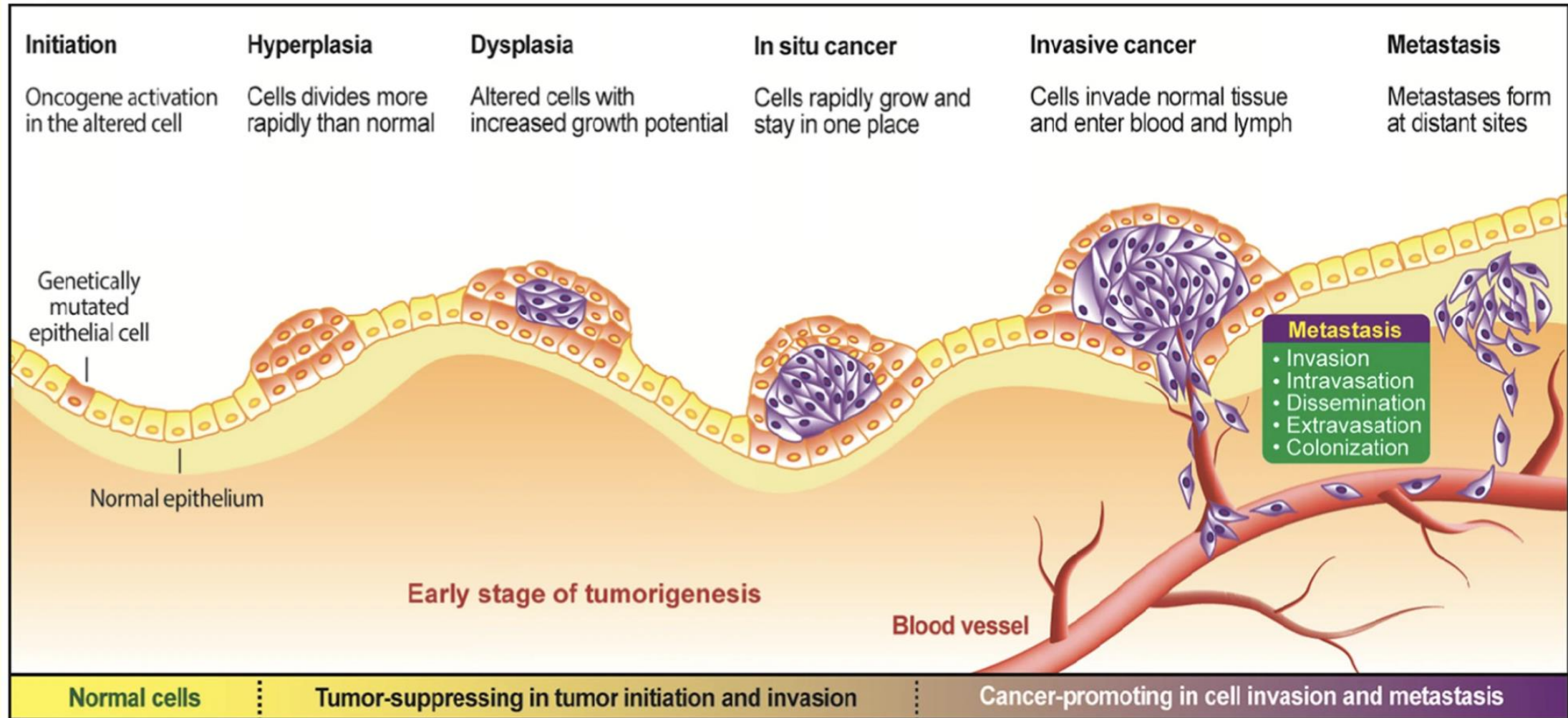
- Most bowel cancers begin with a fault in a gene that normally stops cells dividing too much
- Further gene faults follow over years, each giving the abnormal cell a growth advantage
- Compounds formed during meat processing can directly damage DNA in bowel lining cells
- In IBD, chronic inflammation drives repeated cell damage and repair, accelerating fault accumulation

Colorectal Cancer

PATHOLOGY

Adenoma-carcinoma sequence: normal bowel lining to polyp to invasive cancer

- Gene mutation activates in a normal cell
- Bowel lining cells begin to divide more rapidly (hyperplasia)
- Cells with increased growth potential develop (dysplasia) and develop into a benign growth (polyp)
- In most cases this process takes 10 to 15 years, which is why bowel screening can catch it early
- In people with IBD, long-term inflammation speeds up this process significantly
- Late stage: cancer spreads most commonly to the liver, then the lungs and the lining of the abdomen



Colorectal Cancer

SIGNS AND SYMPTOMS

- Persistent change in bowel habit (looser stools, increased frequency, over 4 to 6 weeks)
- Blood in or on stools (rectal bleeding)
- Unexplained weight loss and fatigue
- Abdominal pain or discomfort, particularly after eating
- Feeling of incomplete bowel emptying
- Anaemia (iron deficiency due to occult bleeding): fatigue, breathlessness

Colorectal Cancer

NON-MODIFIABLE RISK FACTORS

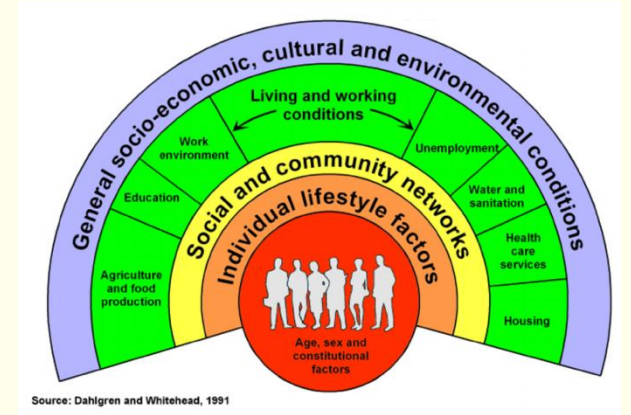
Genetic:

- Familial Adenomatous Polyposis (FAP)
- Lynch Syndrome

Age: (risk increases sharply over 50)

Family history

Personal history: IBD (Crohn's or Ulcerative Colitis) or prior colorectal polyps

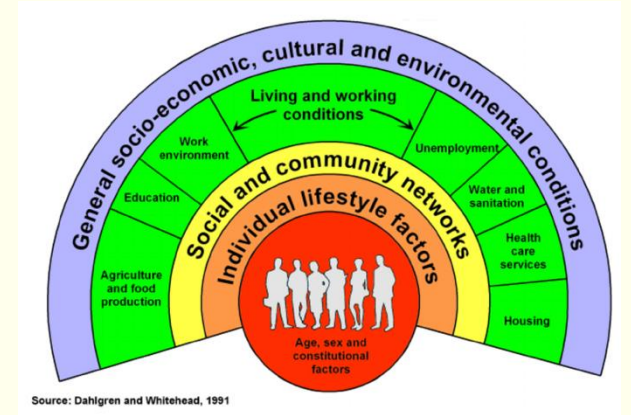


Colorectal Cancer

MODIFIABLE RISK FACTORS

Diet:

- Low fibre diet
- Processed meat consumption: causal links to Group 1 carcinogen (IARC)
- Red meat consumption: probable link to Group 2A (IARC)
- Alcohol consumption



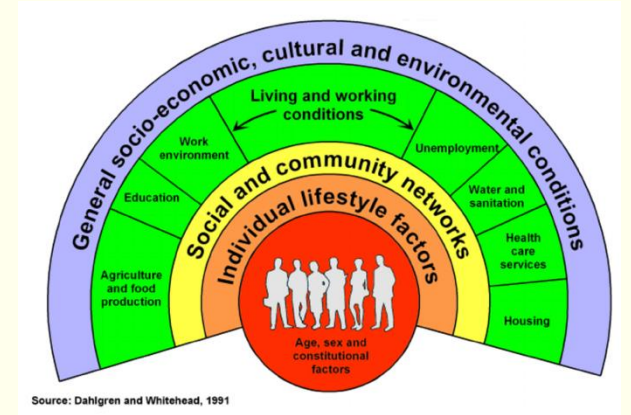
Colorectal Cancer

MODIFIABLE RISK FACTORS

Smoking: associated with adenoma development

Physical inactivity: strong independent risk factor

Obesity: particularly central obesity, increases risk through insulin resistance, chronic inflammation, and altered gut hormone signalling.



Colorectal Cancer

QUALITY OF LIFE

Stoma formation: surgery may result in permanent or temporary colostomy or ileostomy

Bowel function changes: urgency, frequency, incontinence common after pelvic radiotherapy

Psychological: adjustment to stoma; fear of recurrence; body image

- Exercise improves fatigue, bowel function, psychological wellbeing, and may reduce recurrence risk

Prostate Cancer

Prostate Cancer

ETYMOLOGY AND DEFINITION

Prostate: Greek "prostatēs" = protector

Cancer: Latin/Greek = crab (malignant spreading growth)

Definition: malignant tumour arising from the glandular cells of the prostate gland

- The prostate gland produces seminal fluid; sits beneath the bladder

Adenocarcinoma (glandular origin) accounts for over 95% of prostate cancers

Prostate Cancer

PREVALENCE AND INCIDENCE

Global: ~1.47 million new cases in 2022 (7.3% of all cancers);
GLOBOCAN

UK: >62,000 new cases per year; most common cancer in men

10-year survival in the UK exceeds 80% (Cancer Research UK)

Wales: 55% of men diagnosed in 2019 were at stage 1 or 2 (WCISU data)

- Incidence rising partly due to increased PSA testing detection

Prostate Cancer

AETIOLOGY

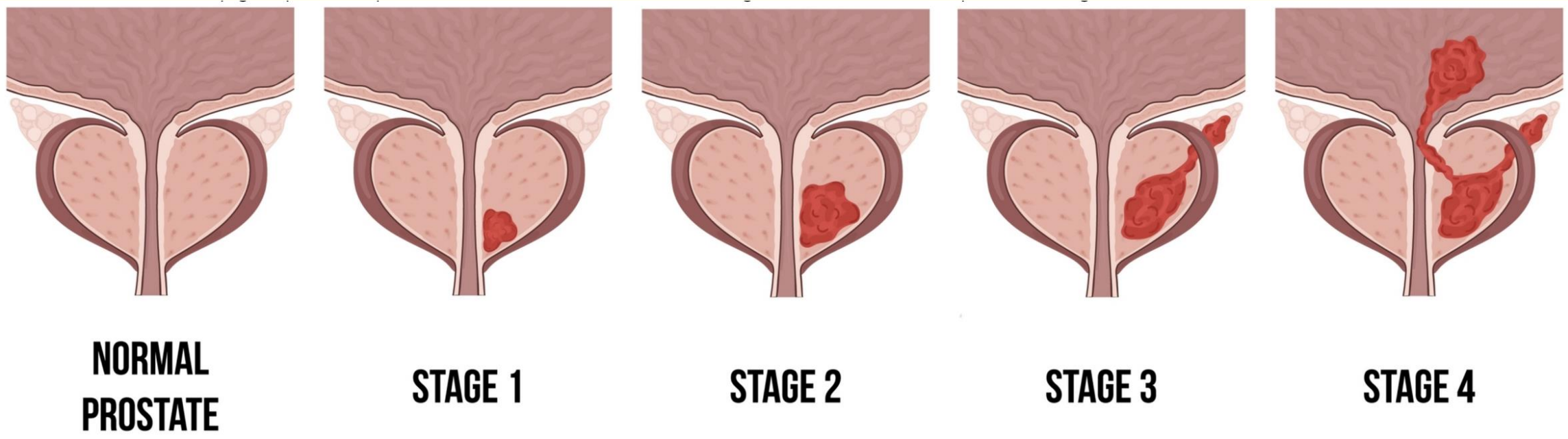
Testosterone drives continuous prostate cell division throughout a man's life

- Each division carries a small risk of a DNA copying error; decades of stimulation mean decades of accumulated risk
- A faulty BRCA2 repair gene allows errors to build up unchecked
- Androgen deprivation therapy works by removing the primary growth signal

Prostate Cancer

PATHOLOGY

- Prostate cancer develops in the outer part of the gland, where most of the glandular tissue sits
- Testosterone acts as a fuel for prostate cell growth, including cancerous growth
- The cell's growth controls fail, allowing abnormal cells to divide unchecked
- Late stage: cancer spreads first to nearby lymph nodes, then most commonly to the colon, bladder, bones of the spine, pelvis, and hip



Source: <https://againstprostatecancer.org/diagnosis-staging>

Prostate Cancer

SIGNS AND SYMPTOMS

Urinary symptoms: increased frequency, urgency, weak or slow stream, incomplete emptying

Nocturia: waking at night to urinate

Blood in urine (haematuria)

Late-stage: bone pain (back, hips, pelvis); unexplained weight loss; fatigue

Many early prostate cancers cause NO symptoms: detected via PSA test or incidentally

Prostate Cancer

NON-MODIFIABLE RISK FACTORS

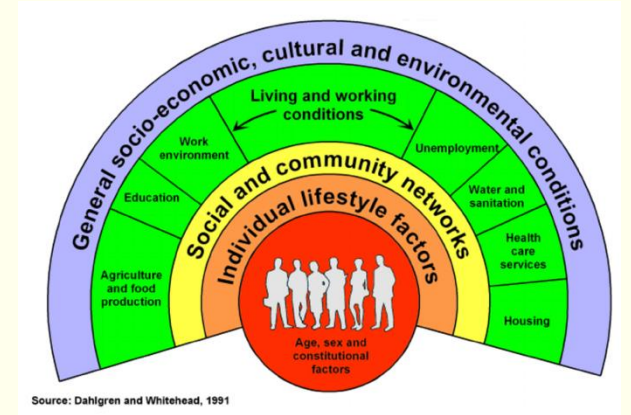
Genetic:

- BRCA2 gene mutation
- Lynch syndrome (modest increased risk)

Age: risk doubles every 10 years after 50

Ethnicity: (Black men: twice the risk)

Family History: father or brother with prostate cancer doubles risk



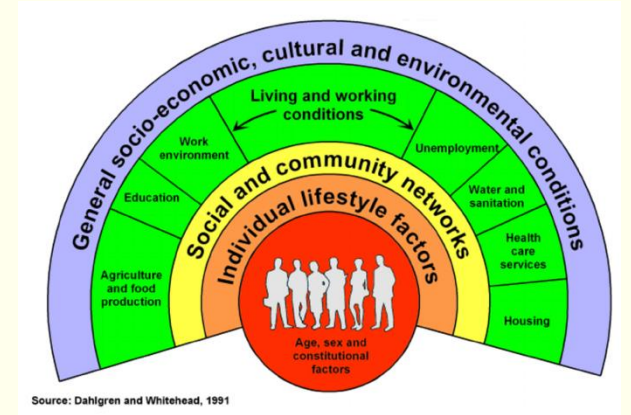
Prostate Cancer

MODIFIABLE RISK FACTORS

Obesity: associated with more aggressive disease and higher mortality

Physical Inactivity: physical inactivity associated with worse outcomes

- Diet evidence less consistent



Prostate Cancer

QUALITY OF LIFE

Treatment side effects dominate: urinary incontinence, sexual dysfunction

Androgen deprivation therapy (ADT): muscle loss, bone thinning, fatigue, hot flushes

Psychological: uncertainty under active surveillance; masculinity and identity

Exercise during ADT: preserves muscle mass, bone density, cardiovascular fitness, and mood

Active surveillance involves regular testing without immediate treatment: anxiety common

Prehabilitation Research Task

Next Week

- Mental Disorders