Medical Screening and Preventive Medicine

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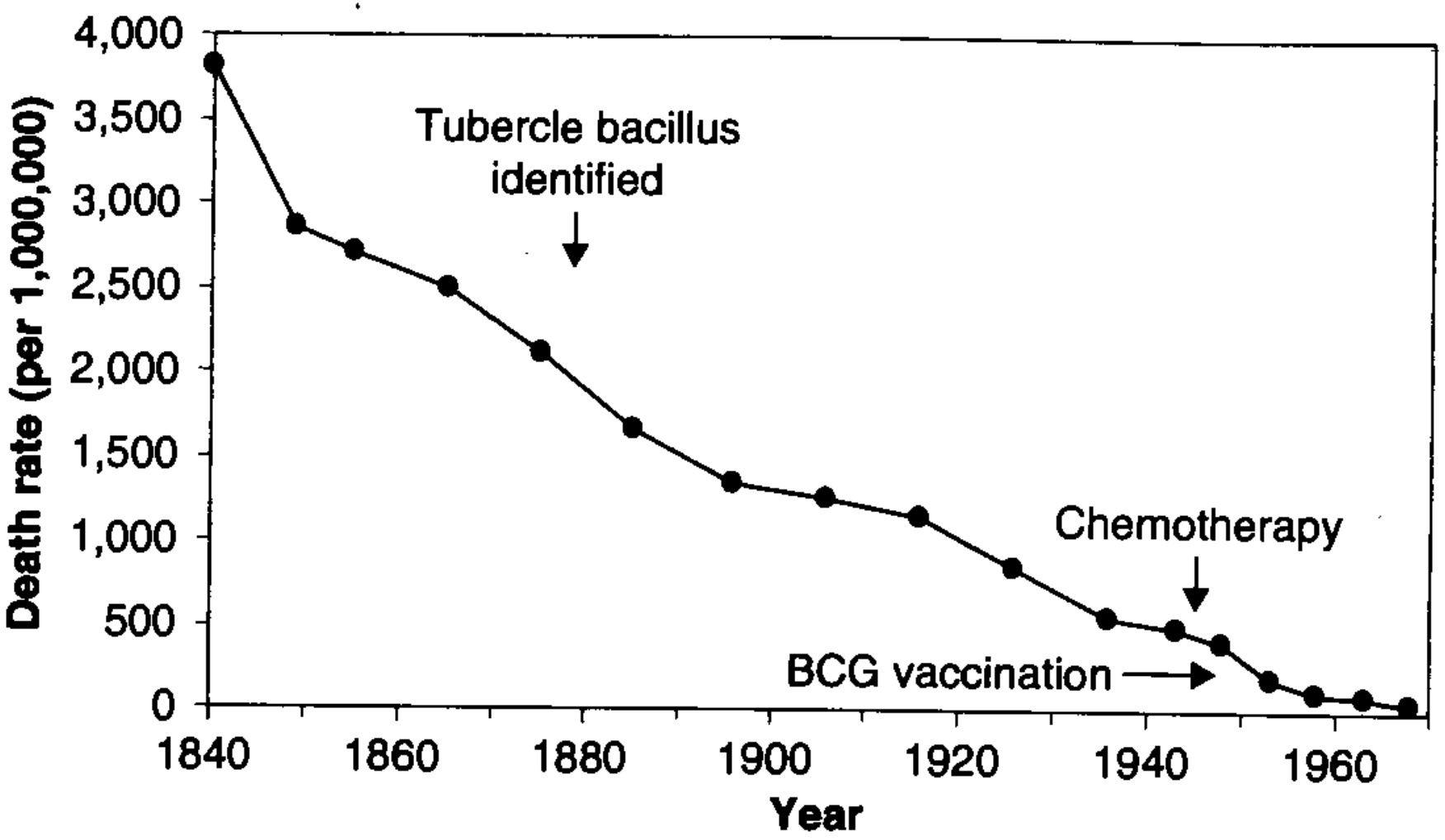
Preventive Medicine

- Prevention was defined by Last as:

"Actions aimed at eradicating, eliminating, or minimizing the impact of disease or disability, or if none of these is feasible, retarding the progress of disease and disability".

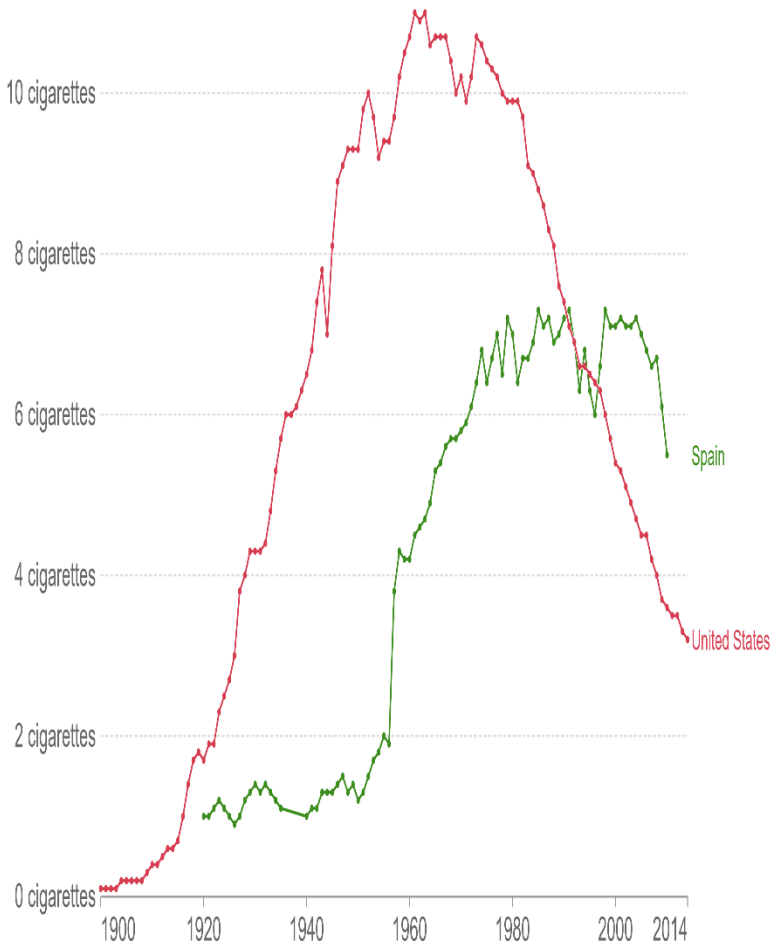
Primary prevention

- 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


Death rate (per 1,000,000)
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1840
1860
1880
1900
1920
1940
1960
Year
Tubercle bacillus identified
Chemotherapy
BCG vaccination

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.

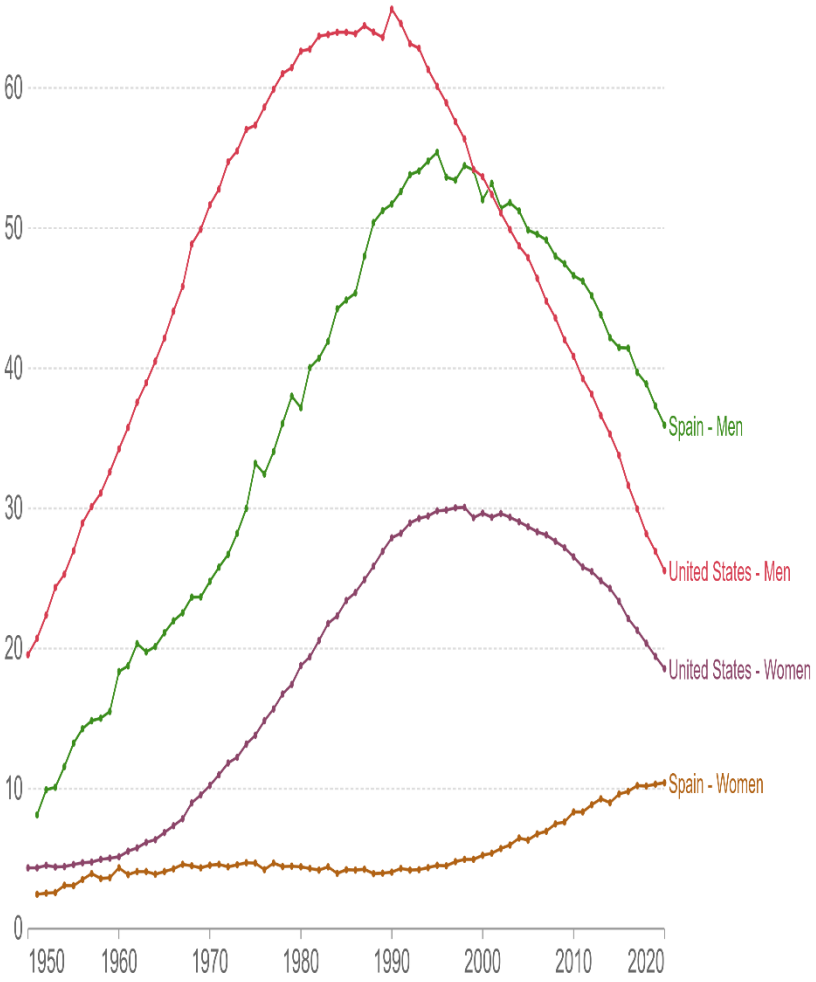


Source: International Smoking Statistics (2017)

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?

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 or early diagnosis** followed by evidence based interventions

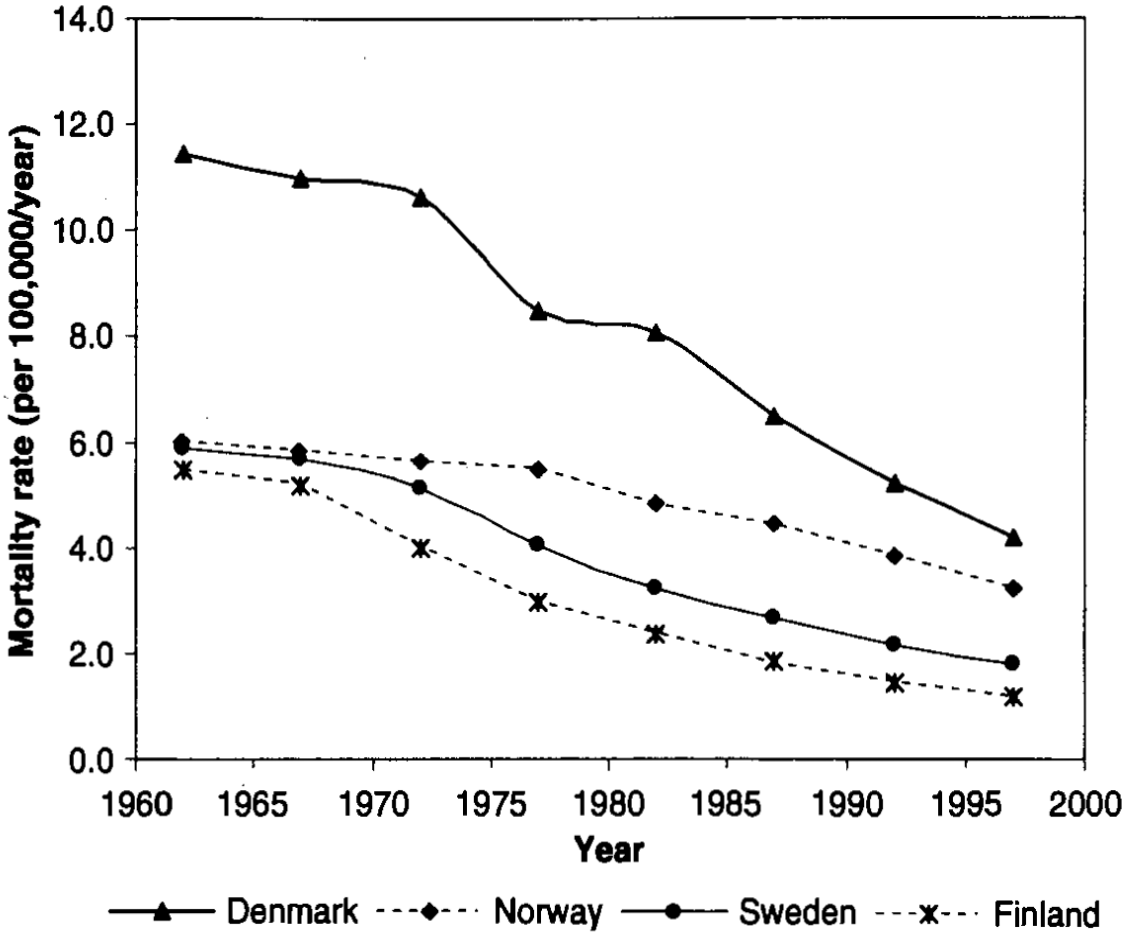


Fig. 14.5 Cervical cancer mortality rates (standardised relative to the world population) from 1950–1998 in the Nordic countries. (Data source: WHO Statistical Information System, accessed via http://www-depdb.iarc.fr/who/menu.htm, March 2004.).

Journal of Renal Care

Original Research

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 (±SD) was 55.0 ± 12.5 years, their mean eGFR (±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.

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.

Quaternary prevention Evidence Based Medicine

- One of the strongest methods to avoid unnecessary medical processes is **Evidence based Medicine**
- (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

	Stages			Outcomes		
Intervention strategies	**Health**	**Asymptomatic**	**Symptomatic**	**Disability**	**Recovery**	**Death**
	→		→			
Levels of prevention	**Primary** →	**Secondary**	→	**Tertiary**		
	Quaternary (Evidence Based Medicine) →					

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.

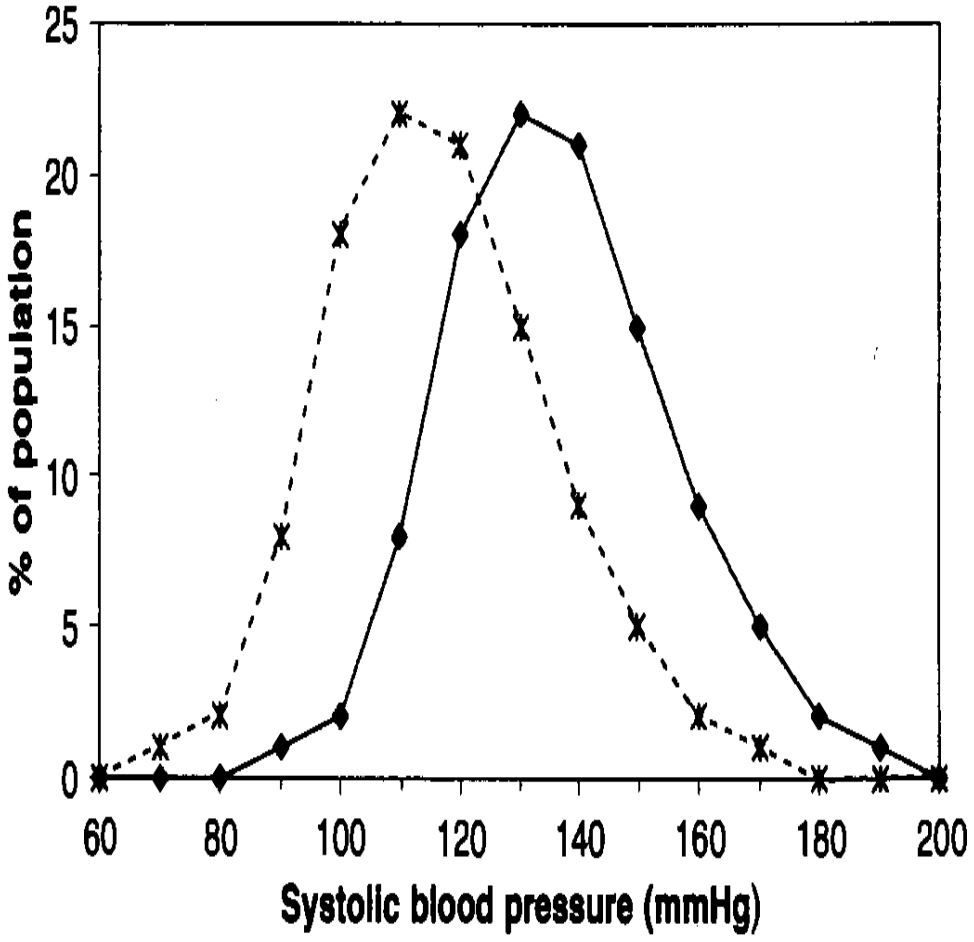
Screening only older pregnant women, who are known to be at high risk of conceiving a child with Down's syndrome, will miss the majority of afflicted fetuses, which are conceived by younger women in who most pregnancies occur.

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.)



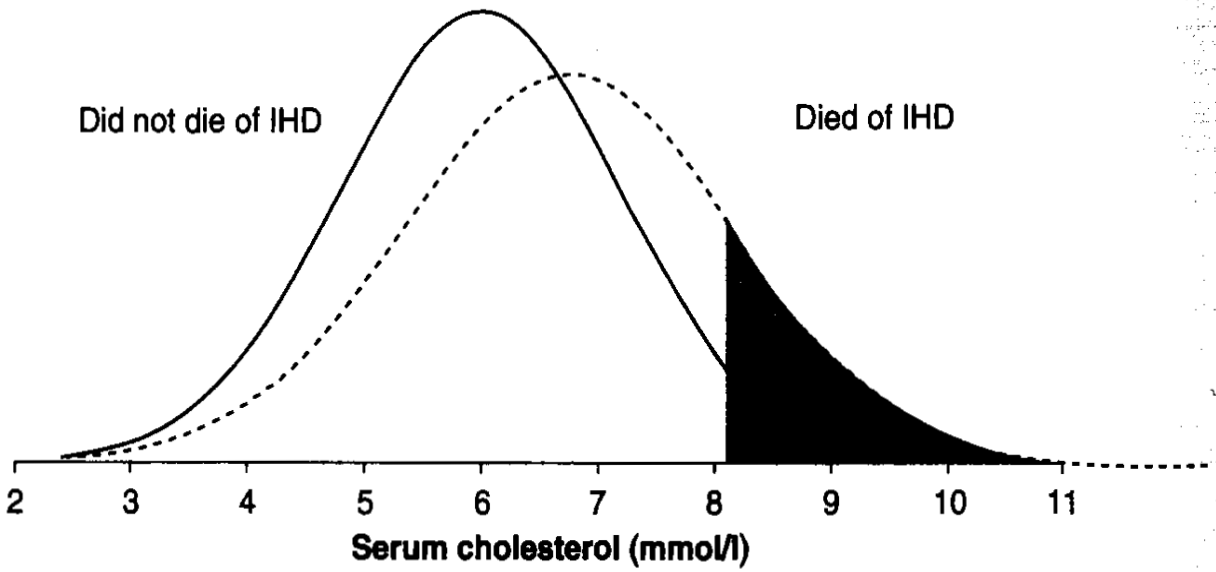


Fig. 13.6 Relative distributions of serum cholesterol levels in men who subsequently died of ischaemic heart disease and men who did not. (From Wald and Law, *BMJ*, 2003; **326**: 1419–1425, reproduced with permission from BMJ Publishing Group.)

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

Ten most common cancers among Jordanians both genders, 2017

No	Site	Freq	%
1	Breast	1302	20.5
2	Colorectal	678	10.8
3	Lymphoma	485	7.6
4	Trachea, Bronchus, Lung	480	7.5
5	Thyroid	293	4.6
6	Bladder	248	3.9
7	Prostate	236	3.7
8	Leukemia	233	3.6
9	Stomach	211	3.3
10	Brain, Nervous system	185	2.9

Ten most common cancers among Jordanians, Males, 2017.

No	Site	Freq	%
1	Colorectal	371	12.4
2	Trachea, Bronchus, Lung	366	12.2
3	Prostate	236	7.9
4	Bladder	215	7.2
5	Non-Hodgkin lymphoma	159	5.3
6	Leukemia	158	5.3
7	Stomach	127	4.2
8	Kidney	117	3.9
9	Brain, Nervous system	102	3.4
10	Hodgkin disease	97	3.2

Ten most common cancers among Jordanian Females, 2017.

No	Site	Freq	%
1	Breast	1292	38.4
2	Colorectal	307	9.1
3	Thyroid	223	6.6
4	Corpus Uteri	148	4.4
5	Non-Hodgkin lymphoma	136	4.0
6	Ovary	109	3.2
7	Trachea, Bronchus, Lung	107	3.2
8	Hodgkin disease	93	2.8
9	Brain, Nervous system	84	2.5
10	Stomach	83	2.5

Factors Influencing Survival from Cancer

Treatment:

- Availability
- Access
- Quality

Disease:

- Natural history
- Clinical extent
- Definitions

Early Detection:

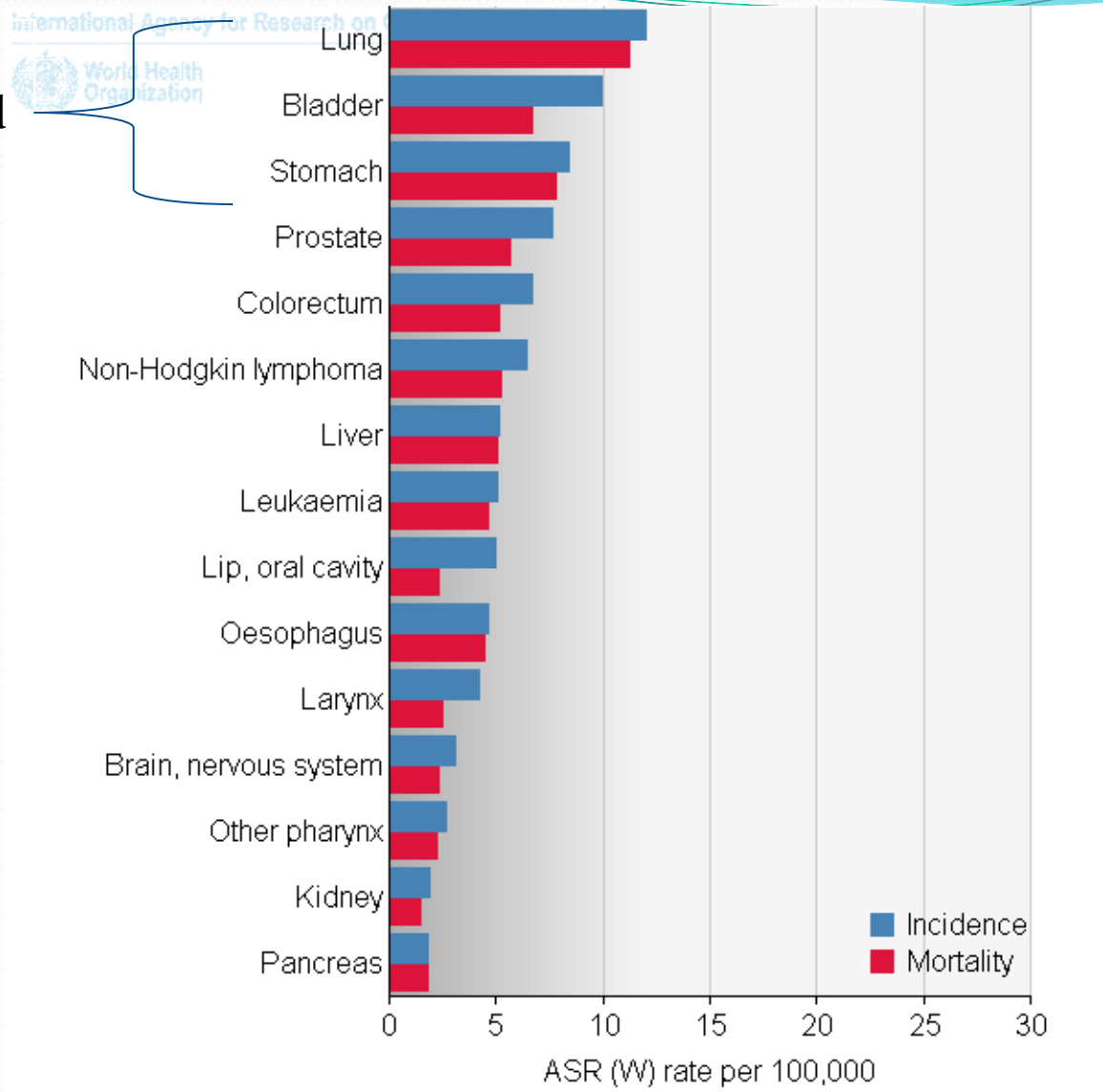
- Early clinical detection
- Screening

Host:

- Age
- Sex
- SES
- Comorbidity
- Behaviour

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

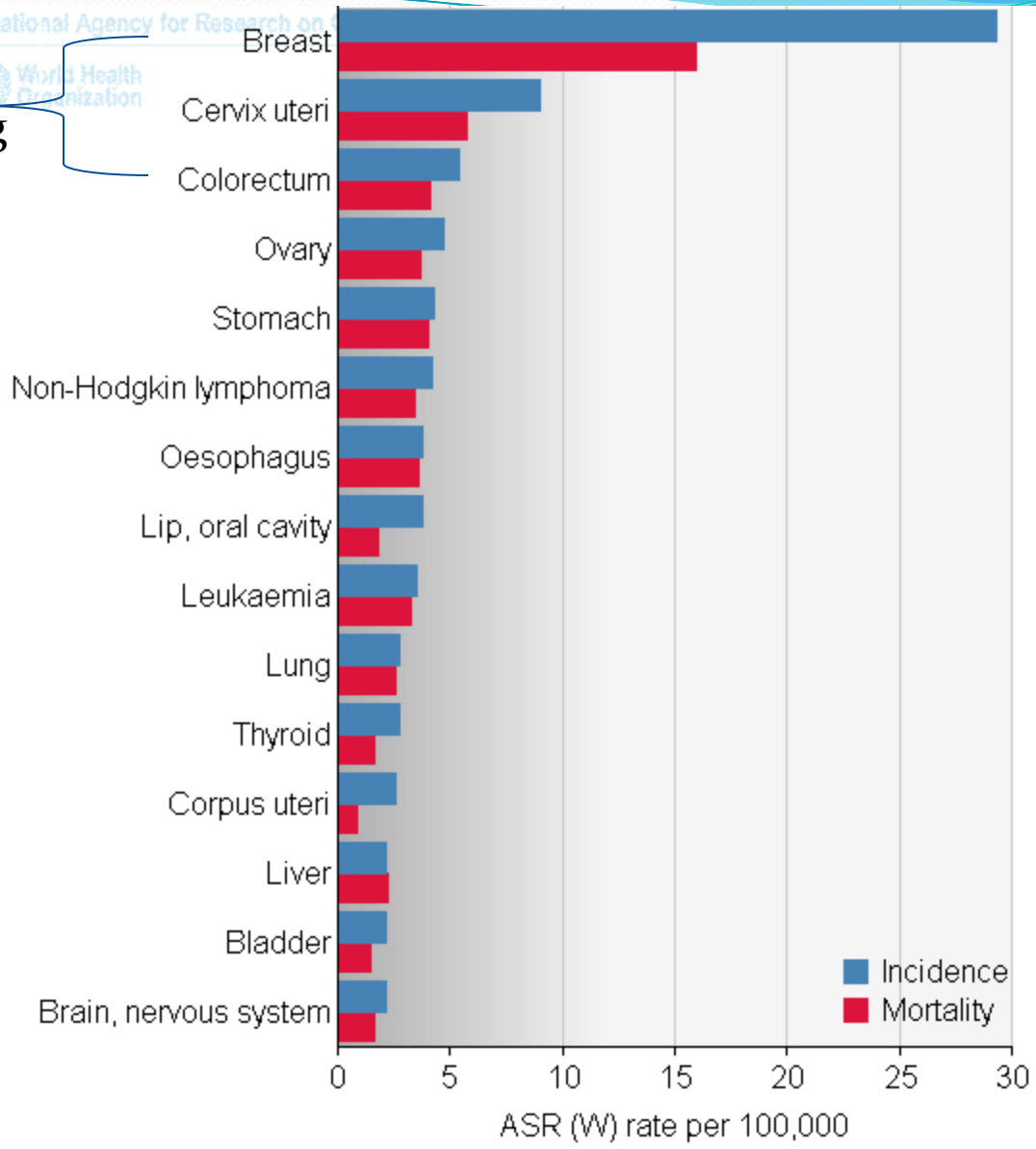
Can be prevented



http://globocan.iarc.fr/factsheet.asp#MEN

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

We can detect them through national systematic screening programmes



http://globocan.iarc.fr/factsheet.asp#MEN

Compare

lung cancer prevention with breast cancer prevention

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

		Stages		Outcomes		
Intervention strategies	**Health**	**Asymptomatic**	**Symptomatic**	**Disability**	**Recovery**	**Death**
Levels of prevention	**Primary**	**Secondary and Quaternary (Evidence Based Medicine)**		**Tertiary**		

Medical Screening

What is screening

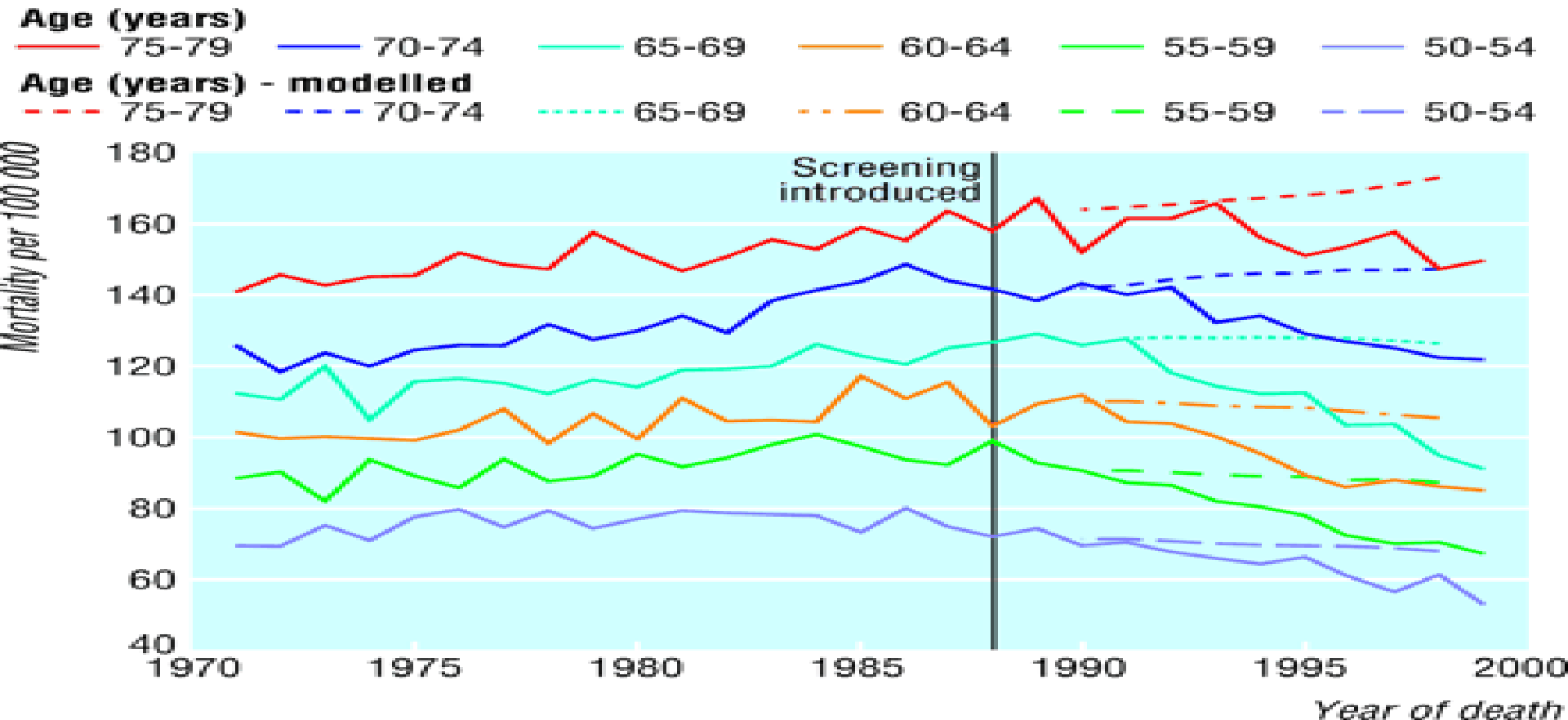
"The systematic application of a test or enquiry, to identify individuals at sufficient risk of specific disorder to benefit from further investigation or direct preventive action, among persons who have not sought medical attention on account of symptoms of that disorder." Wald,2004

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 the lipid profile for your overweight or obese patients when they come to your clinic
- Refer women within age criteria for cervical or breast cancer screening

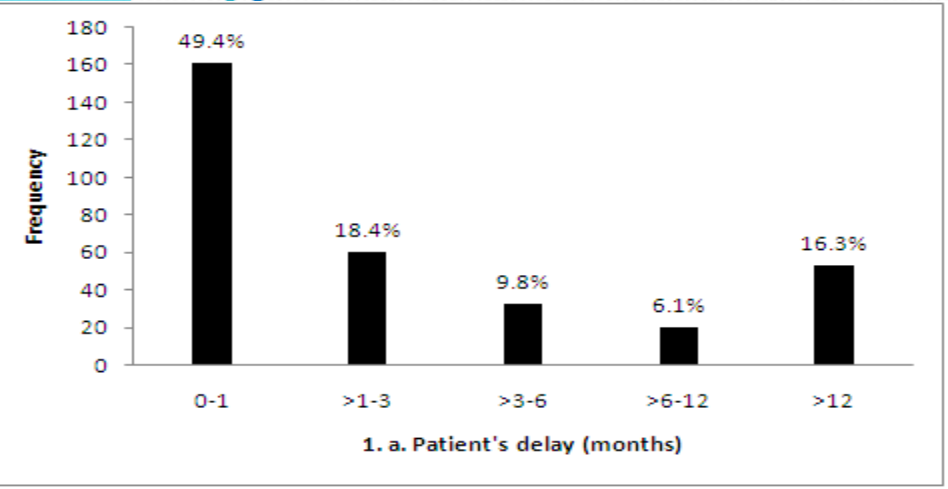
Screening versus diagnosis

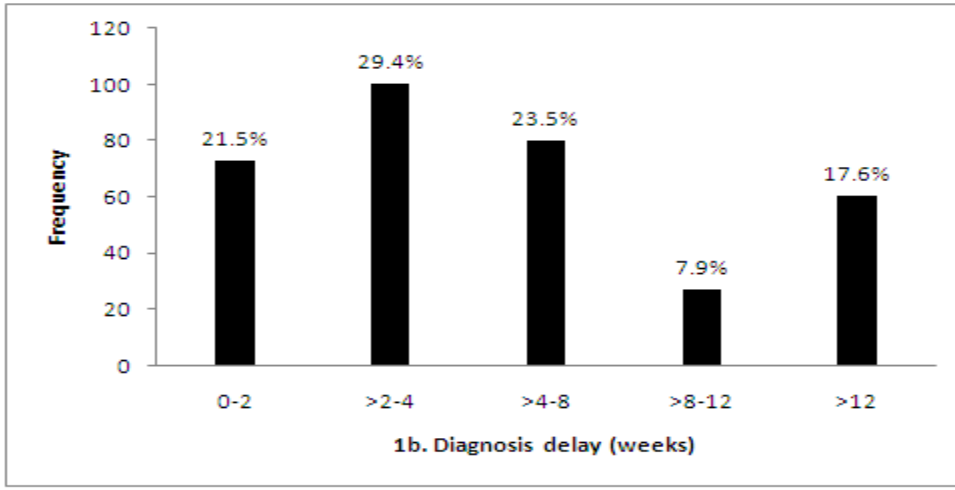
- Early detection: symptoms and signs
- It is essential to work in both directions in parallel way:
- Start your screening programs

&

- 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





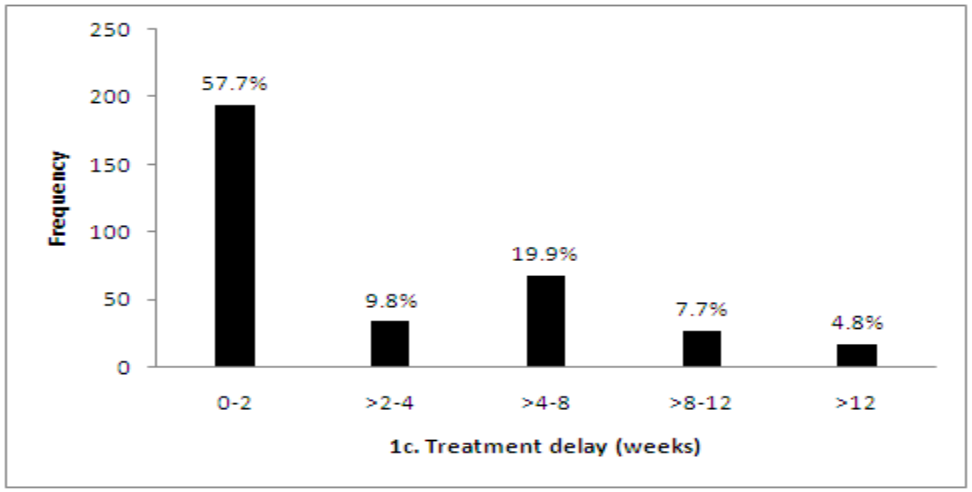
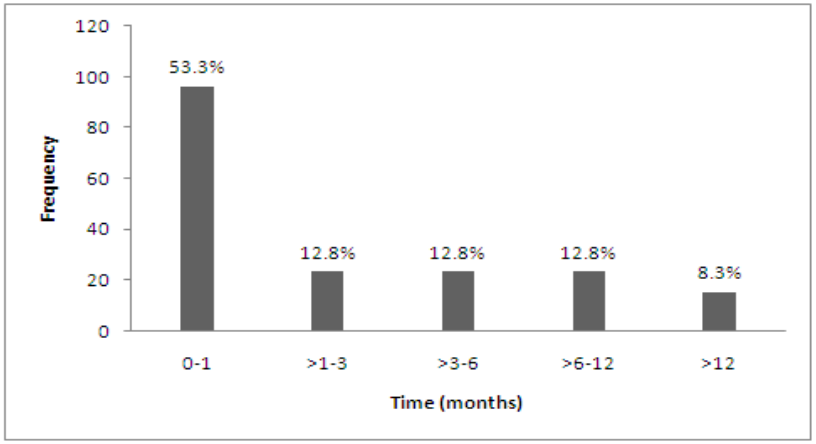


Figure 1: Proportion of participants by patient's delay, diagnosis delay, and treatment delay

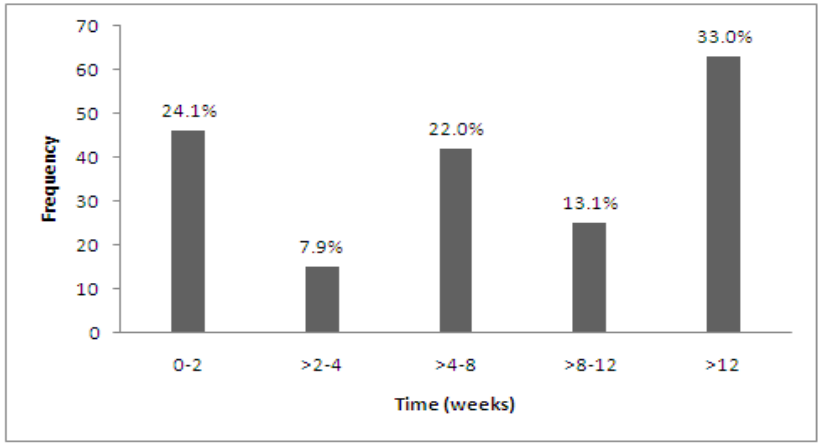
Abu-Helalah, M., Alshraideh, A. H., Al-Hanaqtah, M. T., Da'na, M. D., Al-Omari, A., & Mubaidin, R. (2016). Delay in presentation, diagnosis, and treatment for breast cancer patients in Jordan. *The breast journal*, *22*(2), 213-217.

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

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



(a)



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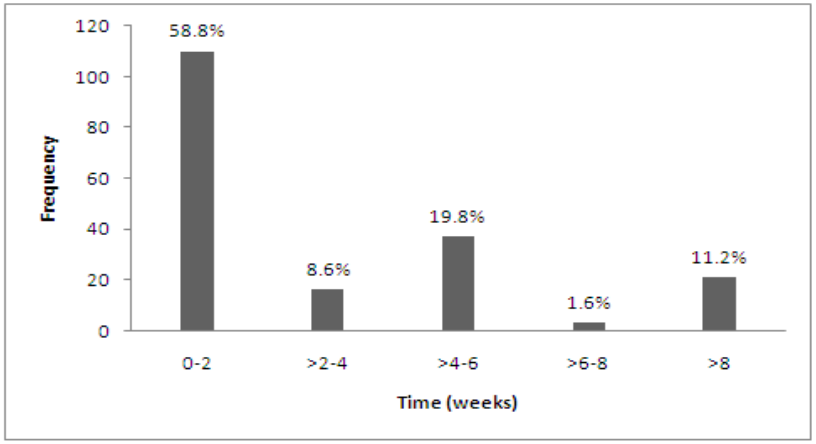

(c)

Abu-Helalah, M. A., Alshraideh, H. A., Da'na, M., Al-Hanaqtah, M. T., Abuseif, A., Arqoob, K., & Ajaj, A. (2016). Delay in presentation, diagnosis and treatment for colorectal cancer patients in Jordan. *Journal of gastrointestinal cancer*, *47*(1), 36-46.

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 for inborn errors of metabolism.

Phenylketonuria screened for 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 phenlylalanine.

If undetected leads to severe mental and growth retardation.

Early Detected cases easily treated by dietary restriction of PKU.

Congenital hypothyroidism screening in Jordan

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

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

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

ORIGINAL ARTICLE

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

M Abu-Helalah, M R Law, J P Bestwick, J P Monson and N J Wald

J Med Screen 2010;**17**:164–169
DOI: 10.1258/jms.2010.010057

Objective To assess the value of population screening for adult hypothyroidism.
Setting Healthy people attending for a general health assessment.
Methods A thyroid-stimulating hormone (TSH) measurement was performed on people attending for a general health assessment (women aged 50–79 [35–49 with a family history of thyroid disease] and men aged 65–79). Those with TSH levels above 4.0 mU/L were invited to join a randomized double-blind crossover trial of thyroxine and placebo, each given in random order for four months. On entry a second blood sample was collected for a TSH measurement after the end of the trial to determine whether this would help select individuals for thyroxine treatment. The daily thyroxine dose started at 50 μg and if necessary was increased to achieve a TSH level of 0.6–2.0 mU/L.
Results There were 341 (8%) people with a TSH level above 4.0 mU/L, 110 met eligibility criteria (64 agreed to participate), and 56 (49 women, 7 men) completed the trial. Among the 15 individuals with a repeat TSH measurement above 4.5 mU/L, 11 reported feeling better on thyroxine than placebo and none reported feeling better on placebo ($P = 0.001$; four felt no different), indicating that in this group 73% benefitted (i.e. 11/15; 95% CI 45–92%). The main symptoms relieved were tiredness and loss of memory. There was no indication of harm. In the 41 individuals with a repeat serum TSH of 4.5 mU/L or less: 10 reported feeling better on thyroxine than placebo and 16 better on placebo ($P = 0.42$, 15 felt no different). Thus about 8% of men and women in the specified age groups had a TSH above 4.0 mU/L, and of these about a quarter had a repeat TSH above 4.5 mU/L, of whom about half would benefit from thyroxine treatment.
Conclusion The results indicate that screening for hypothyroidism would be worthwhile. Approximately 1% of people screened would have a better quality of life. Pilot screening programmes for adult hypothyroidism are justified.

See end of article for authors' affiliations

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Accepted for publication 25 August 2010

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.

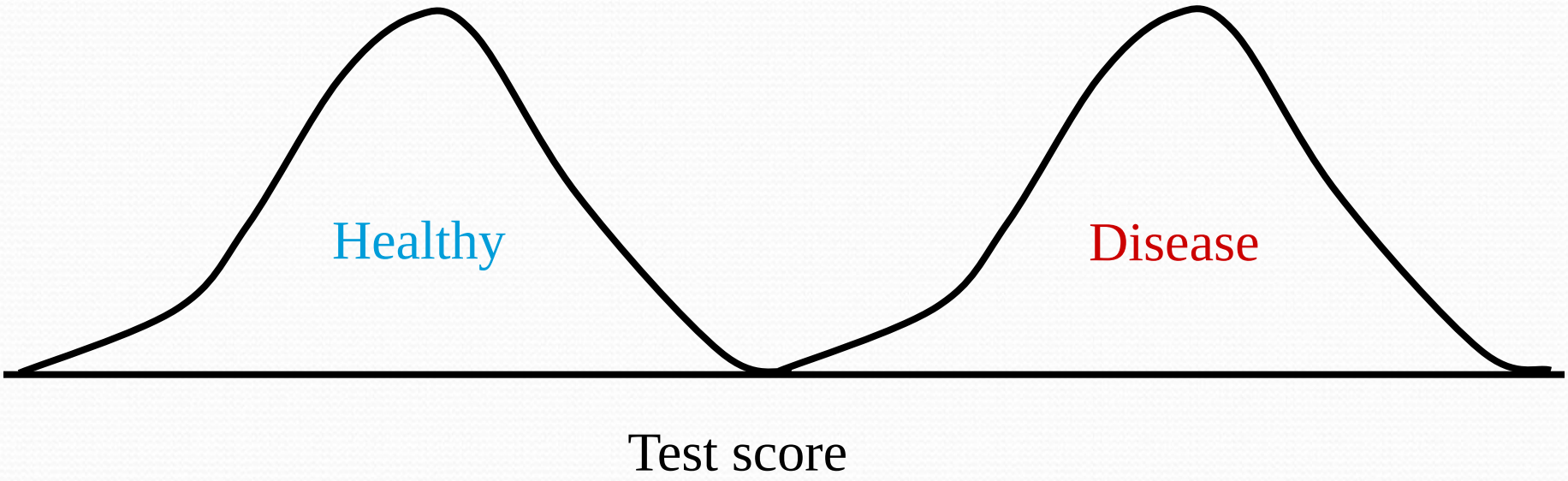
Screening test validity

- **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



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	c False negatives FN	d True negative TN

	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

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

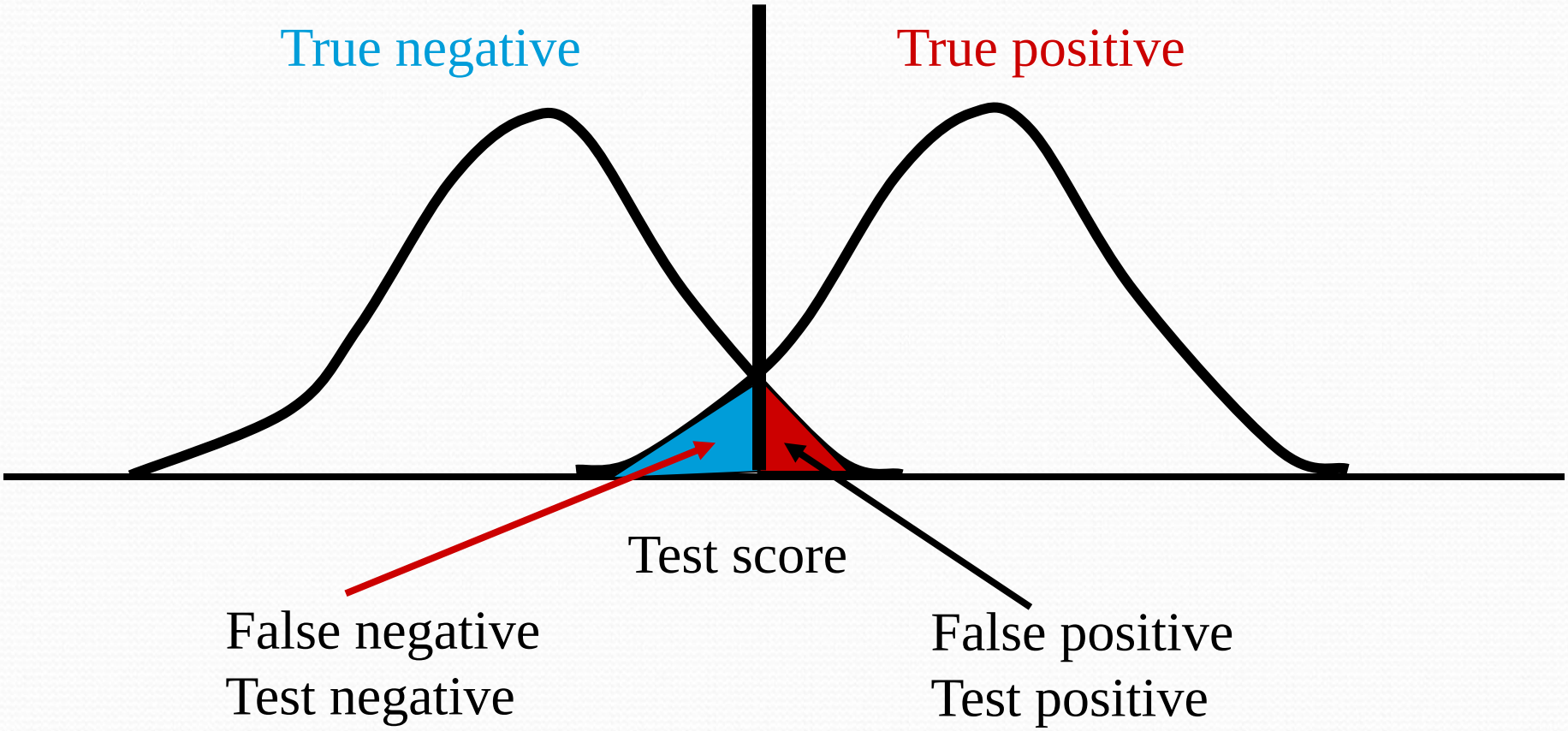
$$\textbf{\textit{Specificity}} = \frac{\textbf{\textit{Well people with a negaitive test}}}{\textbf{\textit{All well people}}} = \frac{\textbf{\textit{TN}}}{\textbf{\textit{TN} + \textit{FP}}}$$

False positive rate= FP/FP+TN

Test based on continuous data

- Hematocrit
- Blood glucose
- Optical density testing

the values between normal/disease overlap



False positive rate

- The proportion of unaffected individuals with positive test results.

- False positive rate= $\frac{b}{b+d}$ =1-specificty

Predictive values

- Positive predictive value= all true positives/all positives(all true and all false) ×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= True negatives/all negatives ×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

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

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

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

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-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)		
		Positive	***Negative***	
Fecal occult blood screen test outcome	***Positive***	**True Positive (TP) = 20**	**False Positive (FP) = 180**	**→ Positive predictive value = TP / (TP + FP) = 20 / (20 + 180) = 20 / 200 = 10%**
	Negative	**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-Specificity
More un-necessary colonoscopes and more cost for the program

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.

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

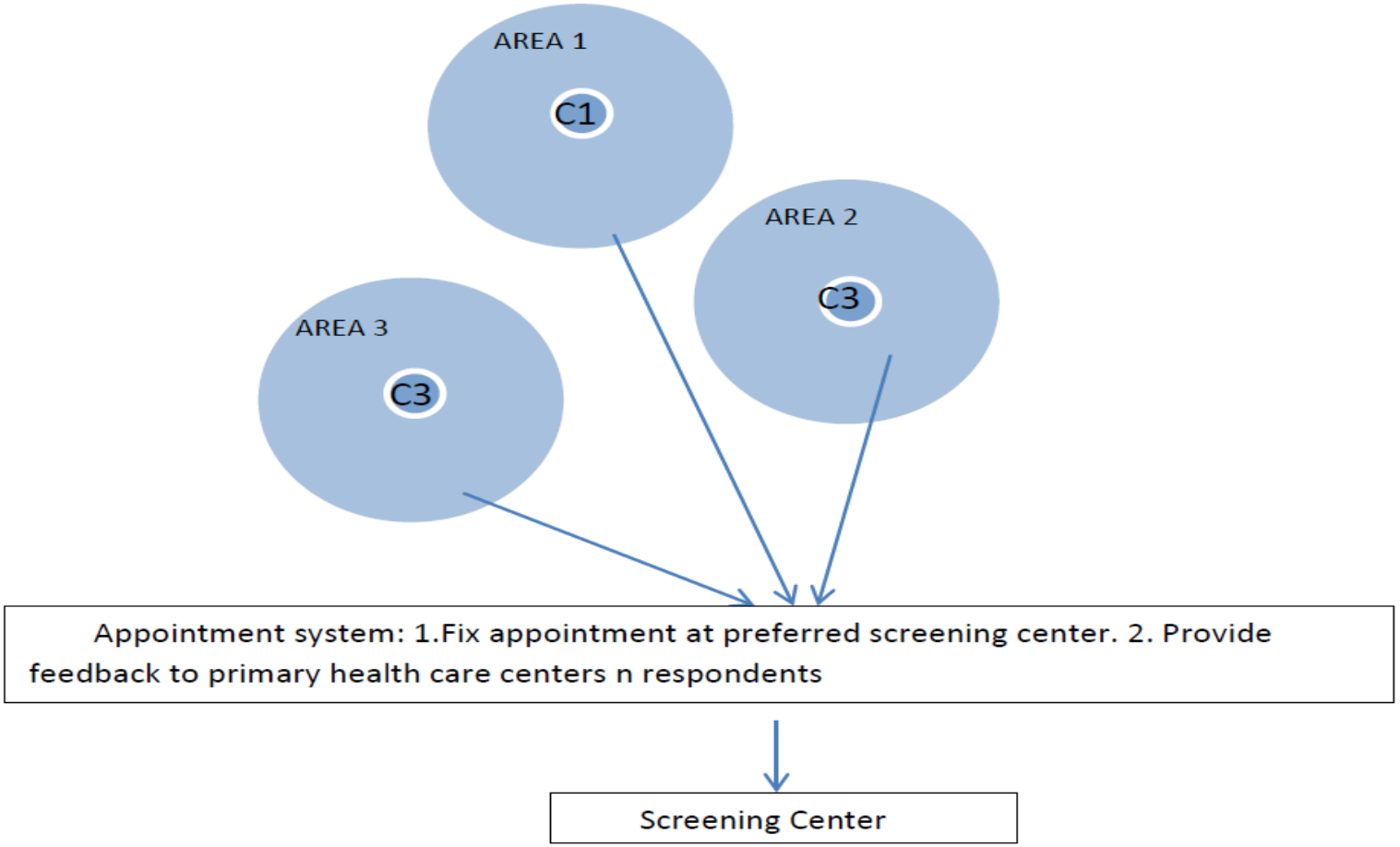
Systematic application

- 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 and should not be fixed to be on annual basis unless there is clinical evidence for that

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

AK Hackshaw*[,1] and EA Paul[1]

[1]*Barts & The London School of Medicine & Dentistry, Wolfson Institute of Environmental & Preventive Medicine, Queen Mary, U Charterhouse Square, London EC1M 6BQ, UK*

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

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

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

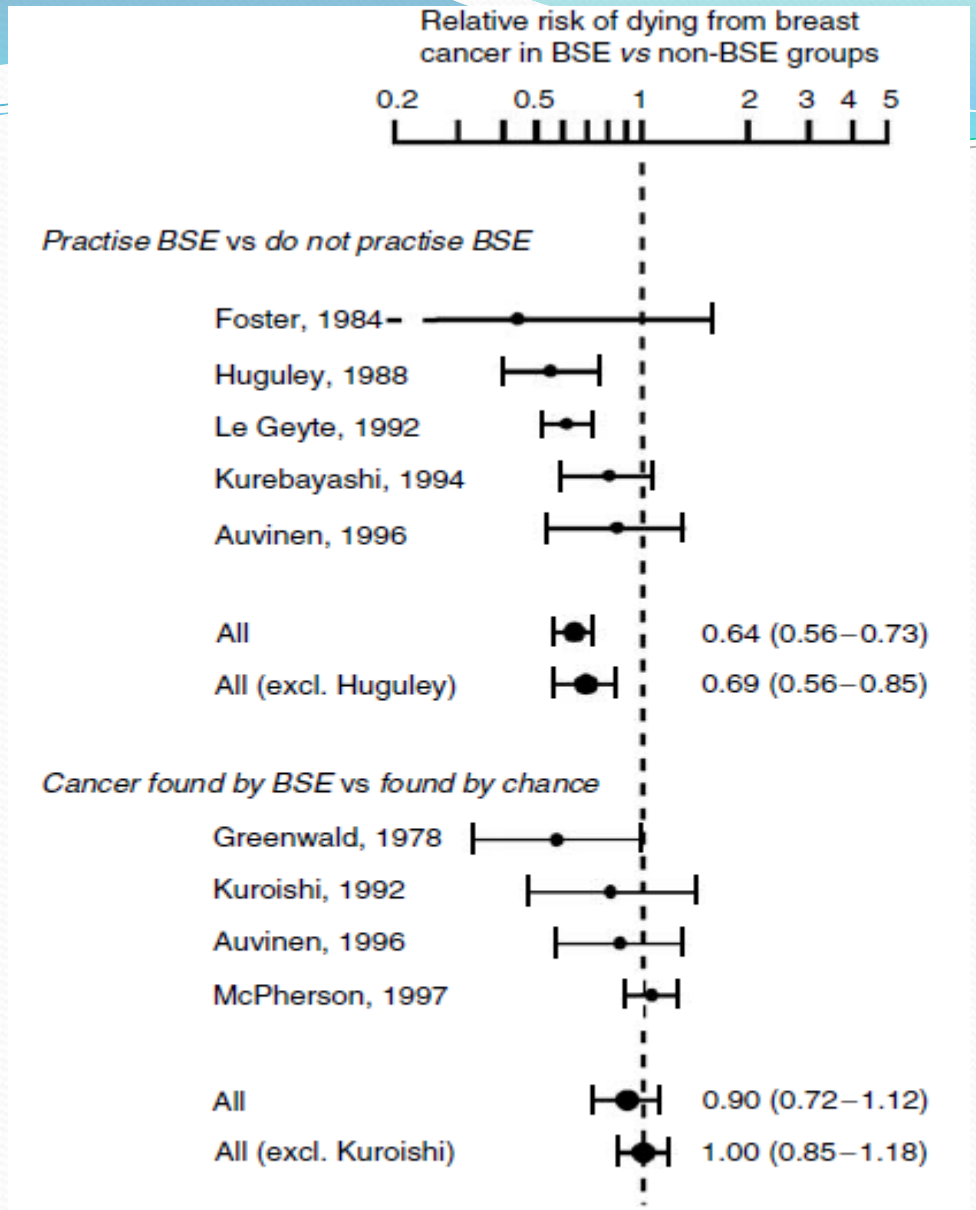
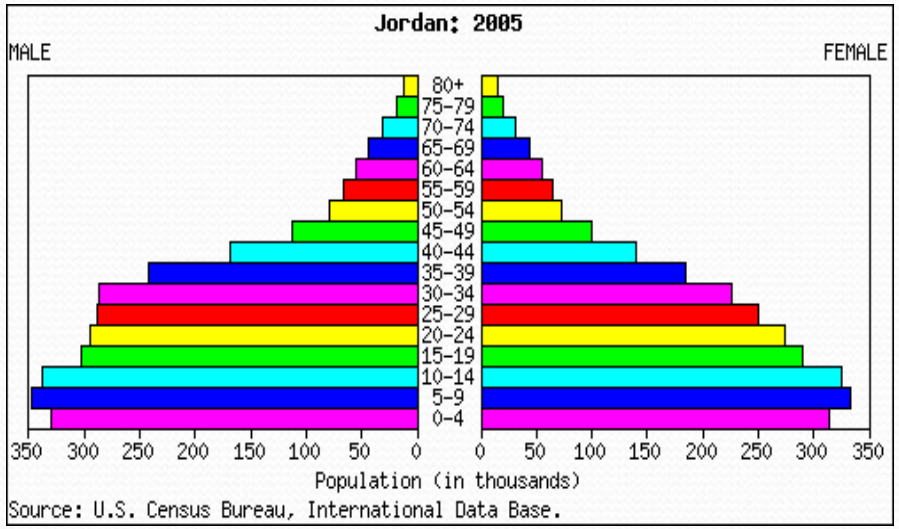
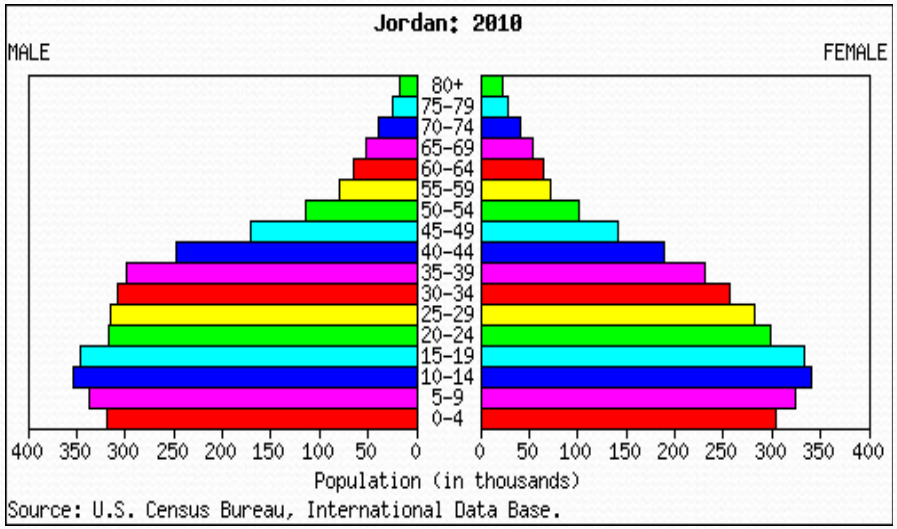
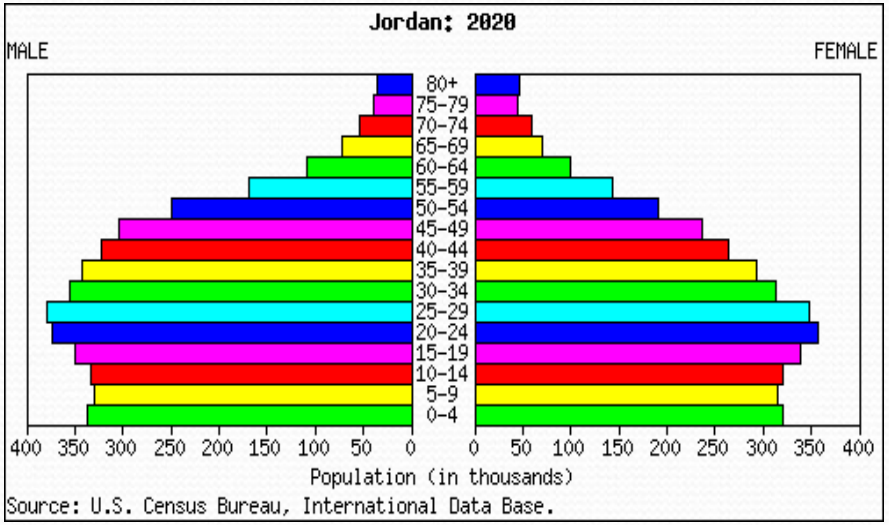


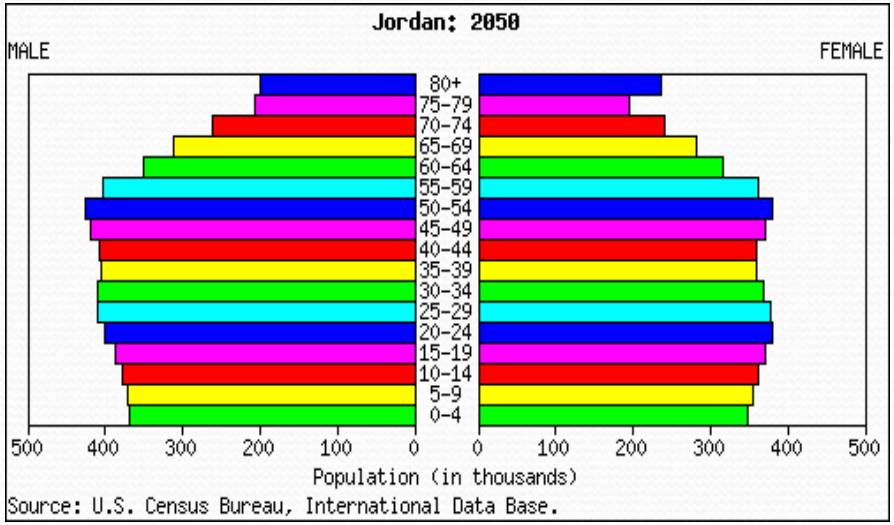
Figure 1 Observational studies of women with breast cancer, comparing the breast cancer death rates between the BSE and non-BSE groups. A test for heterogeneity between the studies yielded a *P*-value of 0.41 for those studies based on women who practise BSE and a *P*-value of 0.26 for those based on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

Acceptability of programme to the public and health care staff.

- Screening test, diagnostic test and therapeutic options should be ethically and socially accepted by the general public and the health care professionals.

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

EUROPEAN JOURNAL OF PUBLIC HEALTH 1997, 7: 68-76

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

Bias related to medical screening

- Lead time bias: screened cases are detected at an earlier stage than that in which treatment would be worthwhile.

  Does treatment work better at this stage?
- Length time bias: cases detected through screening are slowly progressive and may not harm the patient in lifetime
- Selection bias: respondents are different from decliners

Volunteer bias:

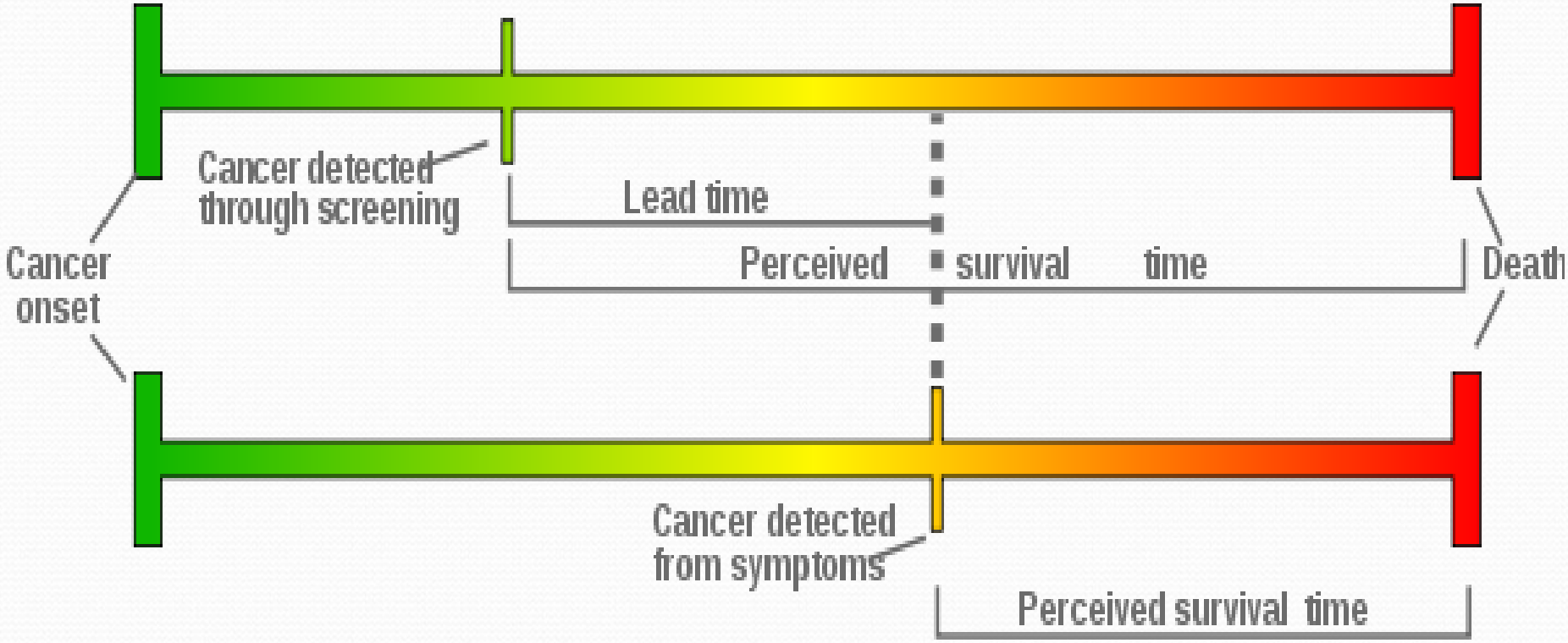
- They tend to be of higher socioeconomic class
- More health-conscious
- Comply better with prescribed advice
- Therefore, better results for a screening programme of volunteers compared with disease outcomes for non-voluntees may be relate to factors associated with the “volunteerism” rather than benefits 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


Cancer detected through screening
Lead time
Cancer onset
Perceived survival time
Death
Cancer detected from symptoms
Perceived survival time

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 CruijsenRonald 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

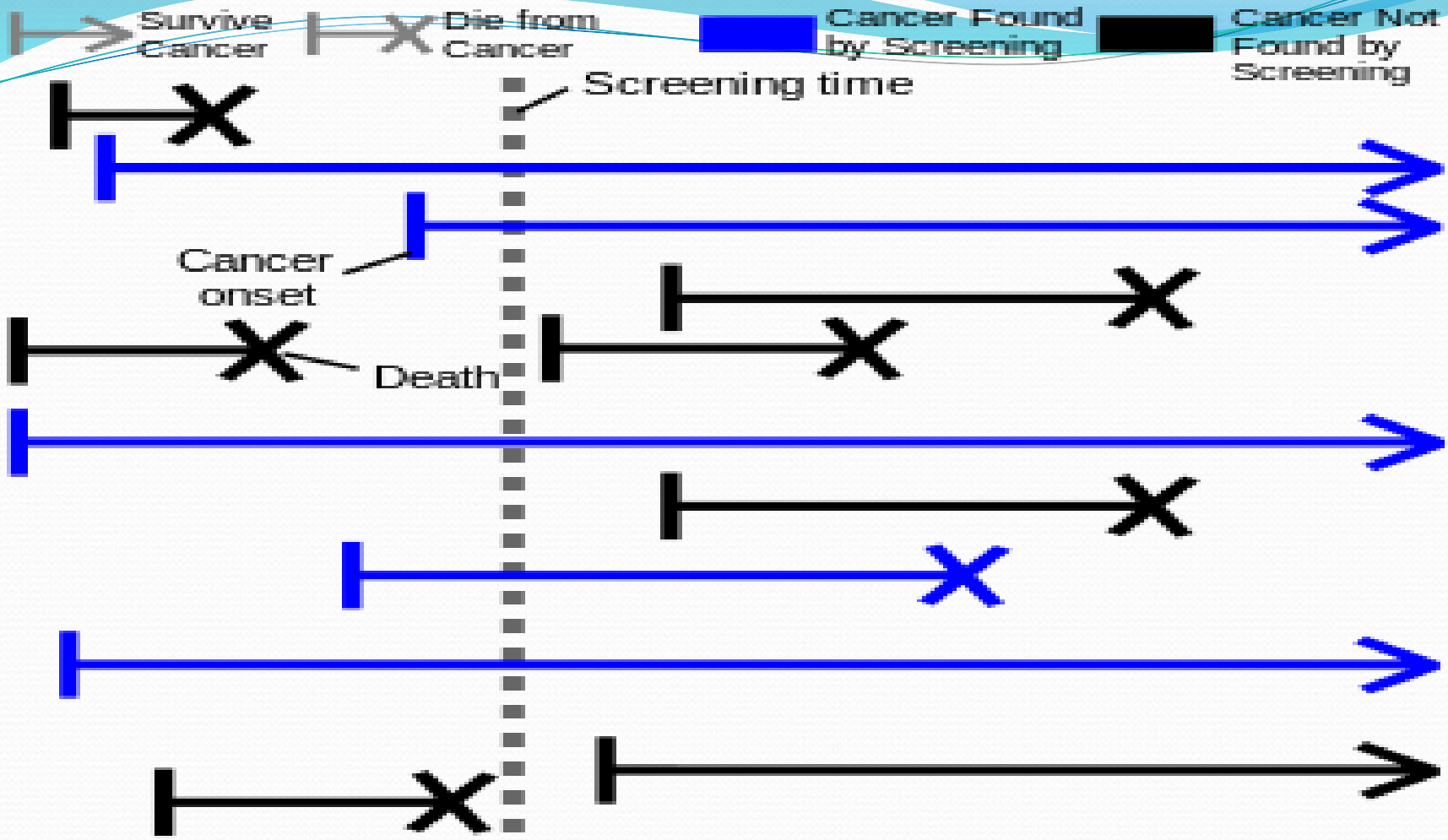
Global Center for Public Health and Disease Control, Global Academy for Health Sciences, OH USA

Length time bias

- It is a form of selection bias.
- When we screen for disease were 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.

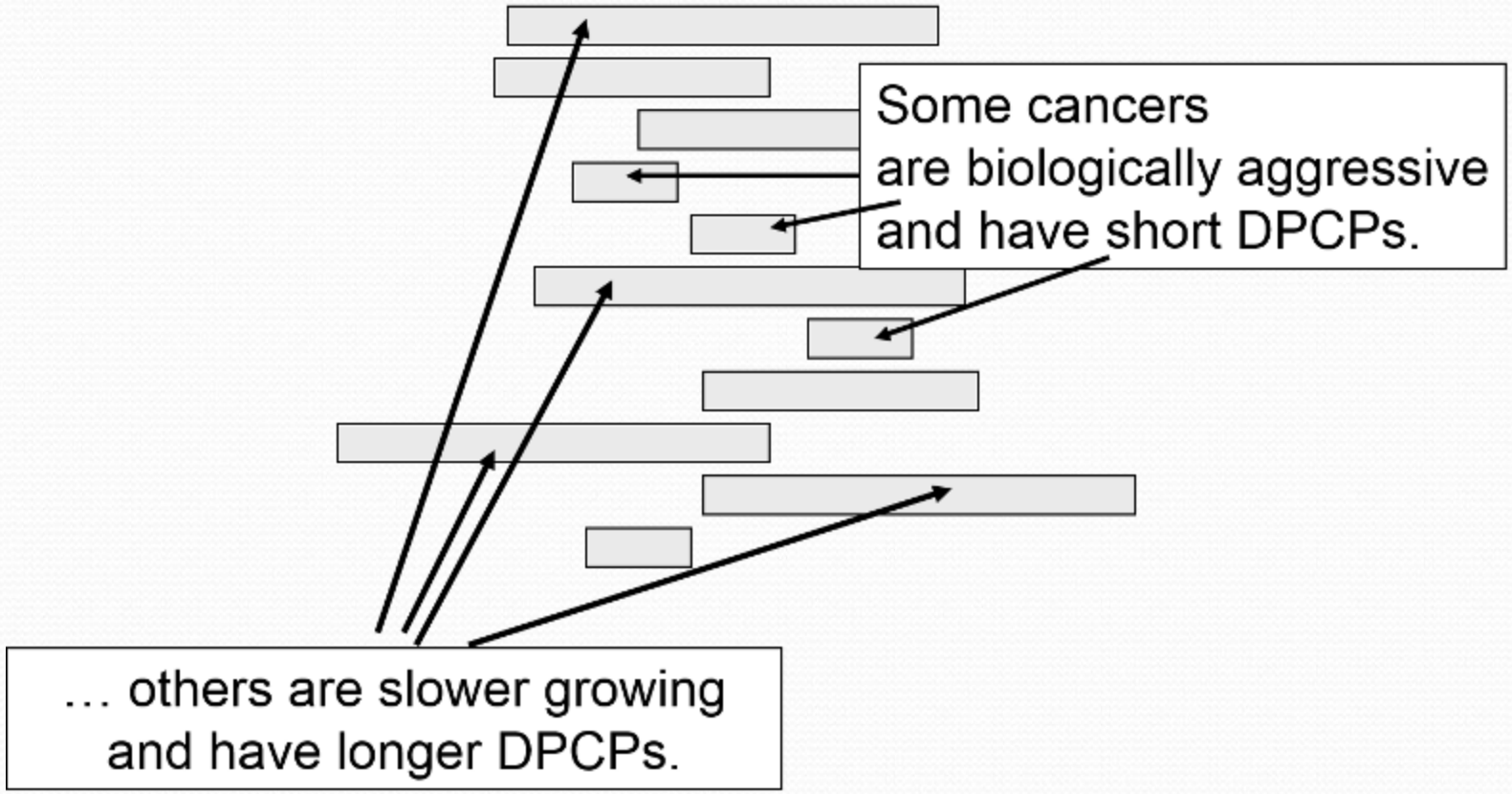
Length time bias

- 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.



	Death from Cancer	Survive Cancer	% Surviving Cancer
Cancer Discovered Through Screening	1	4	80%
Not detected through Screening	7	5	41.7%

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

Pilot basis

- What is my next step?

Quality Assurance

- Quality assurance means that the assessment of the service provided and applying modifications when necessary.
- This includes various steps such as recruitment, registration, waiting time, test procedures, results handling and follow up or referral for treatment procedures.
- Clinical audit

My programme is already in place

- Continuous monitoring and regular evaluation

Community medicine:

- Register your attendance with your university number
- Make sure that the settings of your phone allow tracking location

Go to settings > privacy> location> services> make sure that location services is ON

Thank you!