2024
SUMMARY

COMMUNITY MEDICINE

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Research

- Study design (structured plan or protocol to conduct research), classified into:
  - ***Experimental Studies:*** Participants are assigned to groups by the investigator
  - ***Observational Studies:*** No assignment by the investigator; observation of natural occurrences

Observational Studies

- **Prospective:** Forward-looking, tracks participants over time (expensive, long duration)
  - More reliable and *accurate*, with *direct data collection*
- **Retrospective:** Looks at past data (inexpensive, quick)
  - *Less accurate* and some data may be lost (forgotten) with *incomplete* records
- Observational studies include:
- Descriptive Studies: Provide information on disease patterns without testing variable relationship
  - **Ecological Studies:** Analyze groups instead of individuals
    - ✓ Such as comparing meat consumption and cancer rates across countries
    - ✓ Cons: Ecological fallacy (misleading group-level correlations) and cannot establish individual exposure-disease linkages
  - **Case Reports & Case Series:** Focus on unique patient cases
    - ✓ **Case Report:** Detailed description of a single unique case (1961 case linking pulmonary embolism to oral contraceptives)
    - ✓ **Case Series:** Describes multiple cases with similar characteristics (Reporting of pneumocystis pneumonia in healthy men leading to the discovery of HIV/AIDS)
    - ✓ Case Reports/Series cannot determine disease prevalence or incidence, no control group to establish cause-effect relationships (lack comparison)
  - **Cross-Sectional Studies (Prevalence Studies):** Data is collected at a single point in time
    - ✓ Used for public health planning and initial hypothesis exploration
    - ✓ Suitable for chronic diseases (diabetes, hypertension)
    - ✓ Cannot determine causality, and poor for rare or short-duration diseases
    - ✓ Prevalence = (Cases / Total Population) * 100
- Analytical Studies: test relationships and causality between variables
  - **Case-Control Studies: Compare** people with (cases) and without (controls) a disease to identify past exposures (Retrospective)
    - ✓ Useful for rare diseases but limited for rare exposures
    - ✓ Quick, cost-effective, good for long-latency diseases
    - ✓ Susceptible to recall and selection bias, cannot establish incidence or prevalence rates
  - **Cohort Studies (Follow-Up Studies):** Participants are classified by exposure and *followed over time* to observe disease development
    - ✓ **Prospective Cohort:** Tracks participants into the future
    - ✓ **Retrospective Cohort:** Uses past records for analysis

- ✓ Establishes temporal relationships, Suitable for rare exposures, Measures incidence.
- ✓ Expensive and time-consuming, loss to follow-up can impact findings

Experimental Studies (Interventional Studies)

- **Clinical Trials:** Testing treatments on individuals with diseases
- Key Elements of **Randomized Controlled Trials (RCTs)** subject selection, comparison group, randomization, blinding (single, double, triple) and ethical considerations
  - **Minimizes bias** through randomization, determines **efficacy of interventions**
  - Costly and complex, ethical concerns with ***placebo*** use.
  - Example: Evaluating cholesterol-lowering drugs and their long-term mortality impact
  - Single-Blind: Participants unaware of treatment
  - Double-Blind: Participants and investigators unaware.
  - Triple-Blind: Participants, investigators, and data analysts unaware.
- ***Placebo*** is an inactive substance mimicking the treatment (measure actual effect of interventions)
  - ***Sham controls*** (fake surgeries) are used in surgical studies
- **Cross-Over Trials:** Participants receive several interventions in sequential order
  - Acts as **own control**, reducing variability and requires smaller sample sizes.
  - Carryover effects require washout periods
- **Preventive Trials:** Testing measures to prevent disease in healthy populations
  - Example: Vaccination programs
  - Require larger sample sizes due to lower risk levels
- **Community Trials:** Large-scale interventions applied to entire communities (fluoridation of water to prevent dental caries), and suitable for evaluating policy-level interventions.
- **Surveys:** Data collected from a sample to represent the population
  - Cannot track changes unless repeated over time

Prevention of diseases

- **Primary Prevention:** Prevent disease occurrence and reduce incidence, include:
  - Vaccination programs (measles, rubella, tuberculosis)
  - Eliminating contaminated water sources
  - Smoking cessation programs
- **Secondary Prevention:** Cure or halt disease progression through early detection, include:
  - Screening for prediabetes, early breast cancer, and subclinical hypothyroidism
  - Evidence-based treatment based on screening results
- **Tertiary Prevention:** Improve quality of life and rehabilitate those with established diseases
  - Prevent recurrence, minimize complications, and manage disabilities
- **Quaternary Prevention:** Avoid unnecessary medical interventions that offer no benefit.
  - Evidence-Based Medicine (EBM) to prevent over-medicalization

Prevention Strategies

- **High-Risk Strategy:** Targets individuals at high risk
  - Lipid profile screening for smokers with a family history of heart disease).
- **Mass Strategy:** Aims to reduce health risks across the entire population
  - Immunization programs, water fluoridation
  - Cost-effective and improves overall societal health
  - Cons: May not detect rare or high-risk cases effectively

- **Medical Screening:** Systematic testing to identify individuals at risk before symptoms appear
  - It gives better prognosis and outcomes, protection from communicable diseases, rational allocation of resources and support for research
  - **Breast cancer screening:** by mammography reduce mortality rates.
  - **Colorectal cancer screening:** Effective via fecal occult blood tests and colonoscopy
  - **Lung cancer:** Prevention primarily focuses on smoking cessation
  - **Opportunistic Screening:** Occurs when a patient visits a doctor for another reason, and additional tests are recommended (lipid profile for overweight patients)
  - **Criteria for Effective Screening:**
    1. Disease must be a significant public health concern.
    2. Early detection should improve outcomes.
    3. Tests must be valid, reliable, affordable, and acceptable.

- Screening Test Characteristics
  - **Reliability:** Consistency of results across different observers/occasions
  - **Validity:** Measured through:
    - ✓ **Sensitivity:** Ability to correctly identify those with the disease
    - ✓ **Specificity:** Ability to correctly identify those without the disease
    - ✓ **False Positive Rate:** Percentage of people incorrectly diagnosed
    - ✓ **Positive Predictive Value (PPV):** Likelihood that a positive test indicates disease
    - ✓ **Negative Predictive Value (NPV):** Likelihood that a negative test excludes disease

$$\text{False Positive Rate} = \frac{FP}{FP+TN}$$

- Screening programs should start as **pilot projects** (on a small scale) to assess cost-effectiveness and identify barriers
- **Screening Bias Types:**
  - Volunteer Bias: Volunteers may have better compliance and socioeconomic status, leading to better outcomes
  - Lead Time Bias: Screening detects diseases earlier but does not necessarily extend life expectancy
  - Length Time Bias: Screening may detect slow-progressing diseases more often than aggressive ones, skewing outcomes

- **Quality Assurance:**
  - Regular assessment of services with clinical audits to enhance effectiveness

- **Key Cancer Statistics in Jordan (2022)**

Overall (Both Sexes):	Among Males:	Among Females:
➢ Breast cancer – 20.1%	➢ Lung cancer – 12.9%	➢ Breast cancer – 36.8%
➢ Colorectal cancer – 11.1%	➢ Colorectal cancer – 12.8%	➢ Colorectal cancer – 9.6%
➢ Lung cancer – 7.4%	➢ Bladder cancer – 10.2%	➢ Thyroid cancer – 5.7%

- Pediatric Cancer (Children)
  - ➢ Leukemia (26%) – More common in males.
  - ➢ Brain/CNS cancers (21%) – More common in females.
  - ➢ Lymphoma (11.5%) – More common in males
- An evidence-based approach aimed at:
  - ➢ Reducing cancer incidence through prevention strategies.
  - ➢ Minimizing cancer morbidity and mortality by early detection and treatment.
  - ➢ Preventing recurrence and complications
  - ➢ Improving quality of life for cancer patients
- Around 40% of cancer cases are preventable
- Modifiable risk factors: Smoking (21%), Alcohol (5%), Low intake of fruits and vegetables (5%)
- Factors influencing Cancer Survival
  - ➢ **Disease Characteristics:** Natural history, clinical extent, metastasis, severity
  - ➢ **Host Characteristics:** Age, sex, socioeconomic status (SES), comorbidities, behaviors
  - ➢ **Early Detection:** Clinical detection and national screening programs
  - ➢ **Treatment Availability:** Access to quality healthcare facilities and treatments
- Cancer Prevention and Screening
  - ➢ For men: The most common cancers (lung, bladder, stomach) can be prevented.
  - ➢ For women: Common cancers (breast, cervix, colorectal) can be detected early screening
- Smoking Cessation Strategies
  - ➢ Consideration of new smoking forms (Narjeela, e-cigarettes).
  - ➢ Preventing smoking initiation among teenagers
  - ➢ Increasing tobacco taxes and investing in prevention programs.
  - ➢ Providing free smoking cessation services (medical and behavioral interventions)
  - ➢ Establishing free helplines for smokers.
  - ➢ Training healthcare providers to offer better guidance
- Effectiveness of GP Interventions:
  - ➢ >5 minutes of smoking education by GPs increases quit rates 5-7 times
  - ➢ No education leads to only a 2-fold increase in quit rates
- Role of Incentive Systems in Cancer Screening
  - ➢ **Incentives for physicians** (financial rewards) increase participation in cancer screening programs such as cervical cancer screening
  - ➢ Encourages GPs to educate patients and recommend screenings

- **Definition of Surveillance (WHO)**
  - **Systematic, ongoing collection, collation, and analysis** of data with the timely dissemination of information to relevant stakeholders to facilitate action.
  - It involves continuous vigilance over disease occurrence and distribution, disease risk factors

- Objectives of Disease Surveillance
  - General Objectives:
    1. Monitor health trends over time to set priorities for public health interventions.
    2. Provide early warning for changes in disease incidence (e.g., tuberculosis resurgence).
    3. Detect and respond to epidemics in a timely manner.
    4. Evaluate the effectiveness of health programs and interventions (e.g., vaccine introduction)
    5. Ensure that healthcare resources are allocated to those with the greatest needs.
  - Specific Objectives:
    - ✓ Detect outbreaks early for immediate action
    - ✓ Evaluate the effectiveness of health interventions and policies

- Examples of Events Requiring Surveillance
  - Epidemic Diseases: Measles, meningococcal meningitis.
  - Nutritional Surveillance: Monitoring malnutrition trends.
  - Animal Reservoirs and Vectors: Tracking mosquito- or tick-borne diseases.
  - Environmental Pollution: Monitoring waterborne diseases (e.g., cholera outbreaks).
  - Demographic Events: Tracking births and deaths to assess population health

- Types of Disease Surveillance
  - Passive Surveillance: Data is reported voluntarily without active solicitation by health authorities, notifiable disease reporting systems in UK (hospitals voluntarily report cases)
  - Active Surveillance: Health agencies actively seek out reports by following up with healthcare providers to ensure data completeness (More resource-intensive but provides higher accuracy)
  - Negative Surveillance: reports even if no cases of a disease are detected
    - ✓ Ensures rare conditions are adequately monitored
    - ✓ Example: Pediatric surveillance units tracking rare childhood conditions
  - Sentinel Surveillance: Data is collected from selected healthcare providers or facilities
    - ✓ Used when intensive investigation is needed
    - ✓ Example: Influenza surveillance in Jordan through nasopharyngeal swabs in health centers
  - Mortality Surveillance: Focuses on tracking deaths as a key health indicator.
    - ✓ Death registration is mandatory in most countries, data is used to calculate mortality rates
    - ✓ Low mortality rates generally indicate good population health.

- The surveillance process follows a systematic cycle:

1. Data Collection: gathering raw data from various sources (hospitals, laboratories, health center)
2. Data Collation (Organization)
3. Data Analysis and Interpretation: Evaluating trends, patterns, and significance of collected data.
4. Dissemination: Sharing the analyzed information with policymakers, healthcare providers, public

5. Action: Interventions based on findings (outbreak response, policy adjustments).

- Surveillance allows continuous monitoring, making it easier to track trends over time
- Data flows from healthcare providers to national health agencies, which analyze and disseminate findings, feedback loops ensure improvements and actions are taken based on surveillance insights

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- Chronic nicotine exposure leads to **neuroadaptation**, resulting in increased nicotinic receptor numbers and changes in gene expression and neural pathways
- Dopamine Reward System and Addiction:
  1. Nicotine stimulates alpha-4, beta-2 nicotinic receptors, leading to dopamine release in the brain (prefrontal cortex and nucleus accumbens), causing euphoria and pleasurable feelings.
  2. Without nicotine, dopamine levels drop, causing withdrawal and cravings.
  3. Tolerance develops, requiring increased nicotine intake for the same effect

- Nicotine Withdrawal Symptoms (Peak at **24–48 hours**, subside within **2-4 weeks**): Depression, insomnia, irritability, Anxiety, difficulty concentrating, cravings, restlessness, Increased appetite/weight gain, Decreased heart rate

- Smoking Dependence Scoring Systems:
  1. Modified Fagerström Test for Cigarettes (High dependence: **7-10**, Moderate: **4-6**, Low: **<4**)
  2. Waterpipe Tolerance Questionnaire (WTQ) (High dependence: **4-8**, Moderate: **2-3**, Low: **0-1**)
  3. E-cigarette Fagerström Test: (High dependence: **8+**, Moderate: **5-7**, Low: **0-2**)
     - ✓ Higher scores indicate a greater likelihood of requiring **NRT**

- **Pack-Year** Calculation (Smoking Exposure Measure)
  - ➢ Important for assessing lung cancer, heart disease risk

$$\text{(Number of packs per day)} \times \text{(Years of smoking)}$$

$$\left(\frac{\text{Cigarettes per day}}{20}\right) \times \text{Years of smoking}$$

- Patient Assessment and Management Strategy:
  1. Initial Visit: history, smoking pattern, nicotine dependence (Fagerström Questionnaire)
     - ✓ Use the **"5 R's"** approach (Relevance, Risks, Rewards, Roadblocks, Repetition).
     - ✓ Empathy and motivational interviewing
  2. Choosing Treatment: NRT (patch + gum/spray) for >14 weeks offers highest quit rate (36.5%)

- Therapies for Smoking Cessation:

1. Nicotine Replacement Therapy (NRT)
   - ✓ Provides nicotine via **Patches, gum, lozenges, nasal sprays, inhalers**
   - ✓ Reduces withdrawal symptoms and the pleasure of tobacco use
   - ➢ Continuous delivery (patches) is more effective than intermittent methods.
     - ✓ 23% to 61% within six weeks, depending on motivation and adherence
     - ✓ Do **not smoke** while using and apply to **clean, dry, hairless skin**, avoiding joints/skin folds
     - ✓ Rotate locations to prevent skin irritation
   - ➢ **NRT (First-Line)** Recommended for all smokers except **Pregnant** women, **children**, **light** smokers (<10 cigarettes/day), **cardiovascular** disease patients

- **High Addiction** Treatment Options
  - ✓ Behavioral therapy + nicotine patches/lozenges
  - ✓ Behavioral therapy + varenicline
  - ✓ Smokers with ischemic heart disease: start with **behavioral** therapy, add **NRT** if needed.

2. Varenicline (Champix/Chantix)
   - A **partial agonist** at nicotinic receptors (Reduces cravings and blocks nicotine effects)
   - Used when compliance with NRT is low
   - Side effects: Nausea, sleep disturbances, depression, suicidal thoughts
   - Contraindications: **Pregnancy**, **kidney** disease, **under 18** years, **breastfeeding**.

3. Bupropion (Zyban)
   - Antidepressant that increases dopamine levels and reduces withdrawal symptoms
   - Side Effects: Insomnia, dry mouth, increased seizure risk
   - Contraindicated in **seizure** disorders.

- Counseling and Behavioral Interventions
  - Review previous quit attempts
  - Identify challenges and offer coping strategies.
  - Evaluate patient support systems.
  - Provide personalized withdrawal management techniques

  Combination therapy (pharmacotherapy + counseling) significantly improves success rates

- Benefits of Quitting Smoking:
  - Immediate Benefits (within hours to days):
    - ✓ Nicotine and carbon monoxide levels drop
    - ✓ Taste and smell improve within **48 hours**.
  - Long-Term Benefits:
    - ✓ Decreased risk of heart disease and lung cancer over years.
    - ✓ After **15 years**, risk aligns with non-smokers

- Coping Strategies for Withdrawal Symptoms
  1. Cravings: Distract yourself, deep breathing, call a supportive friend.
  2. Irritability: Engage in hobbies, take relaxing baths.
  3. Depression: Seek support, reward milestones.
  4. Concentration Issues: Take short walks, simplify tasks.
  5. Sleep Disturbances: Maintain a routine, avoid stimulants.
  6. Increased Appetite: Use healthy snacks, drink water.

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