

Medical Screening and Preventive Medicine

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Primary prevention

- Primary prevention aims to prevent disease from occurring in the first place
- **Goal: decrease incidence of the disease**
- Seeks actually to prevent the disease through altering some factors in the environment, change status of the host, or to change behaviour so that disease is prevented from occurring
- Vaccination programmes: has managed to reduce and eliminate infectious disease of childhood such as whooping cough, measles, rubella, poliomyelitis, and mumps.
- Eliminating environmental risks, such as contaminated drinking water supplies

Article

Epidemiology of *Streptococcus pneumoniae* Serotypes in Jordan Amongst Children Younger than the Age of 5: A National Cross-Sectional Study

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Citation: Abu-Helalah, M.; Al-Mnayyis, A.; Alzoubi, H.; Al-Abdallah, R.; Jdaitawi, H.; Nafi, O.; Abu-Sal, K.; Altawalbeh, A.; Khlaifat, A.; Al-Zayadneh, E.; et al. Epidemiology of *Streptococcus pneumoniae* Serotypes in Jordan Amongst Children Younger than the Age of 5: A National Cross-Sectional Study. *Vaccines* **2023**, *11*, 1396. <https://doi.org/10.3390/vaccines11091396>

Academic Editor: Giuseppe La Torre

Received: 9 July 2023

Revised: 17 August 2023

Accepted: 21 August 2023

Published: 22 August 2023



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Abstract: Introduction: *Streptococcus pneumoniae* infections are a major cause of mortality and morbidity worldwide. In Jordan, pneumococcal conjugate vaccines (PCVs) are not included in the national vaccination program. Due to the current availability of several PCVs, including PCV-10, PCV-13, and PCV-15, along with PCV-20, currently undergoing pediatric approvals globally, the decision to introduce PCVs and their selection should be based on valid local data on the common serotypes of *Streptococcus pneumoniae*. Methods: This cross-sectional study aimed to identify the frequency of serotypes of *Streptococcus pneumoniae* in children aged below 5 years hospitalized with invasive pneumococcal diseases (IPDs), including pneumonia, septicemia, and meningitis, during the study's duration in representative areas of Jordan. Serotyping for culture-positive cases was based on the capsular reaction test, known as the Quellung reaction. qPCR was conducted on the blood samples of patients with lobar pneumonia identified via X-ray or on cerebrospinal fluid for those with a positive latex agglutination test for *Streptococcus pneumoniae*. Results: This study was based on the analysis of the serotypes of 1015 *Streptococcus pneumoniae* cases among children younger than the age of 5: 1006 cases with pneumonia, 6 cases with meningitis, and 3 cases with septicemia. Only 23 culture-positive cases were identified in comparison to 992 lobar pneumonia cases, which were PCR-positive but culture-negative, with a PCR positivity rate of 92%. Serotypes 68, 6A, 14, and 19F were the most common serotypes identified in this study, with prevalence rates of 16.45%, 13.60%, 12.12%, and 8.18%, respectively. PCV-10, PCV-13, PCV-15, and PCV-20 coverage rates were 45.32%,

Adult vaccination: Now is the time to realize an unfulfilled potential

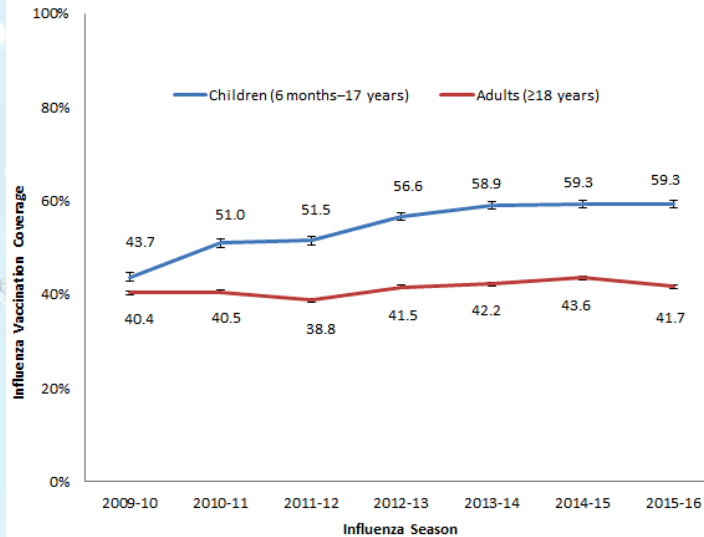
Litjen Tan*

Immunization Action Coalition; St Paul, MN USA

Keywords: adult immunization, immunization financing, immunization policy, immunization infrastructure, prevention, public health

Do you know the rate in Jordan??

Figure 1. Seasonal Flu Vaccination Coverage by Age Group and Season, United States, 2009–2016



Error bars represent 95% confidence intervals around the estimates.

The 2009–10 estimates do not include the influenza A (H1N1) pdm09 monovalent vaccine.

Starting with the 2011–12 season, adult estimates reflect changes in BRFSS survey methods: the addition of cellular telephone samples and a new weighting method.

Influenza infections : A frequent and serious disease leading to heavy public health burden



ANNUAL ATTACK RATE¹

- 5–10% in adults
- 20–30% in children



3 TO 5 MILLION CASES OF SEVERE ILLNESS²

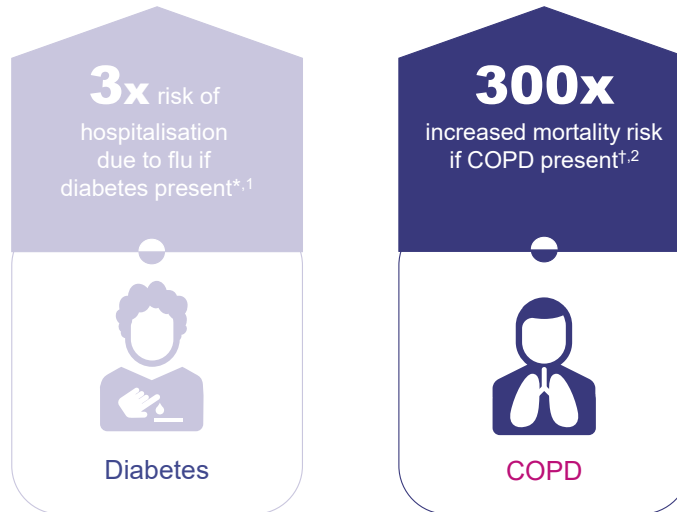


290,000 TO 650,000 ESTIMATED
DEATHS EVERY YEAR WORLDWIDE²

References: 1. WHO (<http://www.who.int/biologicals/vaccines/influenza/en/>) 2. WHO. Influenza (Seasonal) Fact Sheet. [http://www.who.int/news-room/fact-sheets/detail/influenza-\(seasonal\)](http://www.who.int/news-room/fact-sheets/detail/influenza-(seasonal))

Concomitant NCDs increase the risk of complications of influenza

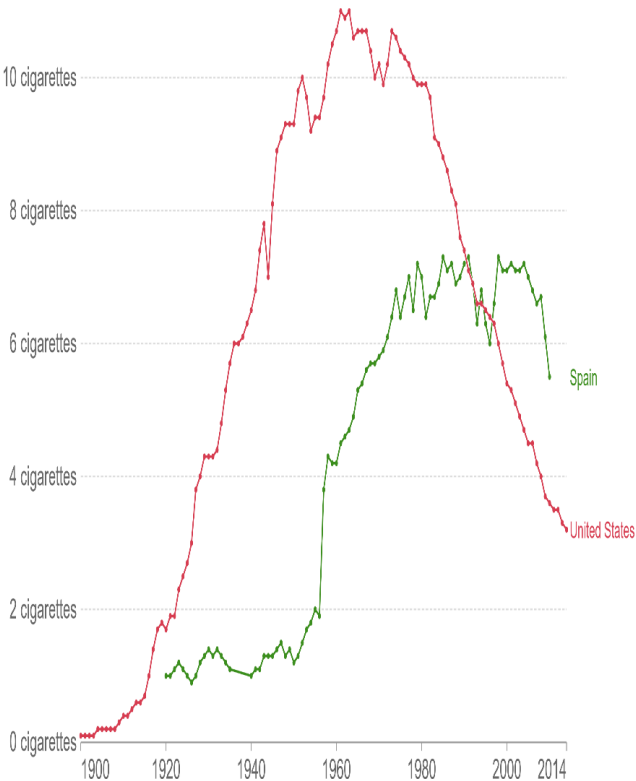
For individuals with influenza:



- COPD, chronic obstructive pulmonary disease; NCD, noncommunicable disease
- *Prevalence ratio for diabetes 3.10 (95% CI: 2.04–4.71) in 239 patients hospitalised with influenza A
- [†]Case fatality rate of influenza in patients with COPD $\geq 30\%$ compared with 0.05–0.01% in otherwise healthy individuals
- Vallard R *et al. Diabetes Care* 2010;33:1491–1493; 2. Plans-Rubio P. *Int J Chron Obstruct Pulmon Dis* 2007;2:41–53

Sales of cigarettes per adult per day, 1900 to 2014

Figures include manufactured cigarettes, as well as estimated number of hand-rolled cigarettes, per adult (ages 15+) per day.

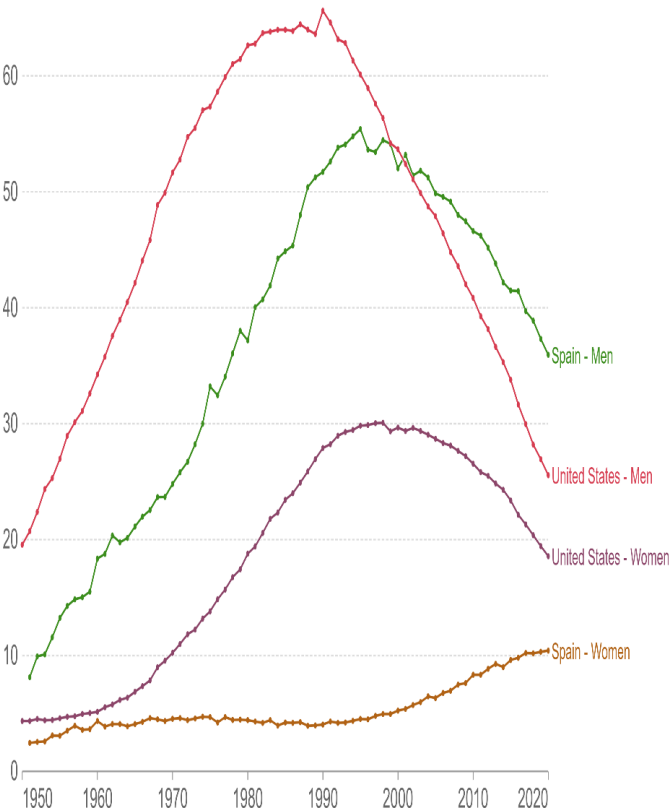


Source: International Smoking Statistics (2017)

OurWorldInData.org/smoking • CC BY

Lung cancer death rates, 1950 to 2020

Number of lung, bronchus and trachea cancer deaths per 100,000 people



Source: WHO Mortality Database (2022)

OurWorldInData.org/smoking • CC BY

Modifiable and non-modifiable risk factors

- Can I change age as a risk factor?
- Can I do something for genetic diseases?

Case of familial cancer management for family members with positive genetic mutations

- Can I change smoking habit as a risk factor?

BRCA1 and BRCA2 genes mutations among 200 high risk breast cancer patients in Jordan

Referral to a specialist genetic clinic

1.4.4 People who meet the following referral criteria should be offered a referral to a specialist genetic clinic.

- At least the following female breast cancers only in the family:
 - 2 first-degree or second-degree relatives diagnosed with breast cancer at younger than an average age of 50 years (at least 1 must be a first-degree relative) [2004] or
 - 3 first-degree or second-degree relatives diagnosed with breast cancer at younger than an average age of 60 years (at least 1 must be a first-degree relative) [2004] or
 - 4 relatives diagnosed with breast cancer at any age (at least 1 must be a first-degree relative). [2004] or
- Families containing 1 relative with ovarian cancer at any age and, on the same side of the family:
 - 1 first-degree relative (including the relative with ovarian cancer) or second-degree relative diagnosed with breast cancer at younger than age 50 years [2004] or
 - 2 first-degree or second-degree relatives diagnosed with breast cancer at younger than an average age of 60 years [2004] or
 - another ovarian cancer at any age. [2004] or
- Families affected by bilateral cancer (each breast cancer has the same count value as 1 relative):
 - 1 first-degree relative with cancer diagnosed in both breasts at younger than an average age 50 years [2004] or
 - 1 first-degree or second-degree relative diagnosed with bilateral cancer and 1 first or second degree relative diagnosed with breast cancer at younger than an average age of 60 years. [2004] or
- Families containing male breast cancer at any age and, on the same side of the family, at least:
 - 1 first-degree or second-degree relative diagnosed with breast cancer at younger than age 50 years [2004] or
 - 2 first-degree or second-degree relatives diagnosed with breast cancer at younger than an average age of 60 years. [2004] or

From: *BRCA1* and *BRCA2* genes mutations among 200 high risk breast cancer patients in Jordan

Category	Number of patients	Prevalence (total 200)
Recurrent mutations		
BRCA1 Positive	15	7.50%
BRCA2 Positive	14	7.00%
BRCA1 or BRCA2 Positive	29	14.50%
Possible (recurrent and novel) mutations		
BRCA1 Positive	7	3.50%
BRCA2 Positive	14	7.00%
BRCA1 or BRCA2 Positive	21	10.50%
Recurrent and novel (VUS and pathogenic) mutations		
BRCA1 Positive	15	7.50%
BRCA2 Positive	21	10.50%
BRCA1 or BRCA2 Positive	36	18.00%

Abu-Helalah et al. <https://www.nature.com/articles/s41598-020-74250-2>

Secondary prevention

- Aims cure the disease or halt its progression if no available therapy can cure it
- Improving the outcomes of the disease that has already developed
- Based on best scientific evidence (meta-analysis, systematic reviews, clinical trials).
- Protocol for management
- Role of personalized medicine- Precision medicine
- Clinical indicators

Secondary prevention

- Interventions at early stages:
- prediabetes, stage 0 breast cancer, Cervical Cancer CIS, Subclinical hypothyroidism
- **Screening:** special consideration of secondary prevention aimed at asymptomatic individuals is necessary
- **Early detection** followed by evidence based interventions

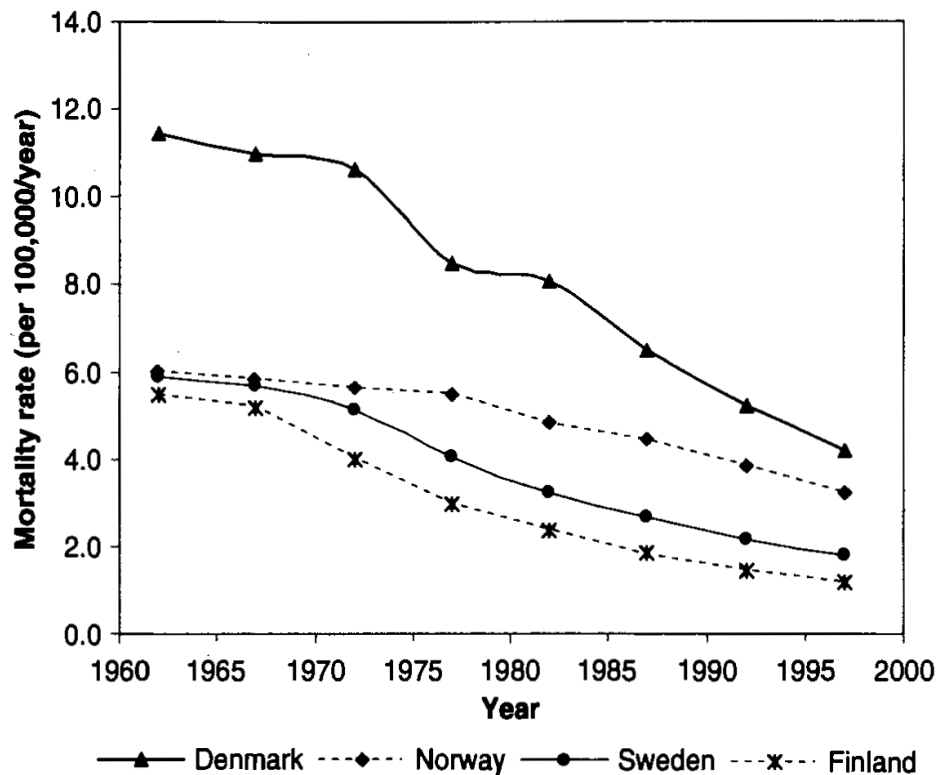


Fig. 14.5 Cervical cancer mortality rates (standardised relative to the world population) from 1950–1998 in the Nordic countries. (Data source: WHO Statistical Information System, accessed via <http://www-depdb.iarc.fr/who/menu.htm>, March 2004.).

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 - 2 first-degree or second-degree relatives diagnosed with breast cancer at younger than an average age of 60 years **[2004] or**
 - another ovarian cancer at any age. **[2004] or**
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 - 1 first-degree or second-degree relative diagnosed with bilateral cancer and 1 first or second degree relative diagnosed with breast cancer at younger than an average age of 60 years. **[2004] or**
- Families containing male breast cancer at any age and, on the same side of the family, at least:
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Tertiary prevention

- implying better rehabilitation or quality of life in the longer term
- Preventing recurrence of the disease
- Concerned with rehabilitation of people with an established disease to minimize residual disabilities and complications, minimize suffering, and maximizing potential years or useful life.



Under-diagnosed chronic kidney disease in Jordanian adults: prevalence and correlates

Amani A. Khalil, Mona A. Abed, Muayyad Ahmad, Ayman Hamdan Mansour

First published: 07 September 2017

<https://doi.org/10.1111/jorc.12214>

Background

Jordan has no relevant database or registry by which chronic kidney disease (CKD) would be early identified. The purpose of the present study is to uncover the prevalence of CKD in a national sample of Jordanian patients at high risk and examine the association of CKD with demographic and clinical factors.

Methods

This is a cross-sectional, correlational study that involved 540 outpatients at high risk for CKD. Demographic and clinical data were obtained in the period from September 2013 to March 2014. Prevalence of CKD was defined based on the National Kidney Foundation Kidney Disease Outcomes Quality Initiative Classification of CKD using estimated glomerular filtration rate. Associations of CKD and demographic and clinical factors were examined using bivariate analysis.

Results

The majority of the sample were females (64%), their mean age ($\pm$ SD) was 55.0 ± 12.5 years, their mean eGFR ($\pm$ SD) was 116.0 ± 47.5 . One third of patients had eGFR of 23.5%, 5.4%, 0.7% and 0.7% which corresponds with mild, moderate, severe and very severe reduction in eGFR, respectively. Ageing, being male, unemployment, packs/years of smoking, co-morbidities [hypertension (HTN), diabetes mellitus (DM) and cardiovascular disease] and low high density lipoprotein (HDL) correlated positively with development of CKD.

Conclusion

This study demonstrates a high rate of under-diagnosed CKD among Jordanians. Several demographic and clinical factors are linked with the development of CKD. Policymakers and healthcare providers need to establish an evidence-based practice project to prevent and screen for CKD in Jordan.

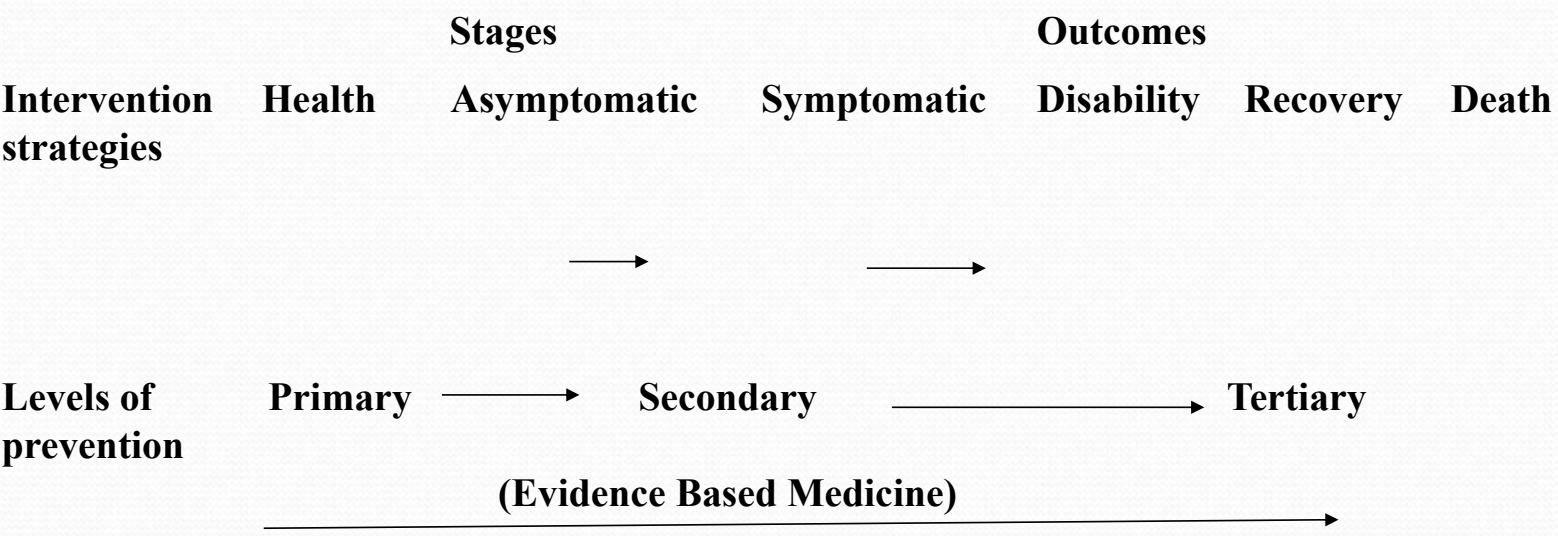
Quaternary prevention

Evidence Based Medicine

- One of the strongest methods to avoid unnecessary medical processes is **QUATERNARY Prevention**
- (EBM) in the sense that it was originally developed by David Sackett and colleagues
- It is the evidence based approach for management of patients.
- Introduction of treatments and investigations according to solid scientific evidence and prevention of unnecessary medicine or the prevention of **over-medicalisation** and the prevention of **unnecessary investigations**



Spectrum of health and disease with the main strategies for prevention at each level





Scope of preventive medicine

- High risk versus average risk

High risk strategy

- Checking lipid profile for everyone older than 50 or for smokers with family history of heart disease
- Influenza vaccines for patients with chronic cardiac and respiratory illnesses, pregnant women, aged 65 or more, cancer patients.
- **Advantages:**
- The intervention is well matched to individuals and their concerns, thus should improve the benefit to risk and benefit to cost ratios
- Avoiding interference with the non-need group
- “Magic bullet approach”
- Easier to conduct and cheaper

High risk strategy

Disadvantages:

- If the cause or risk factor is widely spread or the disease is common, we need to be careful to limit our programmes to the so-called high-risk groups.

Screening only older pregnant women, who are known to be at high risk of conceiving a child with Down's syndrome, will miss the majority of afflicted fetuses, which are conceived by younger women in who most pregnancies occur.

Screening for breast cancer according to risk factors will detect only 30% of the cases

Mass strategy

- Aims to reduce the health risks of the entire population
- It is the alternative approach in the case of a common disease or widespread causes.
- Examples: Immunization programmes and water fluoridation
- This starts with the recognition that the occurrence of common diseases and exposures reflects the behaviour and circumstances of society as a whole.

Fig. 13.8 The distribution of systolic blood pressure in a population of middle-aged men before and after a hypothetical intervention. (From Figure 6.5, *The Strategy of Preventive Medicine*, G. Rose (1992), by permission of Oxford University Press.)

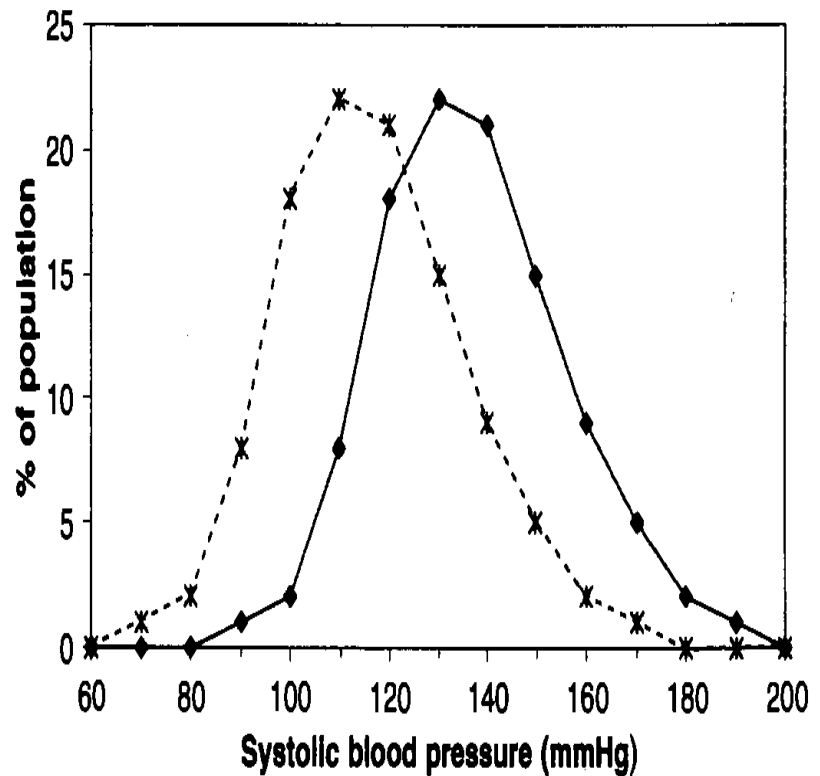


Fig. 13.6 Relative distributions of serum cholesterol levels in men who subsequently died of ischaemic heart disease and men who did not. (From Wald and Law, *BMJ*, 2003; 326: 1419–1425, reproduced with permission from BMJ Publishing Group.)

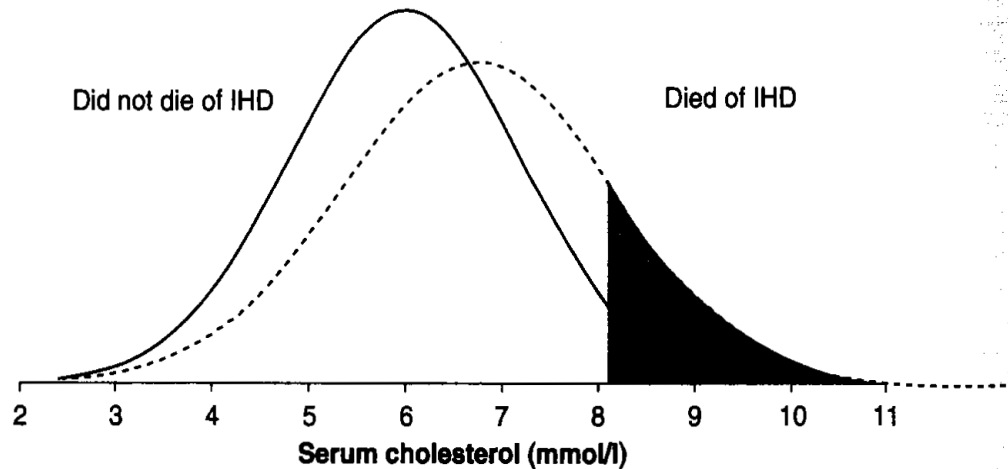


Figure 13.6 shows a concrete example of the close overlap in risk-factor distributions (in this case serum cholesterol level) between those who did and did not subsequently die from ischaemic heart disease (IHD). The whole curve for those who died from IHD is clearly shifted to the right, but the two overlap considerably and the cut-off point identifying the extreme upper 5% of the 'healthy' cohort identifies only 15% of those who will develop IHD. Again screening for high-risk individuals is not a good preventive strategy.

Cancer Control Program

- An evidence based program aims to reduce cancer burden through:
 1. Reducing cancer incidence
 2. Minimizing cancer morbidity and mortality
 3. Prevention of cancer recurrence and complications
 4. Improvement of quality of life

1.1. Top Cancers among Jordanian population by sex, 2022

Table 7: Ten most common cancers among Jordanians, both sexes, 2022.

Rank	Cancer	No	%
1	Breast	1756	20.1
2	Colorectal	969	11.1
3	Trachea,Bronchus,Lung	650	7.4
4	Lymphoma	610	7.0
5	Bladder	471	5.4
6	Thyroid	365	4.2
7	Leukemia	355	4.1
8	Prostate	335	3.8
9	Brain,Nevous system	250	2.9
10	Stomach	208	2.4

Ten most common cancers among Jordanian Males, 2022

	Rank	Site	Frequency	Percent
	1	Trachea,Bronchus,Lung	518	12.9
	2	Colorectal	515	12.8
	3	Bladder	411	10.2
	4	Prostate	335	8.3
	5	NHL	234	5.8
	6	Leukemia	200	5.0
	7	HL	131	3.3
	8	Brain,Nervous System	128	3.2
	9	Kidney	126	3.1
	10	Stomach	114	2.8

Ten most common cancers among Jordanian Females, 2022

	Rank	Site	Frequency	Percent
	1	Breast	1743	36.8
	2	Colorectal	454	9.6
	3	Thyroid	272	5.7
	4	Corpus Uteri	208	4.4
	5	Ovary	167	3.5
	6	NHL	163	3.4
	7	Leukemia	155	3.3
	8	Trachea,Bronchus,Lung	132	2.8
	9	Brain,Nervous System	122	2.6
	10	Stomach	94	2.0

N.B: Total top ten female cancers accounted for 3510 (74.1%)

FACTORS INFLUENCING SURVIVAL FROM CANCER

Treatment:

Availability

Access

Quality

Disease:

Natural history

Clinical extent

Definitions

Early Detection:

Early clinical detection

Screening

Host:

Age

Sex

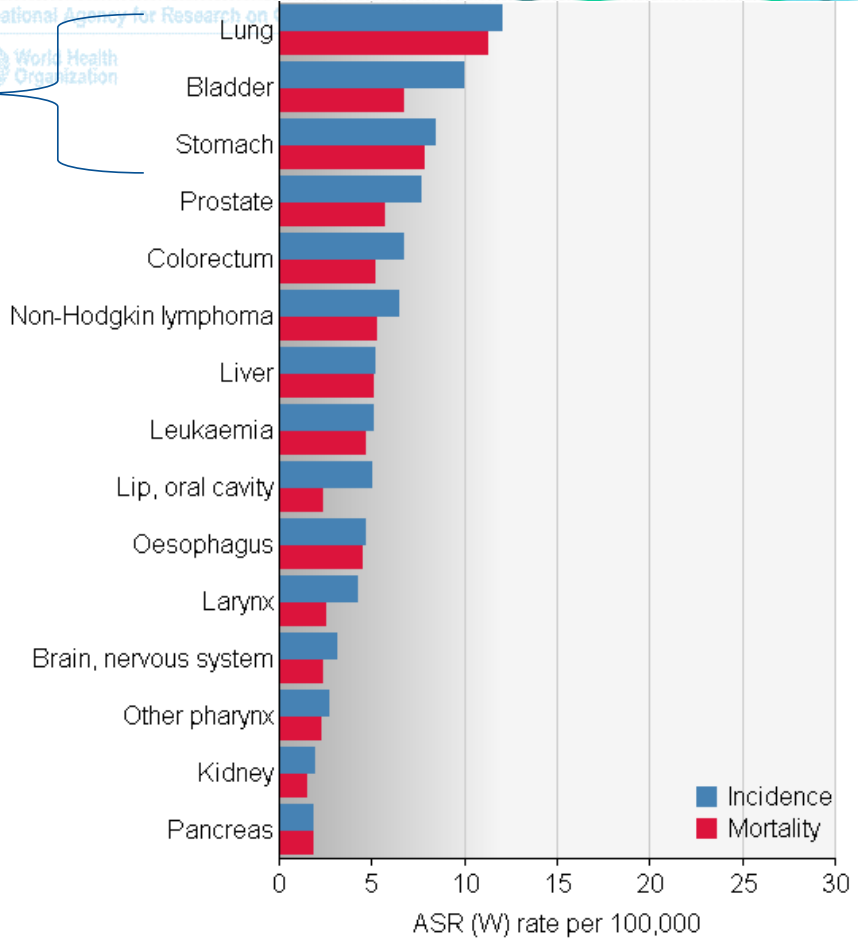
SES

Comorbidity

Behaviour

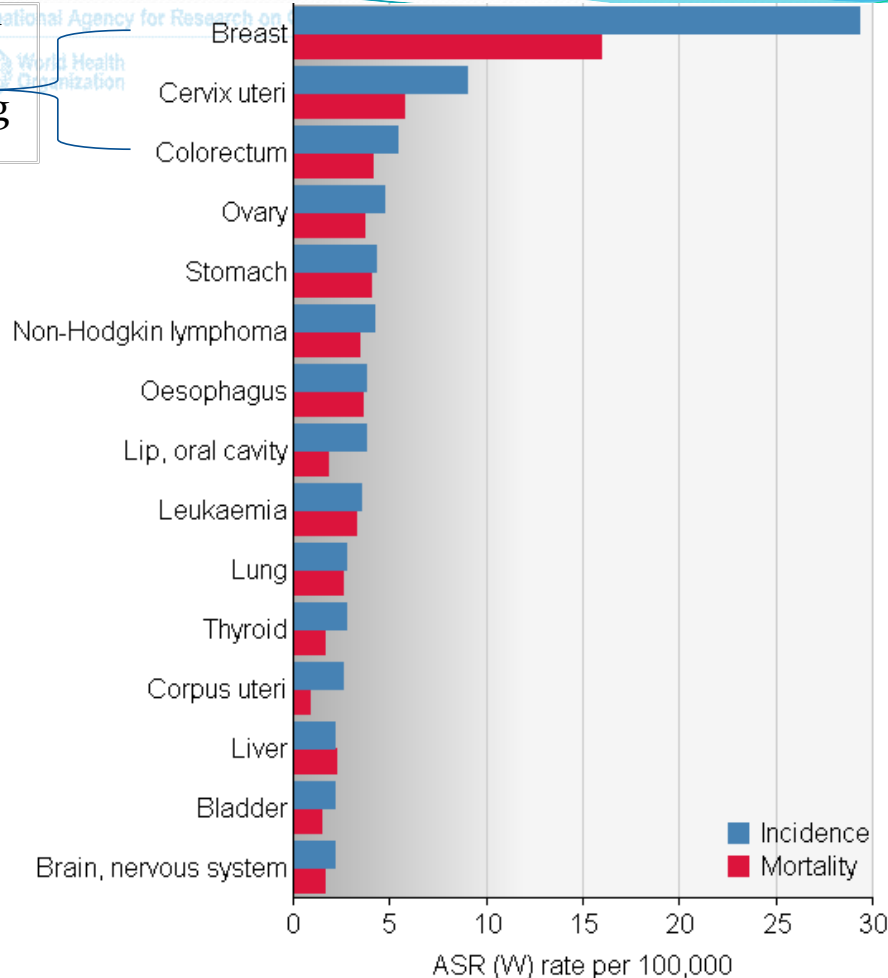
Estimated age-standardised incidence and mortality rates: men- Eastern Mediterranean region

Can be prevented



Estimated age-standardised incidence and mortality rates: women. Eastern Mediterranean region

We can detect them
through national
systematic screening
programmes



Risk factors of chronic diseases including cancers in Jordan

- **Age**
- **Family history**
- **Tobacco smoke**
- **Dietary factor and high cholesterol level**
- **Over weight and obesity**
- **Physical inactivity**
- **Stress and social factors**

Risk factors for cancers

- ▶ The incidence of cancer rises dramatically with age, most likely due to a buildup of risks for specific cancers that increase with age. The overall risk accumulation is combined with the tendency for cellular repair mechanisms to be less effective as a person grows older.
- ▶ Tobacco use, alcohol use, low fruit and vegetable intake, and chronic infections from hepatitis B (HBV), hepatitis C virus (HCV) and some types of Human Papilloma Virus (HPV) are leading risk factors for cancer in low- and middle-income countries
- ▶ In high-income countries, tobacco use, alcohol use, and being overweight or obese are major risk factors for cancer

Examples of commons carcinogens

- **Physical carcinogens:** ultraviolet and ionizing radiation
- **Chemical carcinogens:** asbestos, components of tobacco smoke, aflatoxin (a food contaminant) and arsenic (a drinking water contaminant)
- **Biological carcinogens:** infections from certain viruses, bacteria or parasites

Causes of cancer in the world: comparative risk assessment of nine behavioral and environmental risk factors*

➤ **Number of cases studied: 7018402**

➤ The commonest risk factors in order:

Alcohol use , smoking , low fruit and vegetable intake, indoor smoke from household use of solid fuels , urban air pollution , overweight and obesity, physical inactivity, contaminated injections in health-care settings, and unsafe sex

➤ Risk factors leading to death from cancer:

▶ Low & middle-income countries: Smoking, alcohol use, and low fruit and vegetable intake

▶ In high-income countries: Smoking, alcohol use, and overweight and obesity

*The lancet, [Volume 366, Issue 9499](#), 19 November 2005-25 November 2005, Pages 1784-1793

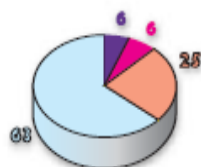
43% of cancer deaths
are due to **tobacco**,
diet and **infection**.

These factors were responsible for
4.4 million
new cancer cases in 2002



Sub-Saharan Africa

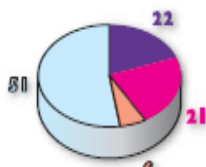
Total: 37%



tobacco diet infection other

Europe (Northern, Southern and Western)

Total: 49%



Tobacco

Tobacco consumption is the world's most avoidable cause of cancer. In most developed countries, smoking is responsible for up to 30% of all cancer deaths. Worldwide, it is responsible for more than 80% of lung cancer cases in men, and 45% in women.

Tobacco also causes cancer at many other sites including throat, mouth, pancreas, bladder, stomach, liver, and kidney cancers.



Diet

In developed countries, almost as many cancer cases are attributable to an unhealthy diet and an inactive lifestyle as to smoking.

Overweight and obesity are associated with colon, breast, uterus, oesophagus, and kidney cancers.

Excessive alcohol consumption increases the risks of cancers of the oral cavity, pharynx, larynx, oesophagus, liver and breast. For some of these cancers, the risks are even greater if you smoke.

The incidence of stomach cancer has gone down because of reduced intake of salt and improved living conditions.

Infection

One-fifth of cancers worldwide are due to chronic infections, mainly from hepatitis viruses (liver), papillomaviruses (cervix), *Helicobacter pylori* (stomach), schistosomes (bladder), the liver fluke (bile duct) and human immunodeficiency virus (Kaposi sarcoma and lymphoma).

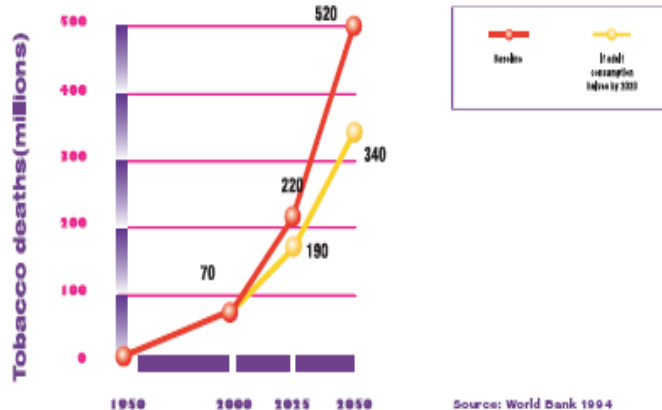


From a global perspective, there is strong justification for focusing cancer prevention activities on these three main cancer-causing factors.

Source: IARC 2000

Source: WHO, IARC 2003

The battle against tobacco

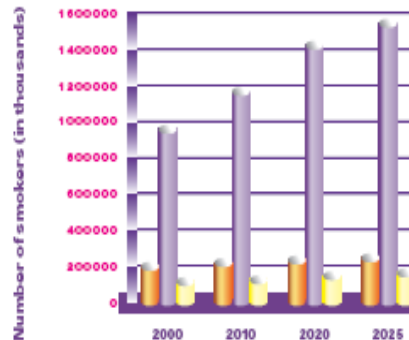


If current trends persist, about 500 million people alive today will eventually be killed by tobacco, half of them in productive middle age, losing 20 to 25 years of life.
World Bank, 1994



WHO P144

The number of smokers is increasing particularly in the developing world.



Source: WHO & World Bank 2003

Developed countries
Developing countries
Transition

Make this the last generation that smokes

Tobacco use is the most preventable cause of death. Halving tobacco consumption now would prevent 20-30 million people from dying before 2025 and 170-180 million people from dying before 2050 from all tobacco-related diseases including cancer.

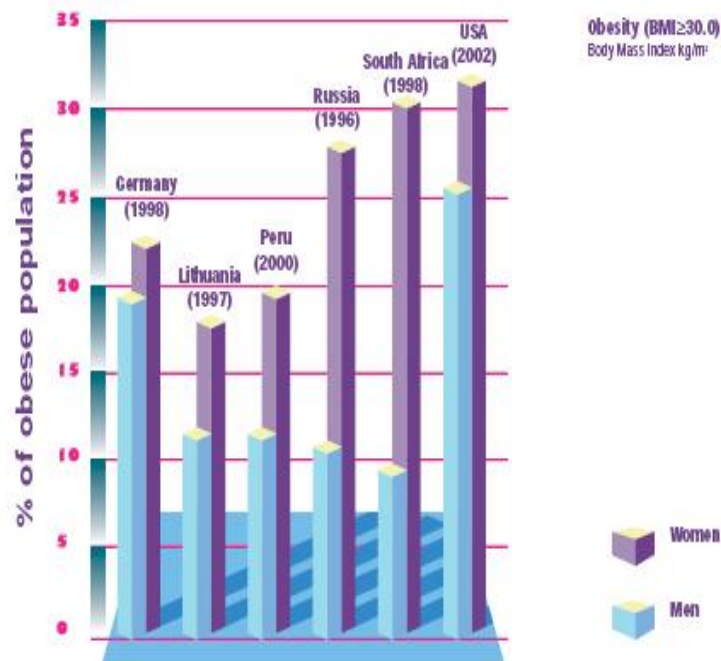
To quit smoking, or even better, to avoid starting to smoke, is the single best thing a person can do for his or her health. For those who do smoke, there are immediate health benefits to be gained from quitting.

Smoking is a public health threat and justifies the involvement of society as a whole in combating it.

Exposure to tobacco smoke (passive smoking) increases the risk of lung cancer by 20% in non-smokers.

The economic cost of tobacco, including treatment of the ill and loss of productivity, outweighs tax revenues derived from tobacco.

In many countries, people are eating **more** and exercising **less**



and there is a potential danger for other countries adopting this lifestyle

Source: WHO Global Data Base on BMI, 2005

Promoting a **healthy** diet and **an active lifestyle**



WHO/FAO

In high income countries, people are eating more and exercising less - with resulting increases in body weight. In many developed countries, as much as half of the adult population may be overweight and more than 25% obese.

Societies reliant on salted and pickled food have higher incidences of gastric cancers.

Through diet and exercise, we can prevent up to a third of cancer cases. Physical activity, avoidance of overweight and frequent daily intake of fresh fruits and vegetables reduce the risk of breast, colon, oral cavity, lung, cervix, and other cancers.



WHO/FAO



WHO/FAO

Tobacco consumption and cancer

- ▶ Tobacco consumption remains the most important avoidable cancer risk.
- ▶ In the 20th century, approximately 100 million people died world-wide from tobacco-associated diseases (cancer, chronic lung disease, cardiovascular disease and stroke).
- ▶ Half of regular smokers are killed by the habit. One quarter of smokers will die prematurely during middle age (35 to 69 years).
- ▶ The lung cancer risk for regular smokers as compared to non-smokers (relative risk, RR) is between 20 and 30 fold.
- ▶ In countries with a high smoking prevalence and where many women have smoked cigarettes throughout adult life, roughly 90% of lung cancers in both men and women are attributable to cigarette smoking.
- ▶ For bladder and renal pelvis, the RR is five-six but this means that more than 50 per cent of cases are caused by smoking.

Tobacco consumption and cancer

- ▶ The RR for cancers of the oral cavity, oral cavity, pharynx, larynx and squamous cell carcinoma of the oesophagus is greater than six, and three to four for carcinomas of the pancreas.
- ▶ For other cancer sites: RR of two to three have been identified as being associated with tobacco smoking, including cancers of the stomach, liver, uterine cervix, kidney (renal cell carcinoma) nasal cavities and sinuses, esophagus (adenocarcinoma) and myeloid leukaemia.
- ▶ Involuntary (passive) tobacco smoke is carcinogenic and may increase the lung cancer risk by 20%.

Infection and cancer

➤ In developing countries: 23% of malignancies are caused by infectious agents, including :

Viruses: hepatitis B & C and liver cancer, Human Papilloma Virus (HPV) and cervical cancer & anogenital cancers, and human immunodeficiency virus (HIV) and Kaposi sarcoma

Bacteria: *Helicobacter pylori* and stomach cancer

Parasites: schistosomiasis and bladder cancer

➤ In developed countries, cancers caused by chronic infections only amount to approximately 8% of all malignancies

➤ More than 80% of all cervical cancer deaths occur in developing countries

Gastrointestinal tract (GIT) malignancies

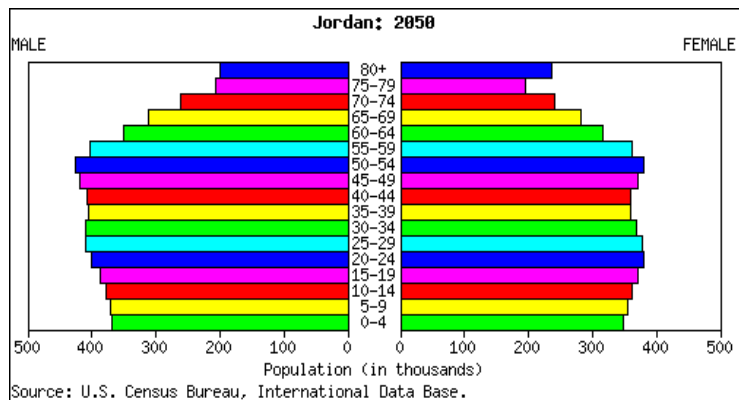
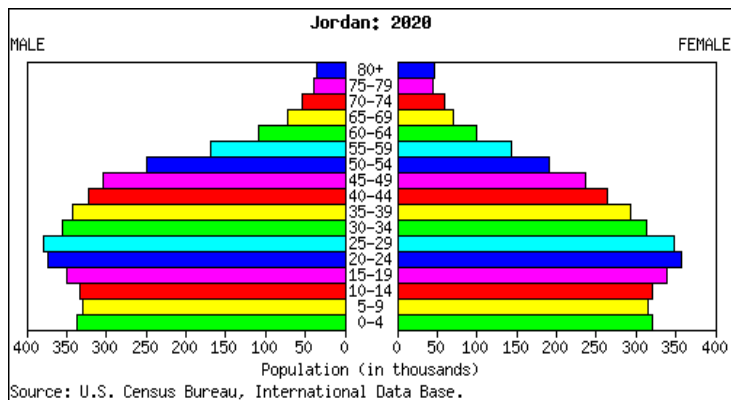
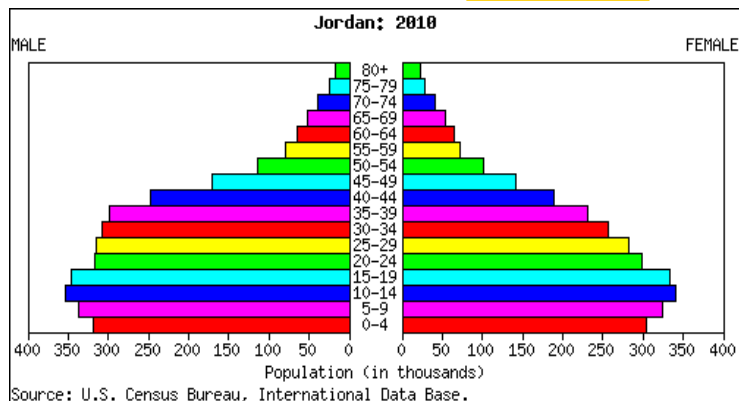
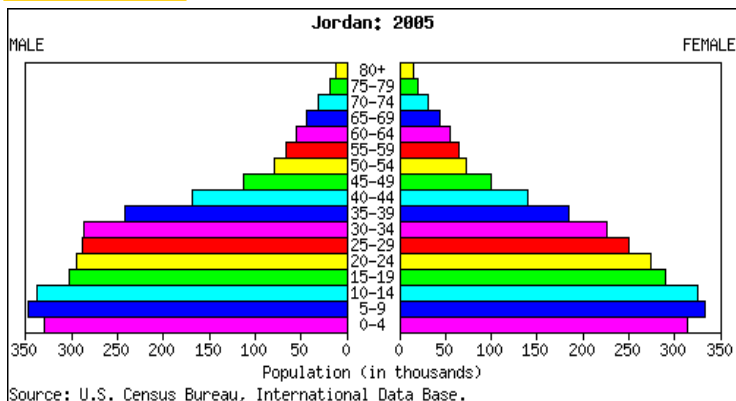
- Any chronic tissue damage with necrosis and regeneration carries an increased GIT cancer risk
- Examples:
 - ▶ Consumption of very hot beverages: Squamous cell carcinoma of the esophagus
 - ▶ Gastro-oesophageal reflux : Adenocarcinoma of the esophagus
 - ▶ Chronic gastritis induced by *H. pylori* infection: Stomach cancer
 - ▶ Crohn's disease: Cancer of the small intestines
 - ▶ Ulcerative colitis: Colon cancer



What needs to be done globally and nationally?



Population pyramids- Jordan



Risk factors of chronic diseases including cancers in Jordan

- Age
- Family history
- Tobacco smoke
- Dietary factor and high cholesterol level
- Over weight and obesity
- Physical inactivity
- Stress and social factors

By **2030**, cancer deaths worldwide are projected to reach

11.9 million
deaths per year

2022 baseline:
9.7 million deaths

Projected increase:
approximately 22%



Source: IARC Global Cancer Observatory, Cancer Tomorrow. GLOBOCAN 2022-based projection.
Projection reflects population growth and ageing, assuming unchanged cancer mortality rates.

Primary Prevention of cancer

➤ Risk factors assessment and control

➤ Examples:

- ✓ HBV vaccination has already been shown to prevent liver cancer in high-incidence countries and it is likely that human papillomavirus (HPV) vaccination will become a reality in 3 to 5 years
- ✓ Epidemiological studies indicate that the frequent consumption of fruit and vegetables may reduce the risk of developing cancers of epithelial origin, including carcinomas of the pharynx, larynx, lung, oesophagus, stomach, colon and cervix.
- ✓ Recent data from the European Prospective Investigation into Cancer and Nutrition (EPIC), suggests that a daily consumption of 500 grams (1.1 lbs.) of fruits and vegetables can decrease incidence of cancers of the digestive tract by up to 25%

Primary Prevention of cancer

- High-risk strategy: directed toward reducing the risk among those with a high risk
- Population-wide strategy: focuses on reducing the average risk level for the whole population
- Tobacco smoking control through smoking cessation clinics should be a top national health priorities

Primary Prevention of cancer

- Public, decision makers and health professionals active involvement
- United and collaborative efforts in controlling risk factors of chronic diseases
- **Tobacco smoking control through smoking cessation clinics should be a top national health priority**
- Assessment of cultural and social barriers to preventive medicine activities
- ▶ Example: Barriers to breast cancer screening in Jordan Study

Secondary prevention of cancer

- Aims to achieve full recovery or to prevent further progression or complications
- Evaluation of screening for common cancers in Jordan (i.e breast and colorectal cancers), and then implementing a nationwide programs
- Guidelines for treatment based on cost-effectiveness analysis on local data

Tertiary prevention of cancer

- Improve quality of life and survival:

This should start by assessment of quality of life and psychological wellbeing for cancer patients in Jordan

- Decrease complications
- Prevention of recurrence

Challenges facing Public Health in Jordan:

- Shortage of experts or health professional interested in the field of public health and limited financial support
- The healthcare system in Jordan is a treatment-based system
- Resource reallocation from the treatment side to the public health activities side is expected to raise strong arguments by both the public and politicians

Summary

- Cancer is a growing major health burden in Jordan
- There are national, regional and worldwide variations in cancer epidemiology
- Breast, lung and colorectal cancers are the commonsts cancers in Jordan
- Tobacco smoking, lack of physical activities, over-weight and obesity are the commonest risk factors for cancer in Jordan



Thank you!

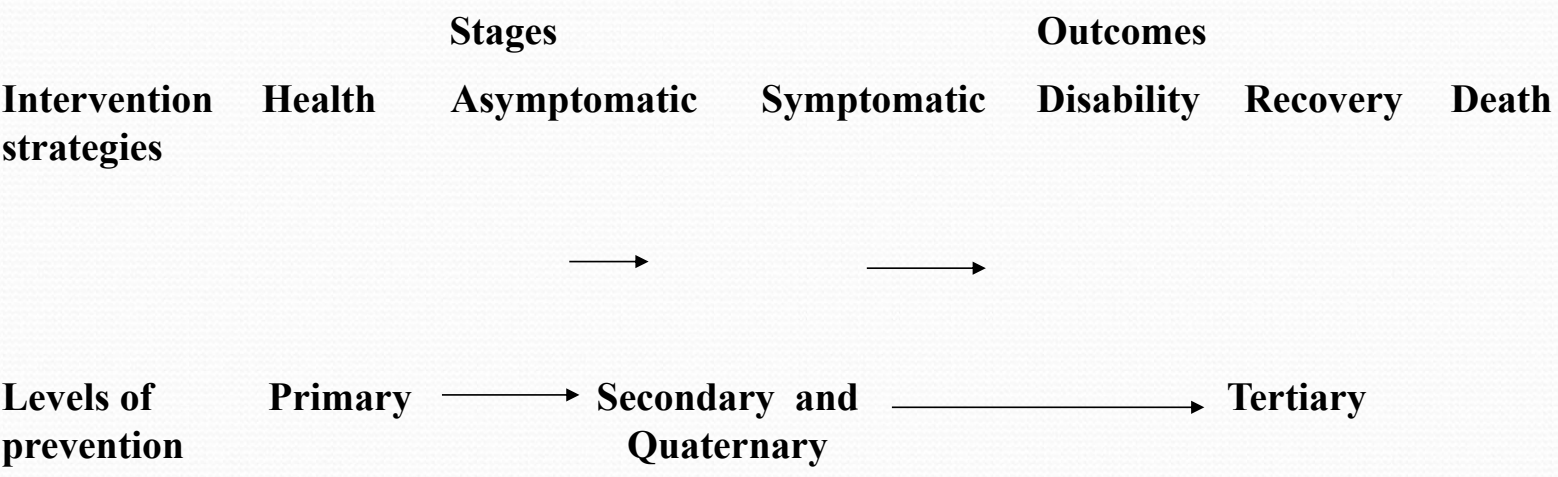
Questions



Compare
lung cancer prevention with
breast cancer prevention



Spectrum of health and disease with the main strategies for prevention at each level



Disease Surveillance

Dr Munir Abu-Helalah

MD,MPH,PhD

Associate Professor, Consultant of
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What is surveillance?

“Systematic ongoing collection, collation, and analysis of data and the timely dissemination of information to those who need to know so that action can be taken.”

World Health Organization

“The ongoing systematic collection, analysis, and interpretation of health data, essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those who need to know.”

U.S. Centers for Disease Control and Prevention



In other words: Surveillance

Continuous and systematic vigilance over the occurrence and distribution of disease and events or conditions which increase the risk of disease



Surveillance: general objectives

- To follow trends in the health status of a population over time.
- To establish health care and public health priorities
- To ensure those with greatest need are prioritized.
- To detect and respond to epidemics
- To evaluate the effectiveness of programmes and services

What are the specific objectives of surveillance?

- **The principal objectives are to :**
- **Give early warning of change of incidence- as with the recent increase in tuberculosis in many countries following along period of decline**
- **Detect outbreaks early**
- **Evaluate the effectiveness of interventions – the introduction of new vaccines , for instance**

Examples of events that may require surveillance are:

- Epidemic diseases, e.g. measles, meningococcal meningitis**
- Malnutrition**
- Animal reservoirs and vectors of communicable diseases**
- Environmental pollution, particularly of water**
- Demographic events, such as births and deaths**

Assessment of whether targets have been reached

Assume a national goal has been set to “Reduce malaria Deaths by 20% in the next five years”

There is a baseline figure on malaria deaths

There is a way of monitoring trends in deaths over time

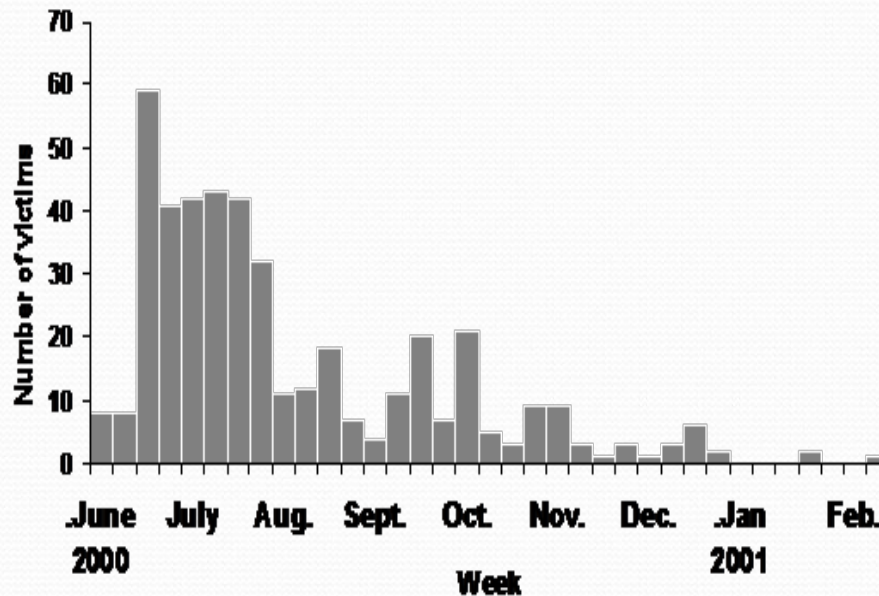
Surveillance

- Surveillance can often produce information which is more timely than information gathered by other methods, such as surveys. It can also allow you to monitor trends more easily.

Types of surveillance

- Surveillance can be classified into the following types:
- ***Passive surveillance***: a system in which data generated without solicitation, intervention or contact by the health agency carrying out the surveillance. Other agencies initiate reporting.
- The data collator awaits its reporting , as with the British system of notifiable disease reporting

This figure is an example of data gathered by passive surveillance from the hospitals run by one organization:



Types of surveillance

- ***Active surveillance*** – the organization conducting surveillance initiates procedures to obtain reports
- The data collator checks that the reporting agency is indeed collecting the source data , and doing so as completely as the collection mechanism allows

Types of surveillance

- **Negative surveillance:** where the data collator presses the collector to report even the absence of cases.
- This is the typically required for uncommon disorders so that the collator can be sure that a 'nil report' truly reflects zero incidence over the period and not simply a failure to report.
- Paediatric surveillance units around the world use negative reporting schemes.

Sentinel surveillance

- Instead of attempting to gather surveillance data from all health care workers, a sentinel surveillance system selects, either randomly or intentionally, a small group of health workers from whom to gather data.
- These health workers then receive greater attention from health authorities than would be possible with universal surveillance.
- Sentinel surveillance also requires more time and resources, but can often produce more detailed data on cases of illness because the health care workers have agreed to participate and may receive incentives.
- It may be the best type of surveillance if more intensive investigation of each case is necessary to collect the necessary data.
- For example, sentinel influenza surveillance in the Jordan collects nasopharyngeal swabs from each patient at selected sites to identify the type of influenza virus. Collection of such data from all health workers would not be possible.

Mortality surveillance

- Another type of surveillance is often done for deaths.
- In most countries, the health authorities require that each death in the population be reported or registered. These reports are then periodically counted up to calculate a death rate. Death registration systems are universal, albeit of widely differing quality and completeness.

- Why is death a common condition under surveillance?

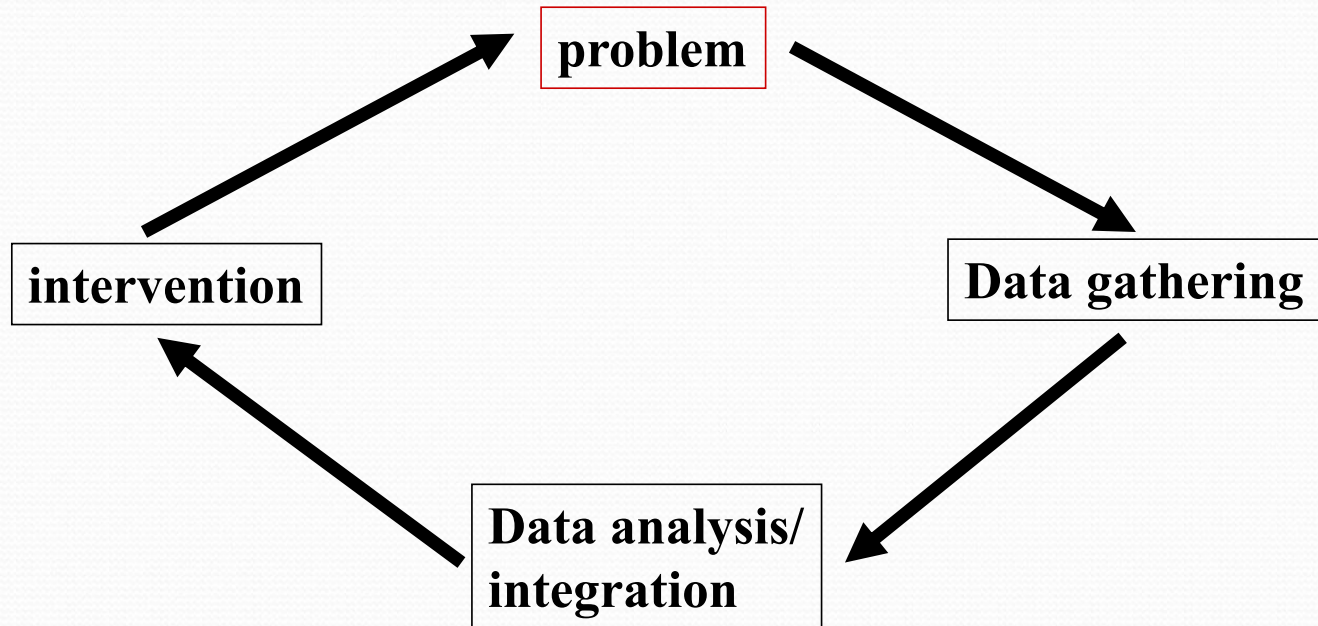
Death is the final common outcome of severe disease. If you can only measure one condition to follow the health status of a population, death is probably the best. If the death rate in a population is normal, the health status of the population is probably not very bad.

Collection of information

- **Geographic subunits**
- **Age**
- **Sex**

Important concepts in surveillance

The surveillance arc





If data are to be used for decision-making, they need to be made available and understandable to public health decision makers in a timely fashion.

Problems:

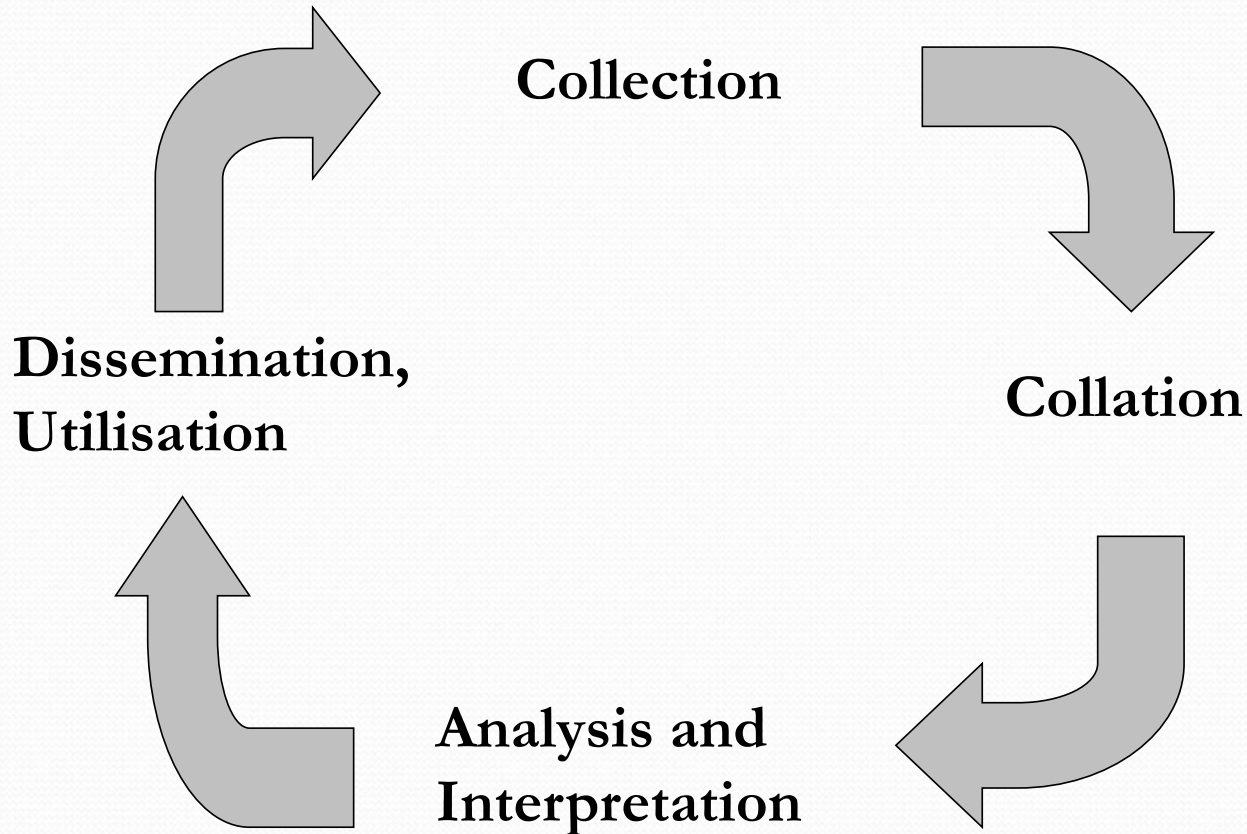
- **Data analysis**
gathering, summary, dissemination
- **Interventions**

Steps involved in surveillance

There are four steps:

- Data collection
- Data collation
- Data analysis
- Dissemination.
- Action may or may not flow from the last.

Flow of Surveillance Data





**Feedback to the previous level
within the data collection system**

Communicable disease		
Acute flaccid paralysis	Anthrax	Ringworm
Polio	Rabies	Leishmaniasis
Measles	Rubella	Plague
Acute watery diarrhoea	Influenza-like illness	Leprosy
Hepatitis A	Foodborne disease	Yellow Fever
Hepatitis B	Typhus	Relapsing Fever
Meningitis	Tuberculosis	SARS
Bloody diarrhoea	Typhoid & Para Typhoid Fever	H1N1
Malaria	Mumps	Coronavirus
HIV	Chicken pox	West Nile virus
Syphilis	Brucellosis	Crimean Congo Fever
Gonorrhoea	Scarlet fever	Acute diarrhoea
Diphtheria	Tetanus	Dengue Fever
Typhus	Pertussis	Rift valley Fever
Animal bite	Bilharzia	Hydatidosis
Scabies		
Non-communicable disease		
Hypertension	Diabetes	
Asthma	Chronic obstructive pulmonary disease	
Neoplasms	Haemophilia	
Mental health		
Alcohol use disorders	Substance use disorders	
Stress related disorders	Psychosis (including Schizophrenia)	
Depression (moderate to severe)	Epilepsy/seizure	
Severe emotional disorder	Self-harm/suicide	
Behavioural disorder	Bipolar disorder	
Developmental disorder	Anxiety disorders	
Dementia	Obsessive compulsive disorder	
Unexplained somatic complaint		

In summary: surveillance can:

- Detect outbreaks
- Detect public health threats
- Detect infectious cases (case finding)
- Monitor trends in a target population
- Monitor exposed individuals for symptoms
- Monitor treated individuals for complications
- Direct public health interventions
- Evaluate public health interventions
- Generate hypotheses for further evaluation

What is screening

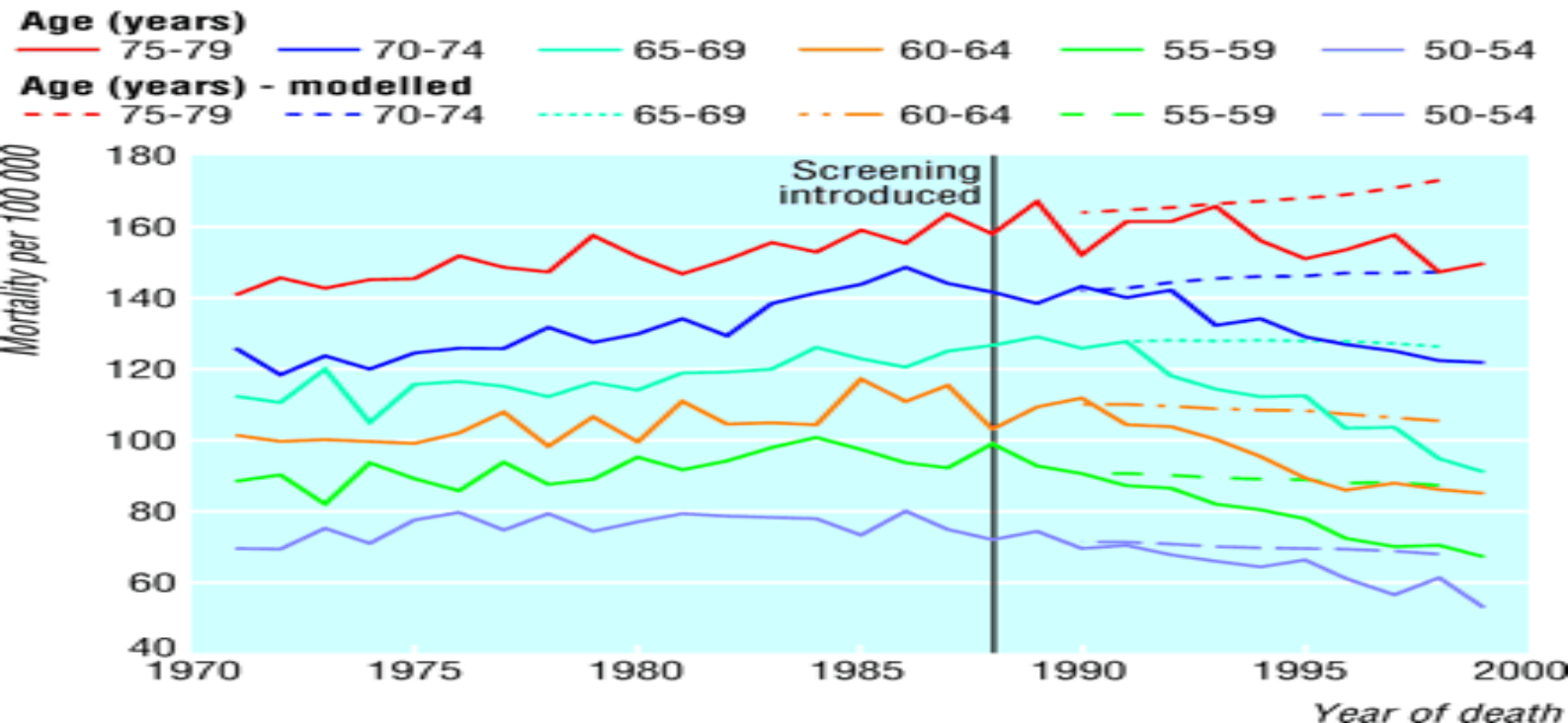
“The systematic application of a test or enquiry, to identify individuals at sufficient risk of specific disorder to benefit from further investigation or direct preventive action, among persons **who have not sought medical attention** on account of symptoms of that disorder.” Wald, 2004

Aims of screening

- Better prognosis/outcomes for individuals
- Protection of public from communicable diseases
- Rational allocation of resources
- Research (understanding natural history of disease)

Example of successful medical screening

- Mortality from breast cancer by year of death for selected age groups, England and Wales, 1971-99



Opportunistic screening (case finding):

- Do screening for someone when he/she comes into contact with the health system for another reason
- Check glucose profile for patient with gastric symptoms, older than 45 with family history of diabetes
- Refer lady aged 40 coming for URTI infection for breast cancer screening
- If the patient has symptoms suggestive of the disease of interest, it is an EARLY DETECTION not screening

Screening versus diagnosis

- Early detection: symptoms and signs
 - It is essential to work in both directions in parallel way:
 - Start your screening programs
- &
- Invest in early detection at GPs and selected specialties & general population levels awareness.

Delay in presentation, diagnosis and treatment for Breast cancer patients in Jordan

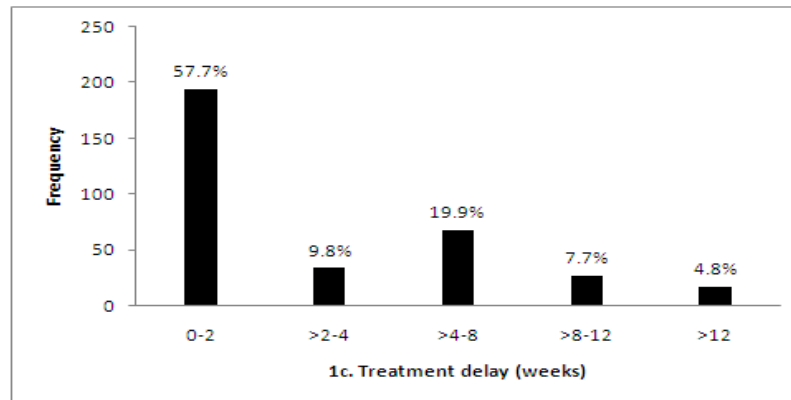
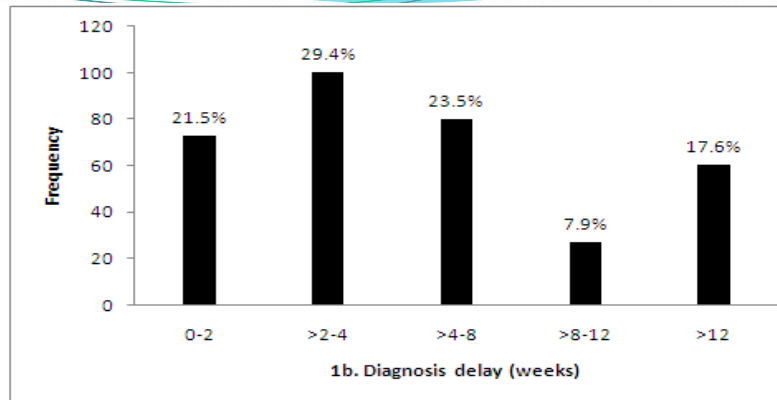
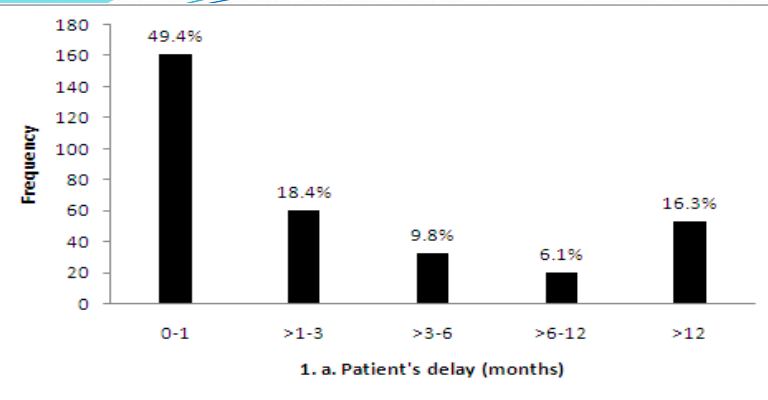
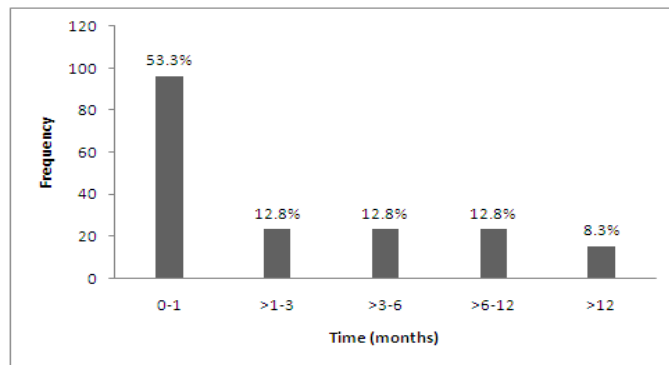


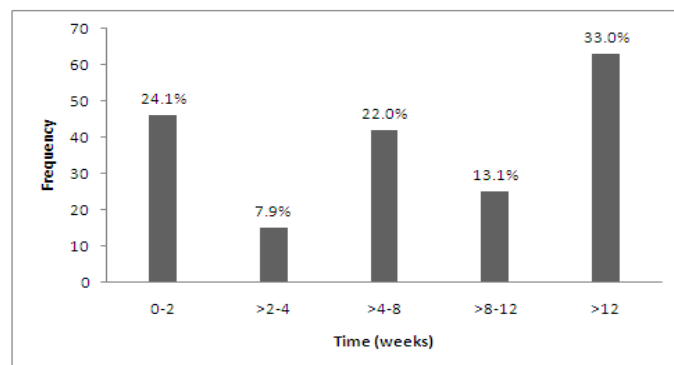
Figure 1: Proportion of participants by patient's delay, diagnosis delay, and treatment delay

Delay in presentation, diagnosis and treatment for colorectal cancer patients in Jordan

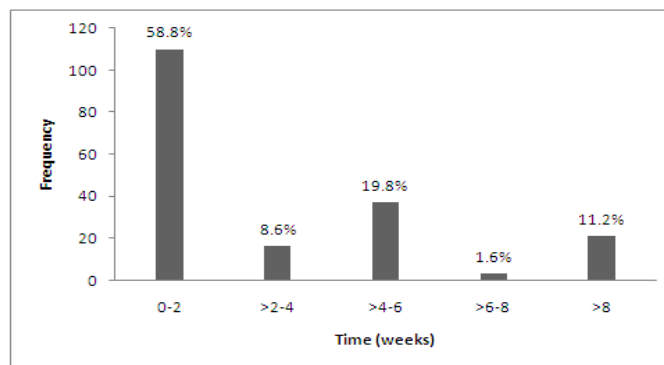
Fig1. Proportion of participants by patient's delay, diagnosis delay and treatment delay



(a)



(b)



(c)



Criteria for screening

1. The disease/condition is an important health problem:

- Well-defined disorder
- Known epidemiology
- Well-understood natural history
- Prevalence of undiagnosed cases

Shall we screen only for common illnesses?

- For serious diseases, even if it is not highly prevalent.
e.g. Neonatal screening Phenylketonuria in Jordan
In 2011, 7 out of 93000 screened babies.

In the UK, incidence, 1:12000 live births.

If undetected, it would lead to severe mental retardation and growth retardation. While detected cases could be treated simply by dietary restriction of phenylalanine.

If undetected leads to severe mental and growth retardation.
Early Detected cases easily treated by dietary restriction of PKU.

2. Presence of presymptomatic or early stage

- **Is there an evidence from a randomised controlled trial that an earlier intervention would work?**
- Detecting the disorder at this stage should help in getting better outcomes when compared with the situation without screening.
- Randomised controlled clinical trials could be needed to evaluate the impact of treatment on those detected from screening programmes as they could be different from those seeking medical attention for their conditions.
- Screening for a disease or a risk factor

It is recommended to screen for diseases, while risk factors are bad screening tools

Trial	Design	Subjects	N; duration (years)	Control group	Active treatments	% change in diabetes risk
Principal diabetes prevention trials that evaluated metformin						
DPP (US) [19]	RCT	IGT and high-normal glucose	3234; 3	Placebo plus standard lifestyle advice	Metformin plus standard lifestyle advice	−31
					Intensive lifestyle intervention	−58
DPP Outcome Study (US) [69]	O	Epidemiological follow-up to DPP	2766; 5.7	Placebo plus intensive lifestyle advice	Metformin 1700 mg/day + intensive lifestyle advice	−13
					Intensive lifestyle advice	+5
IDPP (India) [20, 65]	RCT	IGT	531; 2.5	Standard lifestyle advice	Metformin plus standard lifestyle advice	−26
					Metformin plus intensive lifestyle intervention	−28
					Intensive lifestyle intervention	−29
Wenying et al. (China) [68]	NR	IGT	321; 3	Standard lifestyle advice	Metformin	−88
					Acarbose	−87
					Intensive lifestyle intervention	−43
Li et al. (China) [66]	RCT	IGT	70; 1	Placebo	Metformin	−66 ^a
Iqbal Hydrie et al. (Pakistan) [67]	RCT	IGT	317; 1.5	Standard lifestyle advice	Metformin	−76.5
					Intensive lifestyle intervention	−71
CANOE (Canada) [64]	RCT	IGT	207; 3.9	Placebo	Metformin 500 mg plus rosiglitazone 2 mg twice daily	−66
Principal diabetes prevention trials that did not evaluate metformin						
Diabetes Prevention Study (Finland) [70]	RCT	IGT	522; 3.2	Standard lifestyle advice	Intensive, multifactorial lifestyle intervention	−58
Da Qing study (China) [71]	RBS	IGT	577; 6	Standard lifestyle advice	Diet, exercise, or both together	−31 to −46
STOP-NIDDM (International ^b) [72, 73]	RCT	IGT	1429; 3.3	Placebo	Acarbose	−25
XENDOS (Sween) [74]	RCT	IGT and obesity	694; 4 ^c	Placebo	Orlistat	−45
DREAM (21 countries ^d) [75, 76]	RCT	IGT ± IFG	5269; 3	Placebo	Rosiglitazone	−62 ^e
				Placebo	Ramipril	−9 ^f (NS)
IDPP−2 (India) [77]	NR ^f	IGT	407; 3	Placebo + lifestyle intervention	Pioglitazone + lifestyle intervention	+8 (NS)
SOS study (Sweden) [78]	RCT	Obese, non-diabetic	3429; 10	No surgery ^g	Bariatric surgery	−83

Journal of Medical Screening
Volume 17, Issue 4, December 2010, Pages 164-169
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<https://doi.org/10.1258/jms.2010.010057>



Original Article

A randomized double-blind crossover trial to investigate the efficacy of screening for adult hypothyroidism

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A Cross-Sectional Study to Assess the Prevalence of Adult Thyroid Dysfunction Disorders in Jordan

Munir Abu-Helalah,^{1,2} Hussam Ahmad Alshraideh,^{3,4} Sameeh Abdulkareem Al-Sarayreh,⁵
Ahmad Hassan Khalaf al Shawabkeh,⁶ Adel Nesheiwat,⁷ Nidal Younes,⁸ and AbdelFattah AL-Hader⁹

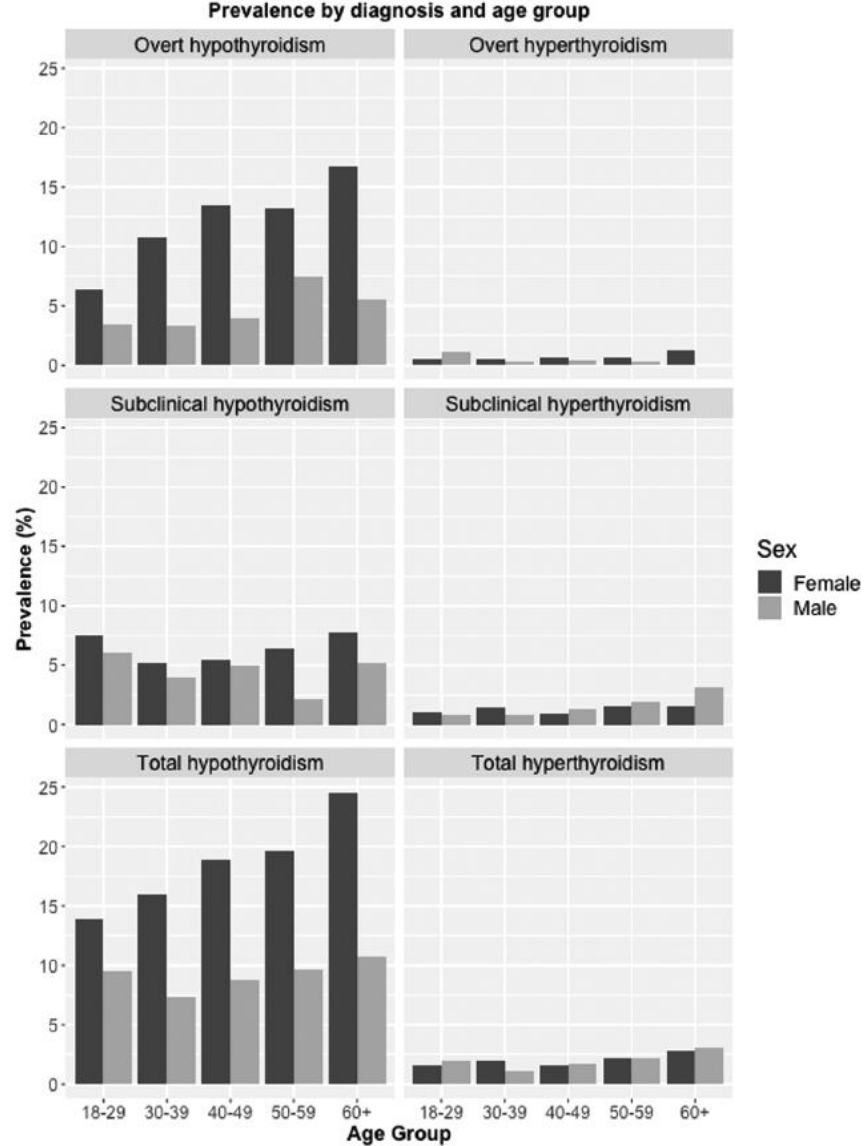
Background: Insufficient production of thyroid hormones results in hypothyroidism, while overproduction results in hyperthyroidism. These are common adult disorders, with hypothyroidism more common in the elderly. Jordan has had past problems with dietary iodine deficiency but there are no published studies assessing the population prevalence of these disorders in the Arab Middle East.

Methods: A cross-sectional study was conducted in three representative areas of Jordan. There were 7085 participants with a mean age of 40.8 years. Participants completed a questionnaire and had blood taken for thyroid analysis.

Results: *Hypothyroidism:* The prevalence of any hypothyroidism (already diagnosed and/or identified by blood testing) was 17.2% in females and 9.1% in males. Undiagnosed prevalence was 8% and 6.2% for females and males, respectively. The prevalence of subclinical hypothyroidism, defined as high serum thyrotropin (TSH) and normal serum-free thyroxine (fT4), was 5.98% among females and 4.40% among males. The prevalence of overt hypothyroidism, defined as high TSH and low fT4, was 2.00% among females and 1.80% among males. Only 53.5% (55.3% for females, 42.1% males) of those previously diagnosed with hypothyroidism had TSH levels within the appropriate range. *Hyperthyroidism:* The prevalence of any hyperthyroidism (already diagnosed and/or identified by blood testing) was 1.8% in females and 2.27% in males. The undiagnosed prevalence was 1.4% and 2.1% for females and males, respectively. The prevalence of subclinical hyperthyroidism (low TSH and normal fT4) was 1.20% and 1.80% among males and females accordingly. The prevalence of overt hyperthyroidism (low TSH and high fT4) was 0.2% among females and 0.3% among males. About 85.7% (83.3% for females, 100% males) of those previously diagnosed with hyperthyroidism had TSH levels within the appropriate range.

Conclusions: The results of this study reveal that the total prevalence of thyroid dysfunction among adult females and males in Jordan is very high compared with international statistics, particularly in the rates of undiagnosed cases. This indicates the need for further assessment of the value of screening for adult hypothyroidism in Jordan.

FIG. 1. Prevalence by diagnosis and age group.



What do you aim to achieve from your screening programme?

- Mortality
- Morbidity
- Quality of life and psychological wellbeing

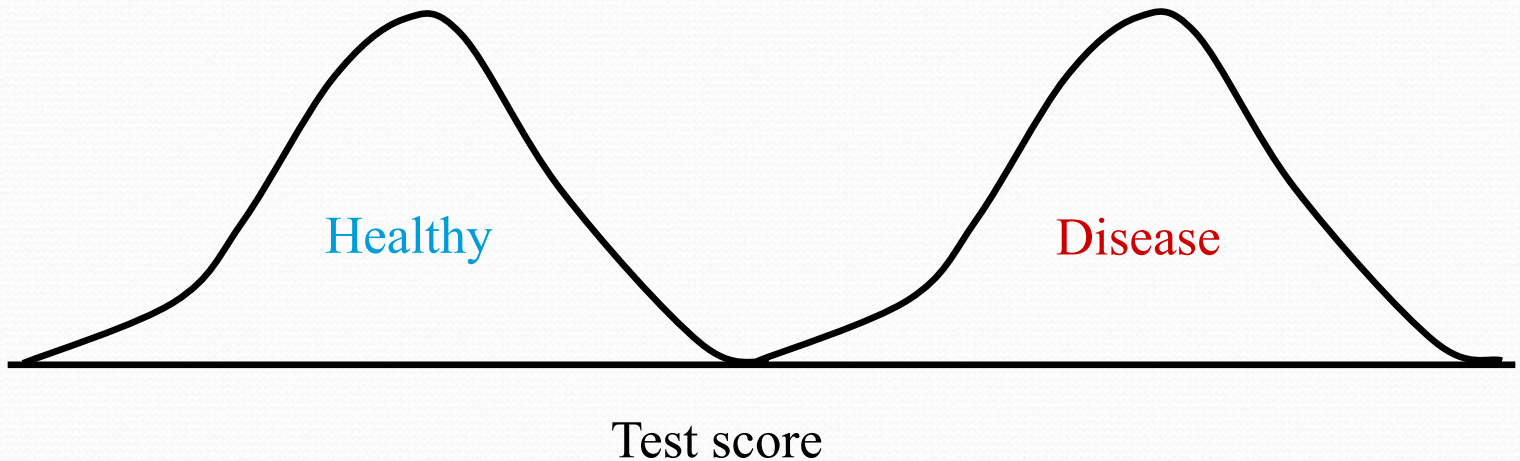
Screening test:

- Safe
- Inexpensive
- Acceptable
- Reliable
- Valid
- No or minimal adverse effects: pain or any possible adverse effects should be considered in addition to convenience and duration of the test.

Screening test validity

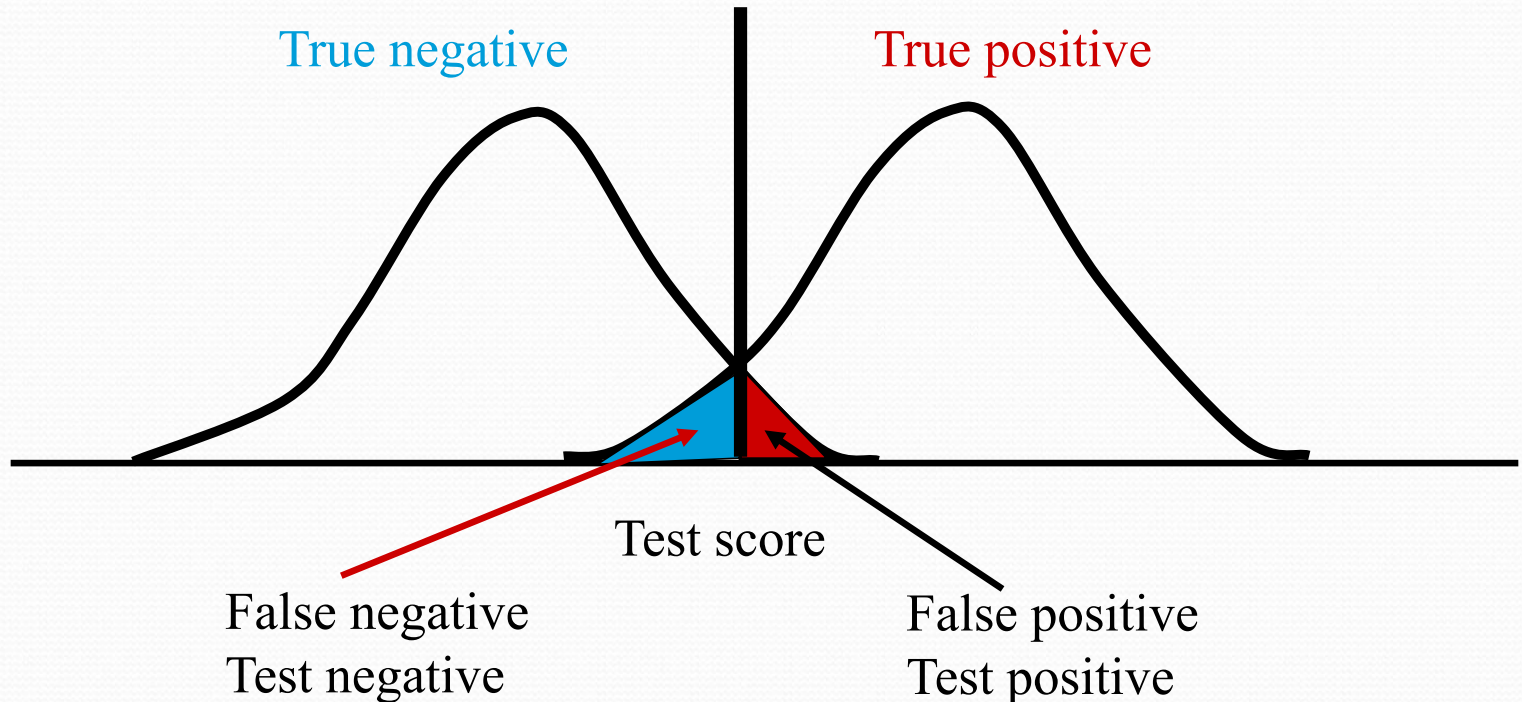
- The validity of a screening test can be evaluated through its detection rate (sensitivity) and specificity.
 - A. Detection rate (sensitivity) evaluates the ability of a screening tool to detect the disorder or problem. It represents the proportion of diseased individuals who have a positive screening test.
 - B. Specificity is the ability of a screening tool to label people without the targeted condition as “unaffected” (for diseases, healthy people as non-diseased).

An ideal laboratory test would detect all people who have a disease and at the same time identify as normal all those who do not have the disease



Test based on continuous data

the values between normal/disease overlap



False positive rate (1-specificity)

- More meaningful and practical than specificity because it shows the expected rate of those who would be falsely labelled as diseased or screen positive and might offered further investigations.
- It helps in estimation the magnitude of the economic (further investigations) and other harmful effect such as psychological distress associated such outcomes.

Validity of a test

How well a test performs can be assessed based on the values in the following 2x2 table

	Disease present	Disease absent
Test positive or Surveillance Detection positive	True Positives TP a	False positives FP b
Test negative or Surveillance Detection negative	False negatives FN c	True negative TN d

	Disease present	Disease absent
Test positive or Surveillance Detection positive	True Positives TP a	False positives FP b
Test negative or Surveillance Detection negative	 c False negatives FN	d True negative TN

$$\text{Sensitivity} = \frac{\text{Diseased people with a positive test}}{\text{All diseased people}} = \frac{\text{TP}}{\text{TP} + \text{FN}}$$

$$\text{Specificity} = \frac{\text{Well people with a negative test}}{\text{All well people}} = \frac{\text{TN}}{\text{TN} + \text{FP}}$$

$$\text{False positive rate} = \text{FP} / \text{FP} + \text{TN}$$

False positive rate

- The proportion of unaffected individuals with positive test results.
- False positive rate = $\frac{b}{b+d} = 1 - \text{specificity}$

Predictive values

- Positive predictive value= $\frac{\text{all true positives}}{\text{all positives (all true and all false)}} \times 100$
- How likely it is that a positive test result indicates the presence of the disease.
- It is the percentage of all people who test positive and who really have the disease
- Negative predictive value= $\frac{\text{True negatives}}{\text{all negatives}} \times 100$
- It is the percentage of all people who test negative who really do not have the disease

	Disease present	Disease absent
Test positive or Surveillance Detection positive	True Positives TP a	False positives FP b
Test negative or Surveillance Detection negative	 c False negatives FN	 d True negative TN

$$prevalence = \frac{\text{Diseased people}}{\text{All people}} = \frac{TP + FN}{TP + FN + FP + TN}$$

$$predictive\ value\ positive = \frac{\text{Diseased people with a positive test}}{\text{All people with a positive test}} = \frac{TP}{TP + FP}$$

$$predictive\ value\ negative = \frac{\text{Well people with a negative test}}{\text{All people with a negative test}} = \frac{TN}{TN + FN}$$

Screening test validity:

Outcomes of screening tests

	Disease present	Disease absent	All
Positive screening test	a (true positive)	b (false positive)	$a + b$
Negative screening test	c (false negative)	d (true negative)	$c + d$
All	$a + c$	$b + d$	$a + b + c + d$
Detection rate	proportion of affected individuals with positive test results	$\frac{a}{a+c}$	
Specificity	Proportion of unaffected individuals with negative test result	$\frac{d}{b+d}$	
False positive rate	proportion of unaffected individuals with positive test results	$\frac{b}{b+d} = (1 - \text{specificity})$	
Positive predictive value	Probability of the disease being present given a positive test	$\frac{a}{a+b}$	
Negative predictive value	probability of no disease being present given a negative test result	$\frac{d}{c+d}$	

		Patients with bowel cancer (as confirmed on colonoscopy)		
		<i>Positive</i>	<i>Negative</i>	
Fecal occult blood screen test outcome	<i>Positive</i>	True Positive (TP) = 20	False Positive (FP) = 180	→ Positive predictive value = $TP / (TP + FP)$ = $20 / (20 + 180)$ = $20 / 200$ = 10%
	<i>Negative</i>	False Negative (FN) = 10	True Negative (TN) = 1820	→ Negative predictive value = $TN / (FN + TN)$ = $1820 / (10 + 1820)$ = $1820 / 1830$ ≈ 99.5%
		↓ Sensitivity = $TP / (TP + FN)$ = $20 / (20 + 10)$ = $20 / 30$ ≈ 66.67%	↓ Specificity = $TN / (FP + TN)$ = $1820 / (180 + 1820)$ = $1820 / 2000$ = 91%	

Example of validity assessment

	G-FOBT	FIT
Sensitivity	50.00% (6.76–93.24)	75.00% (19.41–99.37)
Specificity	77.87% (72.24–82.83)	90.12% (85.76–93.50)
Positive likelihood ratio	2.26 (0.83–6.18)	7.59 (3.86–14.94)
Negative likelihood ratio	0.64 (0.24–1.71)	0.28 (0.05–1.52)
Positive predictive value	3.45% (0.42–11.91)	10.71% (2.27–28.23)
Negative predictive value	98.99% (96.42–99.88)	99.56% (97.59–99.99)

False positive rates: $1 - \text{Specificity}$

More un-necessary colonoscopies and more cost for the program

Diabetes test	Normal	Prediabetes	Diabetes
Hemoglobin A _{1c} , %	< 5.7	5.7–6.4	≥ 6.5
Fasting blood glucose, mg/dL	< 100	100–125	> 125
Oral glucose tolerance, mg/dL	< 140	140–199	> 199

Sensitivities and specificities of different screening models for prediabetes

Screening model	Sensitivity (%) (95% CI)	Specificity (%) (95% CI)
FPG $\geq$ 5.6 mmol/l	64.1 (61.7, 66.5)	65.4 (63.0, 67.8)
FPG $\geq$ 6.1 mmol/l	32.4 (30.0, 34.8)	88.3 (86.7, 89.9)
HbA1c $\geq$ 5.6%	66.2 (63.8, 68.6)	51.0 (48.5, 53.5)
FPG $\geq$ 5.6 mmol/l and HbA1c $\geq$ 5.6%	42.4 (39.9, 44.9)	82.4 (80.5, 84.3)
FPG $\geq$ 5.6 mmol/l or HbA1c $\geq$ 5.6%	87.9 (86.3, 89.5)	33.4 (31.0, 35.8)

Reliability of screening test

- Reliability means that the same results should be obtained by different observer or the same observer at different occasions.
- In practice, it is hard to achieve 100% reliability
- Guidelines should be in place on decisions when two observers have different opinions.

UKCCCR multicentre randomised controlled trial of one and two view mammography in breast cancer screening

Nicholas J Wald, Philip Murphy, Philippa Major, Carol Parkes, Joy Townsend, Chris Frost

Abstract

Objective—To compare one view (oblique) and two view (oblique and craniocaudal) mammography in breast cancer screening.

Design—Randomised controlled trial.

Setting—Nine breast screening centres in England.

Subjects—40 163 women aged 50–64 attending their first breast screening examination.

Interventions—Women were randomised to have one view mammography, two view mammography, or two view mammography in which one view was read by one reader and both views were read by another.

Main outcome measures—Prevalence of cancer detected, recall rates, cost per cancer detected, and marginal cost per extra cancer detected.

Results—Two view mammography detected 24% more women with breast cancer (95% confidence interval 16% to 31%) than one view mammography. Prevalence of detected cancer was 6.84 with two view mammography and 5.52 per 1000 women with one view. The proportion of women recalled for assessment was 15% lower (95% confidence interval 6% to 23%) with two view (6.97%) than with one view (8.16%) mammography. The cost of two view screening was higher (£26.46 compared with £22.00 per examination) but the average cost per cancer detected was similar (£5330 compared with £5310) and the marginal cost per extra cancer detected with two views was similar to the average cost (£5400).

Conclusion—Two view mammography is medically more effective than one view; it detects more

cases, knowing that the second film reading could correct the high recall rate.

To resolve the matter we, with the support of the United Kingdom Coordinating Committee on Cancer Research (UKCCCR) conducted a randomised trial allocating women to one view or two view mammography to determine (a) the additional breast cancer detection achievable with two views instead of one at the first screening examination, (b) the recall rates for the two policies, and (c) the economic implications of the two policies.

Patients and methods

A total of 40 163 women were recruited between 1990 and 1994 from nine centres in England (West London 10 610, Brighton 8048, Worthing 6564, North London 4260, Liverpool 3858, Reading 3141, Winchester 2388, Leeds 1060, and Southampton 234). Twenty one national breast screening programme film readers took part. All but two were radiologists. Women aged 50–64 were eligible for the trial at their first screening examination if they had not had breast surgery and could give consent. To be eligible for the trial, centres must have screened at least 5000 women as part of a general screening programme and identified at least four breast cancers for every 1000 women screened, with a recall rate of less than 10%, and have at least two film readers (X and Y).

In each centre women were randomised to one of three groups in the ratio 1:1:2 by means of a computerised random numbers generator. Group 1 had oblique view mammography alone, interpreted by film reader X; group 2 had two view mammography, interpreted by film reader X; and group 3 had two

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Agreed plan on further investigation, diagnosis and treatment:

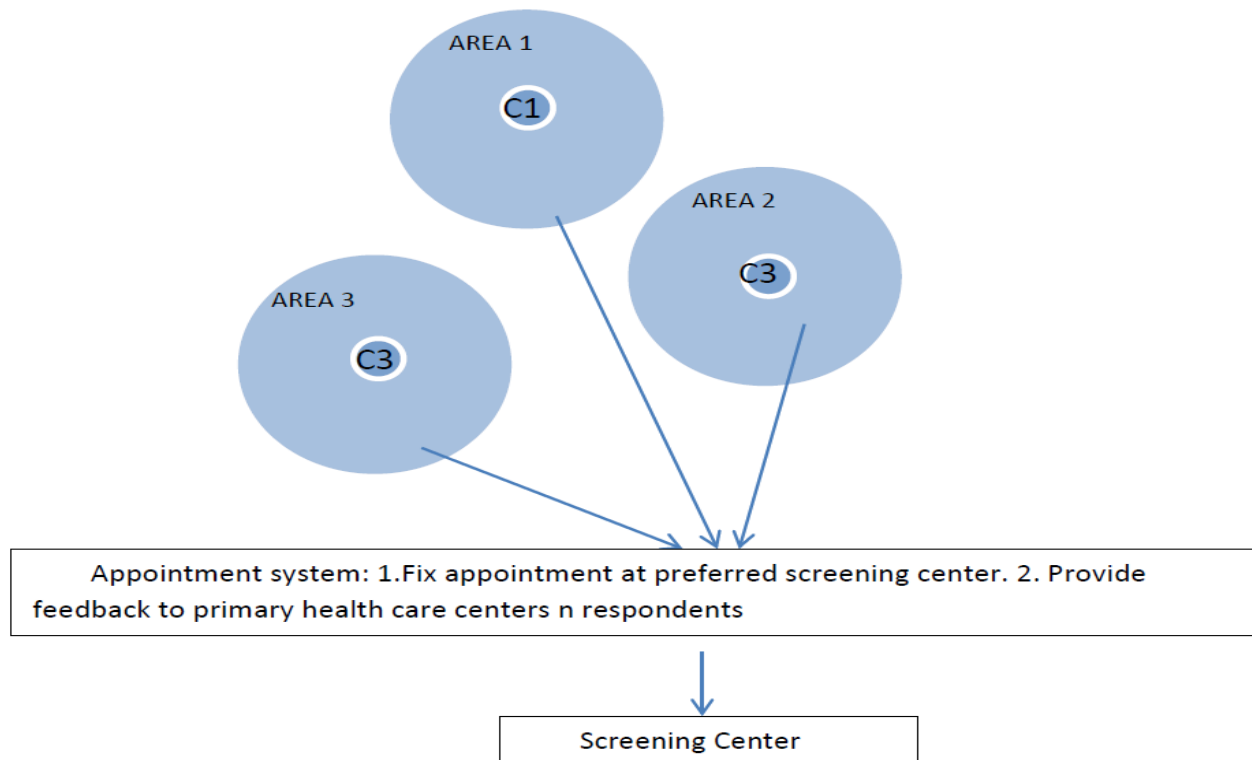
- Where to refer your positive subjects
- What is the diagnostic tests
- Who will pay for the investigations and treatments
- Diagnostic tools, screening intervals and treatment
- Facilities required for such steps should also be available or easily installed and equally accessed by the screened population

Systematic application

- This means that the test is offered routinely to the target group based on agreed criteria.

Do it in a systematic way!

- **Regular systematic national screening programs for breast and colorectal cancers should replace the current scattered campaigns and activities in many countries in the region.**
- Work should start with **pilot systematic screening projects in representative area in the country of interest.**



Obtain data from Ministry of Interior on residents in Areas 1,2,3 who fulfills screening criteria

Send letters through Health Centers C1,C2,C3

Send reminders through Health Centers C1,C2,C3 for non-respondents

Ask practice manager or health counselor to call non-respondents from the two calls and arrange for GP visit if needed.

Obtain data from the screening centers for respondents to screening calls.

Simplify your program

Is it too difficult to have a national systematic regular screening program for breast cancer in country “x” where the number of women aged 40-70 is 1,000,000?

In this country: it is recommended to screen women aged 40-69 once every two years

Notice: Screening interval depends on mean sojourn time, local data and health economics model.

Cut it down so it will be simple

Practical example: In country X, there are 1000000 women aged 40-70 who are eligible for screening

100000	Women aged 40-70					
To be screened annually		500000				
75% response rate:		375000				
300 working days/ 6 days work			1250			
	if there are 12 main districts in your country					
25 centers in the whole country	2 mammograms per center	50 mammograms				
1250/50	25 subjects Per machine per day	7 working hours, means 4 subjects per hour	In the UK, 6-8 patients per hour per machine.			
If we have only 5 centers in Amman, 3 centers in Irbid, 2 centers in Zarqa, 2 centers in Karak and one center in the remaining governorates						
we need 50 machines in 25 centers for 1 million women across Jordan						
This number is already available and can be provided at the public sector						

Breast self-examination and death from breast cancer: analysis

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Breast self-examination (BSE) is widely recommended for breast cancer prevention. Following recent controversy over mammography, it may be seen as an alternative. We present a meta-analysis of the effect of regular BSE on breast cancer mortality. From a search of the medical literature, 20 observational studies and three clinical trials were identified that reported breast cancer death rates or rates of advanced breast cancer (a marker of death) according to BSE practice. A lower risk of mortality from breast cancer was only found in studies of women with breast cancer who reported practising BSE before diagnosis (pooled relative risk 0.64, 95% CI 0.56–0.73; advanced cancer, pooled relative risk 0.60, 95% CI 0.46–0.80). The results were not significant due to bias and confounding. There was no difference in death rate in studies on women who detected their breast cancer by self-examination (pooled relative risk 0.90, 95% CI 0.72–1.12). None of the trials of BSE training (in which most women practising it regularly) showed lower mortality in the BSE group (pooled relative risk 1.01, 95% CI 0.92–1.12). The results suggest that BSE is associated with considerably more women seeking medical advice and having biopsies. Regular BSE is not associated with a reduction of reducing breast cancer mortality.

British Journal of Cancer (2003) **88**, 1047–1053. doi:10.1038/sj.bjc.6600847 www.bjcancer.com

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Keywords: breast self-examination; breast cancer; mortality; meta-analysis

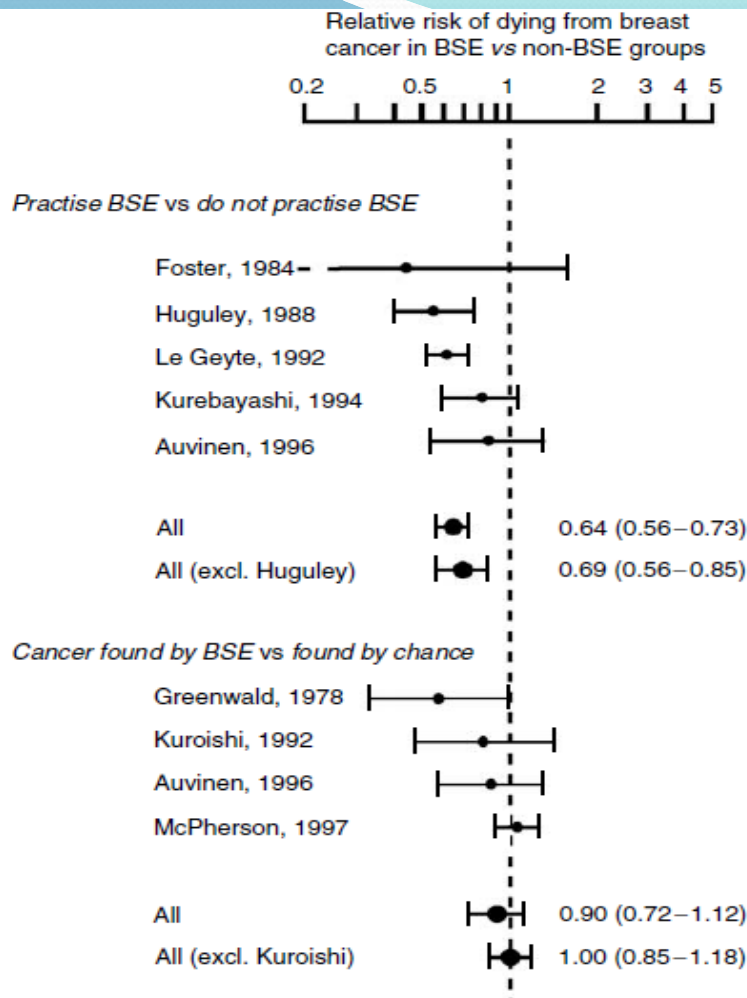
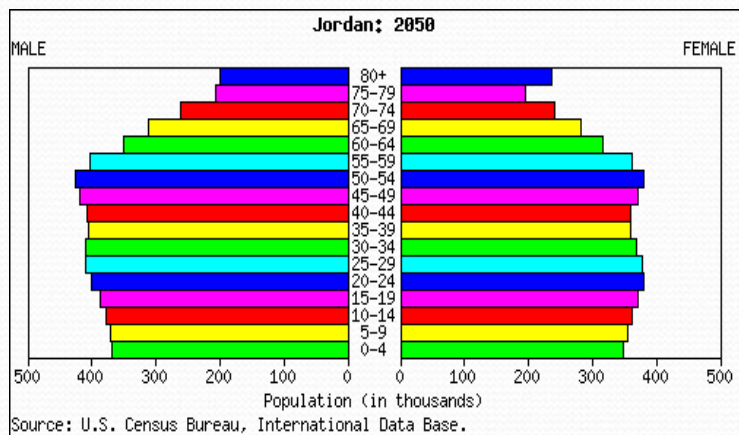
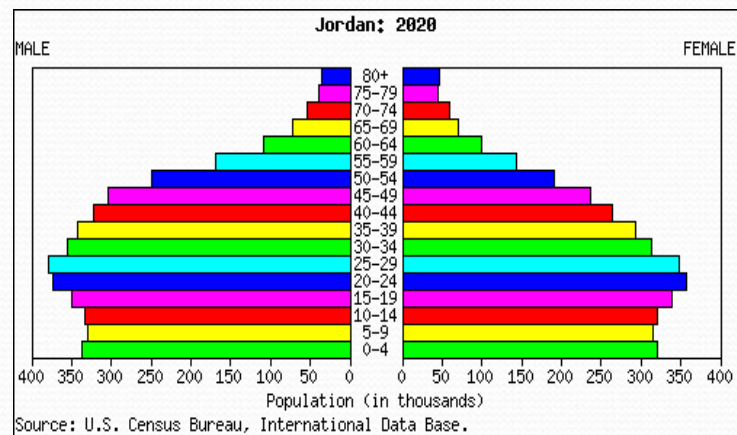
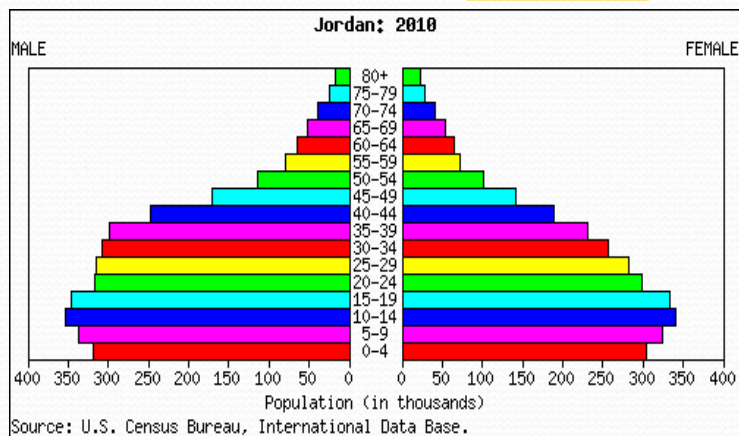
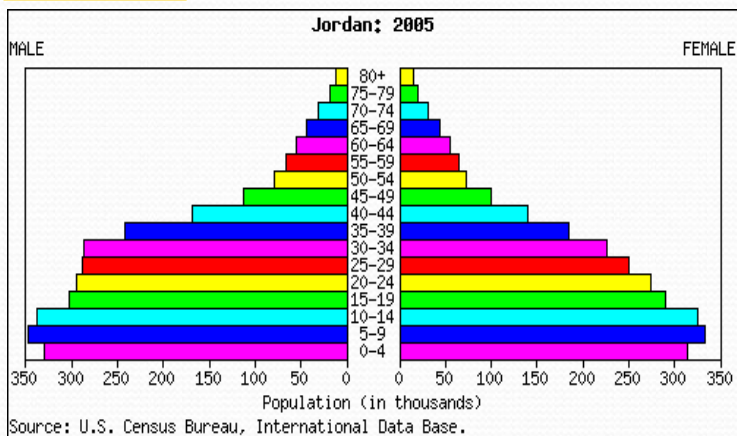


Figure 1 Observational studies of women with breast cancer, comparing the breast cancer death rates between the BSE and non-BSE groups. A test for heterogeneity between the studies yielded a *P*-value of 0.41 for those studies based on women who practise BSE and a *P*-value of 0.26 for those based on finding cancer by BSE.

Population pyramids- Jordan



Test it before you generalize it

- Start with pilot program
- Assess response rate
- Is my program cost-effective
- What is my cost-effective screening criteria
- Quality of all involved steps (single versus double reader mammography screening, FIT versus Haemoccult test)
- Compare respondents with non-respondents
- Assess success rates
- Look for determinants of success and failure
- Is there a specific group who needs different intervention?

Importance of Pilot Projects

1. Health economics evaluation
2. Setting age cut-off based on local data
3. Improve performance at national level by learning from experience at pilot phase
4. Comprehensive assessment of the screening program helpline, waiting time, film quality, guidelines such as double readers, false positive rate, false negative rate, diagnosis process, psychological counseling, treatment, prognosis, economic evaluation, how can we make it better at the national level.
5. Assessment of barriers to screening
6. Quality assessment of staff

Economic evaluation:

- Implementing screening programmes should be more economically effective than the existing system.
- Cost of all steps related to the screening programme should be assessed and compared with outcomes of the screening and with other services.
- **Each country should has its own studies and data**
- What is cost effective in the UK might not be cost effective in Jordan or India
- In breast cancer screening: age range for screening plays a key role in the cost-effectiveness of the program
- UK (Screening aged 50-70 Every three years, then in few years ago aged 40-49 at high risk)
- Sweden (age 40-70) annually

MAMMOGRAPHIC SCREENING

Economic evaluation of a mammography-based breast cancer screening programme in Spain

ROBERTO GARUZ, TARSICIO FORCÉN, JUAN CABASÉS, FERNANDO ANTOÑANZAS,
CRISTINA TRINXET, JOAN ROVIRA, FRANCISCO ANTÓN *

The aim of the study was to perform a cost-effectiveness analysis of a breast cancer (BC) mammography screening programme, compared to a do-nothing alternative, in Spain. Screening consisted of a biennial mammography performed on all women 50-65 years old. A marginal analysis including women 45-49 years old was also performed. With the aid of a decision tree model, the numbers of BC cases diagnosed through screening, BC cases missed by screening and false-positive BC cases were calculated. Costs were calculated by feeding local data into Markovian models and the cost-effectiveness ratio calculation was performed in a computer spread sheet. A sensitivity analysis was also conducted. Results were presented in ECUs of 1993. The cost-effectiveness ratio per avoided death is 115,500 ECUs and per saved life year 7,300 ECUs. Including women 45-49 years old in the programme raises this ratio to 229,000 and 9,400 ECUs respectively. The sensitivity analysis showed the efficacy of mammography, compliance of the programme and screening costs to be the more sensitive variables.

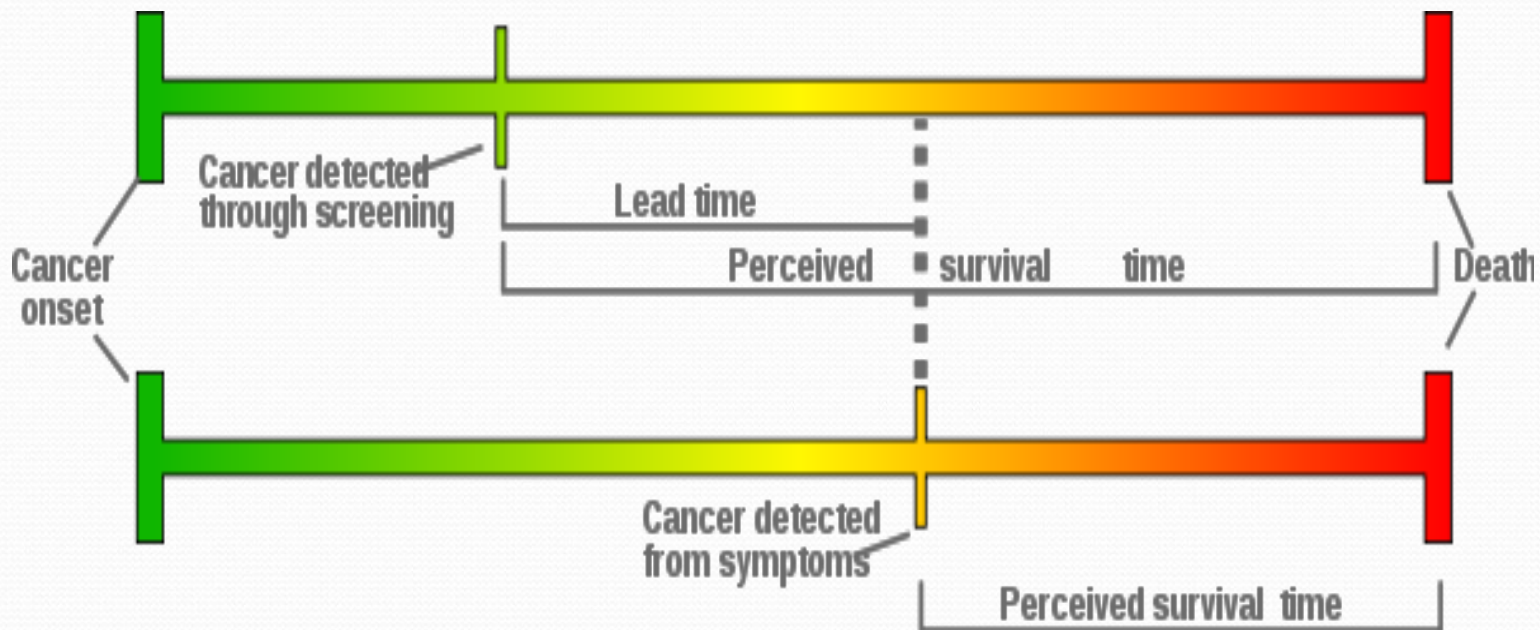
Key words: breast cancer, screening, economic analysis, cost-effectiveness analysis

Volunteer bias:

- They tend to be of higher socioeconomic class
- More health-conscious
- Comply better with prescribed advice
- Therefore, better results for a screening programme of volunteers compared with disease outcomes for non-volunteers may be related to factors associated with the “volunteerism” rather than benefits of treatment following diagnosis.
- Therefore it is essential to analyse data on participants and ensure that all target group have the same access and received the same message

Lead time bias

- Lead time: period between when the disease is detected by screening and when it would have become symptomatic and been diagnosed in the usual way.
- Prolongation between diagnosis and death
- There is no difference in outcomes between patients detected through screening and patients who is treated when the condition manifest clinically
- Screening simply makes the condition evident at an earlier stage without actually affecting its course. (appears to lead to longer survival because of earlier detection)
- If left with no screening the disease will be diagnosed at age of 50 and die at age of 54
- If screened disease will be diagnosed at age of 47 and die at the age of 54



Lead time bias in Prostate cancer

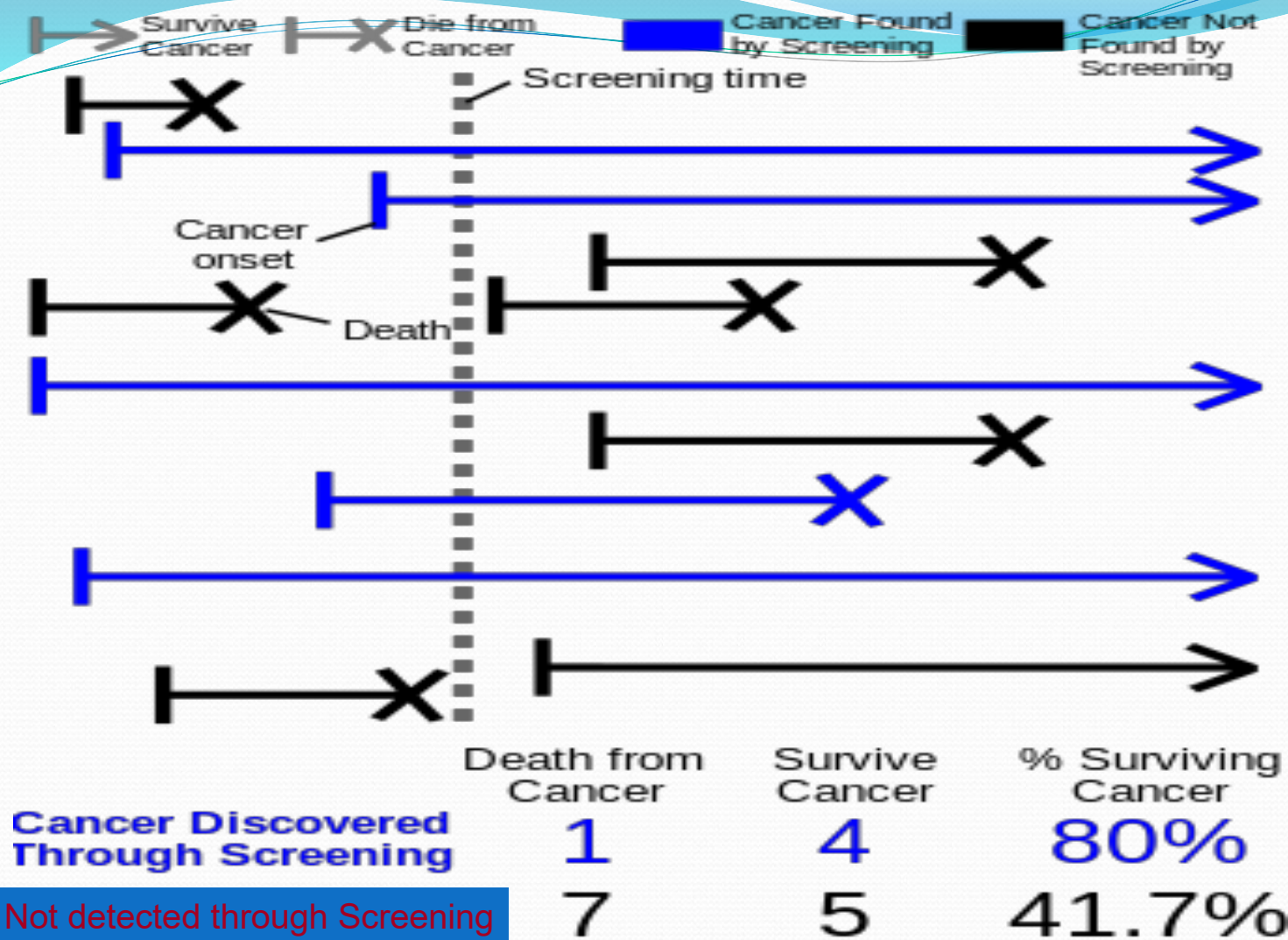
- **Lead Times and Over detection Due to Prostate-Specific Antigen Screening: Estimates From the European Randomized Study of Screening for Prostate Cancer**
- Gerrit Draisma Rob Boer Suzie J. Otto Ingrid W. van der Cruijsen Ronald A. M. Damhuis Fritz H. Schröder Harry J. de Koning
- *JNCI: Journal of the National Cancer Institute*, Volume 95, Issue 12, 18 June 2003, Pages 868–878, <https://doi.org/10.1093/jnci/95.12.868>

Length time bias

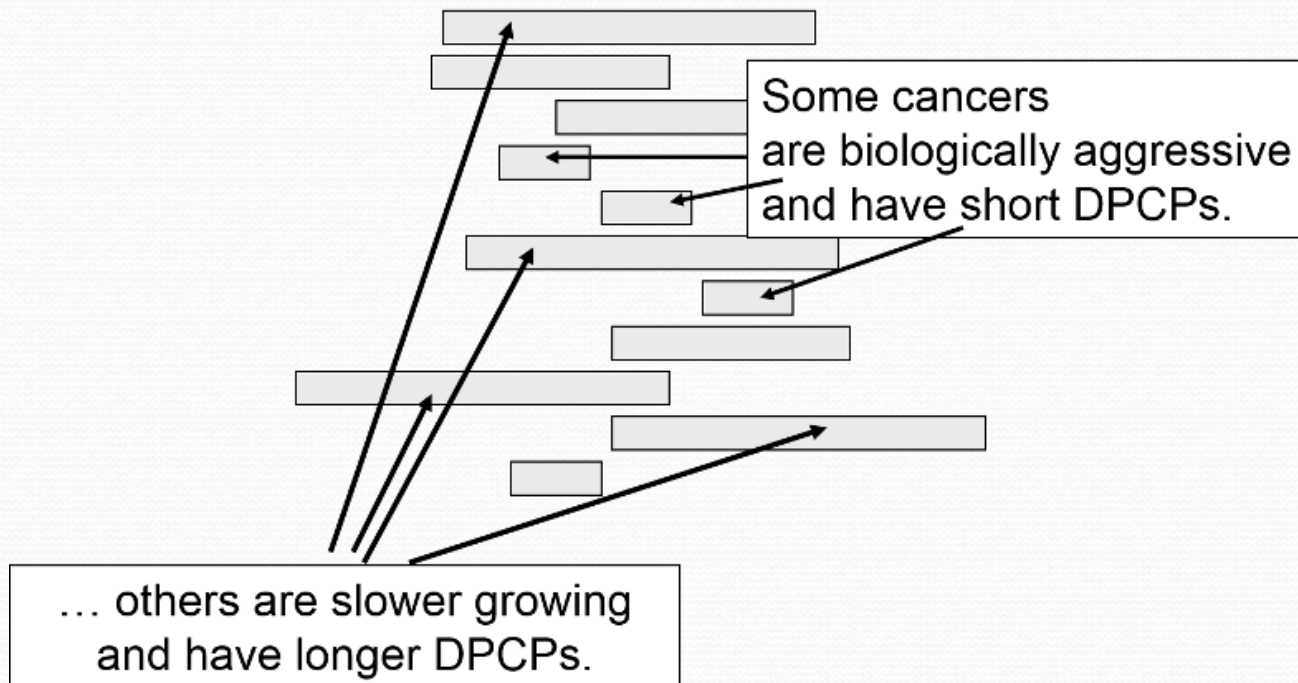
- It is a form of selection bias.
- When we screen for disease we are more likely to detect cases where the disease is progressing slowly
- Over-presentation of slowly progressing disease among cases detected by screening.
- Screening will detect more slowly growing tumours, while rapidly growing tumours are more likely to develop and to proceed to clinical presentation within the interval between two consecutive screening examinations.

Length time bias

- Faster-growing tumors generally have a shorter asymptomatic phase than slower-growing tumours, and so are less likely to be detected. However, faster-growing tumors are also often associated with a poorer prognosis. Slower-growing tumors are hence likely to be over-represented in screening tests. This can mean screening tests are erroneously associated with improved survival, even if they have no actual effect on prognosis.



Prostate Cancers With Varying DPCPs



DPCPs: detectable preclinical phase



Challenges

- Validity of the screening test
- Healthy people need further tests
- Anxiety caused
- Health care resources