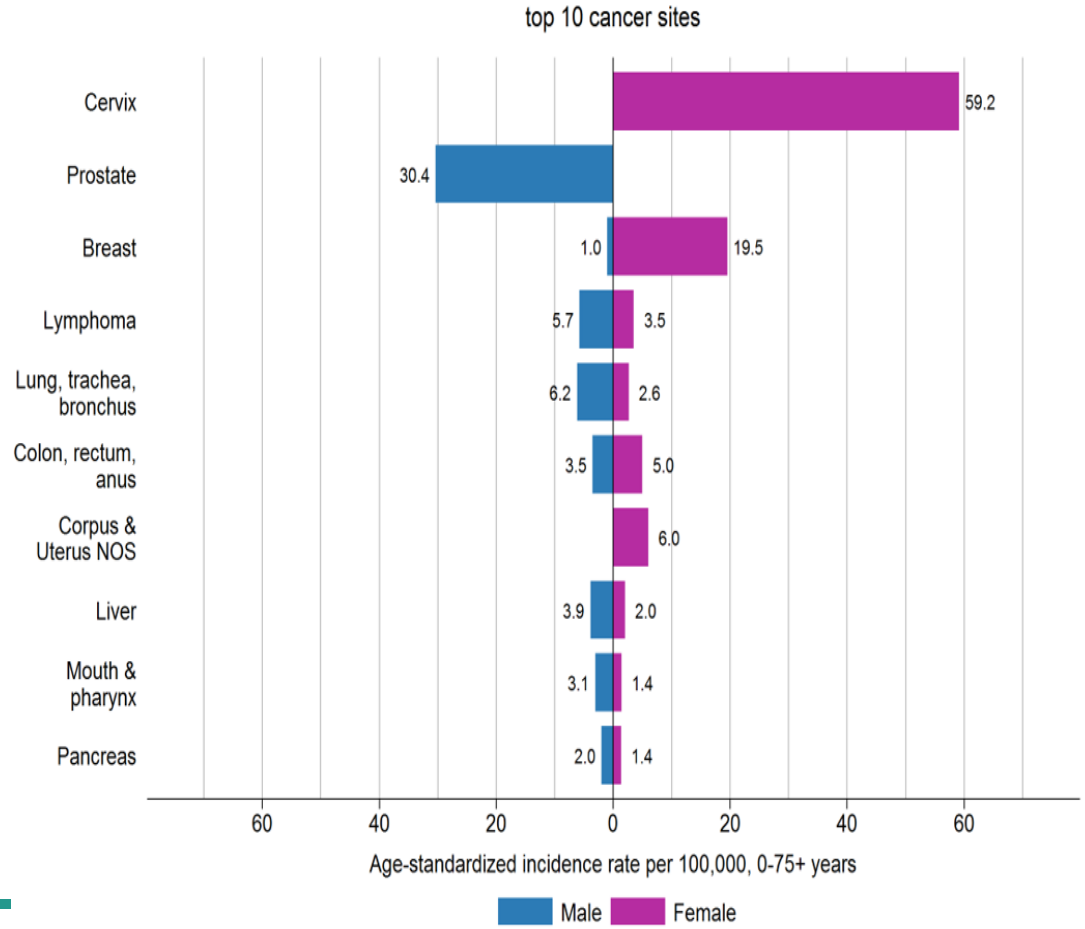
CELL CYCLE AND CANCER

Eswatini Cancer status

- Cervical Cancer is the leading cancer among women ages 15-49 years with age standard rate of 59.2.3 % per 100 000.
- Other HPV related leading cancers as shown are:
  - Anal Cancers (3.5%, 5.0 %) male and female respectively.
  - Mouth and pharynx (3.1, 1.4) male and female respectively[3]
- The mortality rate of the cervical cancer has been 68% in 2021.

. Top 10 cancers, both sexes (Number of cases)



3Eswatini National Cancer Registry report , 2021.

- Cell development and cancer are intricately linked processes, with cancer often arising from disruptions in normal cell development and regulatory mechanisms.

- Understanding the mechanisms of normal cell development and the disruptions that lead to cancer is crucial for developing effective treatments.

Normal Cell Development

- **Interphase**: The cell grows (G1 phase), duplicates its DNA (S phase), and prepares for division (G2 phase).
- **Mitosis**: The cell divides its duplicated DNA into two identical daughter cells.
- **Regulation**: The cell cycle is tightly regulated by checkpoints (G1, G2, M) and proteins such as cyclins and cyclin-dependent kinases (CDKs).
- **Differentiation**
- Cells become specialized for specific functions.
- Stem cells differentiate into various cell types through signals and gene expression patterns.
- **Apoptosis**
- Programmed cell death to remove damaged or unnecessary cells.
- Essential for maintaining tissue homeostasis.

CANCER CELL DEVELOPMENT (carcinogenesis)

Genetic Mutations/Alterations

- **Oncogenes**: Changes in the DNA sequence of oncogenes, tumor suppressor genes, and DNA repair genes that drive cancer growth (e.g., RAS, MYC).
- **Tumor Suppressor Genes**: Genes that normally inhibit cell division or promote apoptosis; when inactivated, they can lead to cancer (e.g., TP53, RB1).

Epigenetic Changes

- Modifications that alter gene expression without changing the DNA sequence (e.g., DNA methylation, histone modification).

Chromosomal Abnormalities

- Numerical Abnormalities: Abnormal number of chromosomes.
- Structural Abnormalities: Segments of chromosomes are rearranged.

Hallmarks of Cancer

Sustaining Proliferative Signaling

- Cancer cells can continuously signal themselves to divide.

Evading Growth Suppressors

- Cancer cells ignore signals that normally inhibit cell growth.

Resisting Cell Death

- Cancer cells evade apoptosis.

Enabling Replicative Immortality

- Cancer cells activate mechanisms (e.g., telomerase) to divide indefinitely.

Inducing Angiogenesis

- Cancer cells stimulate the formation of new blood vessels to supply nutrients.

Activating Invasion and Metastasis

- Cancer cells spread to other parts of the body.

HALL MARKS OF CANCER CELL

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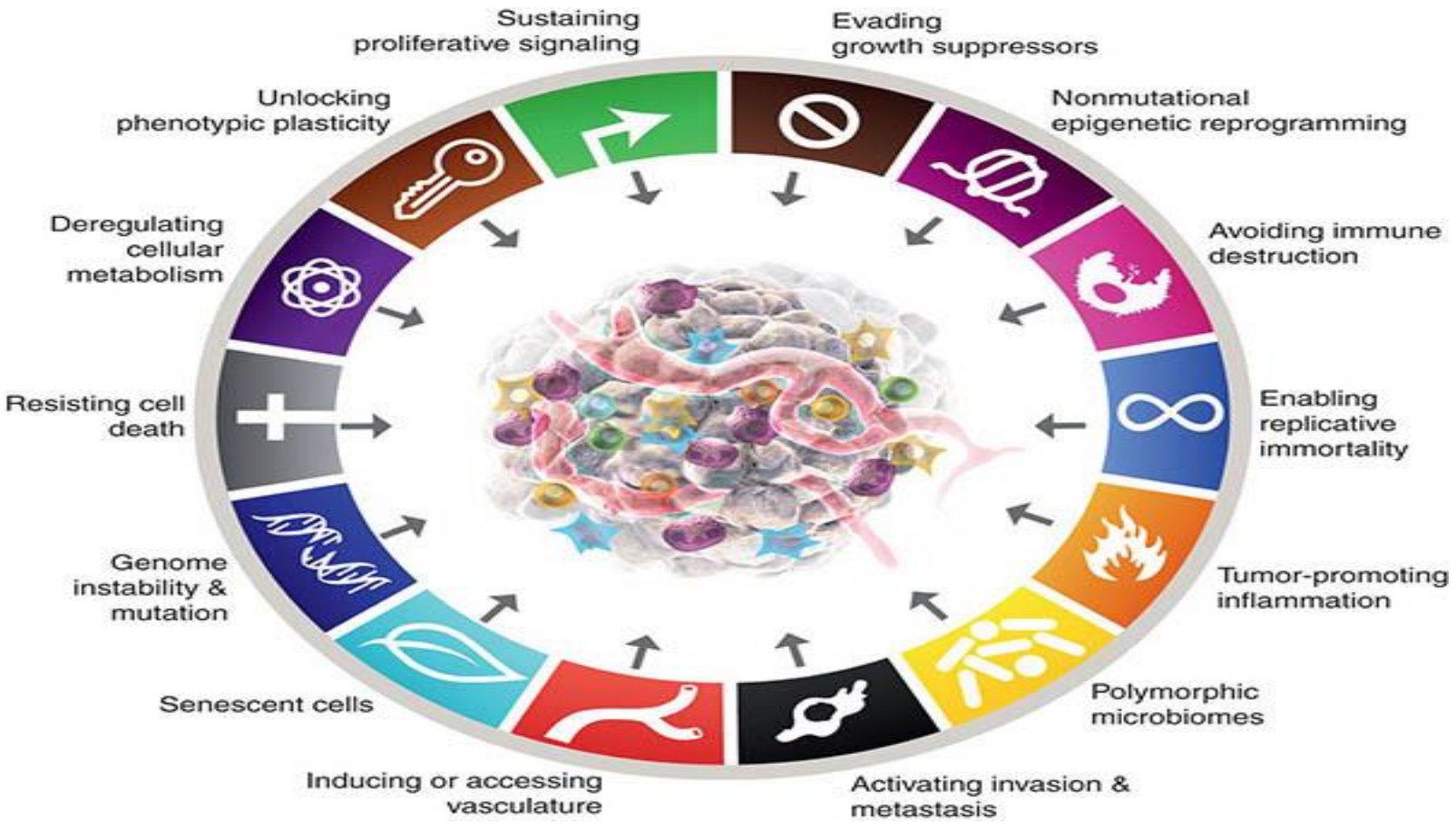

Tumor Microenvironment

- **Interactions**: Between cancer cells and the surrounding stroma, immune cells, blood vessels, and extracellular matrix.
- **Influence on Growth**: The microenvironment can promote cancer growth and survival, invasion, and resistance to therapy.

Genetic Predisposition and Risk Factors

Inherited Mutations

Such as BRCA1 and BRCA2 mutations increasing breast and ovarian cancer risk.

Environmental Factors

Including exposure to carcinogens (e.g., tobacco smoke, radiation), lifestyle factors (e.g., diet, physical activity), and infectious agents (e.g., HPV, Hepatitis B and C).

Staging and Diagnosis

- **Staging Systems**: The TNM system (Tumor size, Node involvement, Metastasis) is commonly used to stage cancer.
- **Diagnostic Tools**: Include imaging (CT, MRI, PET scans), biopsy, and molecular testing to identify specific mutations and markers.

Treatment Strategies

Surgery

Often the first line of treatment to remove localized tumors.

Radiation Therapy

Used to destroy cancer cells and shrink tumors.

Chemotherapy

Uses cytotoxic drugs to kill rapidly dividing cells.

Targeted Therapy

Focuses on specific molecules and pathways critical to cancer cell survival and growth (e.g., HER2 inhibitors for breast cancer, EGFR inhibitors for lung cancer).

Immunotherapy

Enhances the body's immune response against cancer cells (e.g., checkpoint inhibitors, CAR-T cell therapy).

Hormone Therapy

For cancers driven by hormones, such as breast and prostate cancer.

Personalized Medicine

Genomic Testing- Identifies specific mutations to tailor treatment.

Biomarkers- Used to predict response to therapies and monitor treatment effectiveness.

Monitoring and Survivorship

- **Follow-Up Care**: Regular monitoring for recurrence and managing long-term side effects.
- **Survivorship Plans**: Address ongoing health issues and quality of life after cancer treatment.
- The National Comprehensive Cancer Network (NCCN)emphasis using

Evidence-Based Recommendations on the latest research and clinical evidence, offering standardized protocols for different cancer types.

Multidisciplinary Approach

SIYABONGA

THERE IS No **I A** IN TEAM……!!