



PERÚ

Ministerio  
de Salud

# Estudio costo/Efectividad de intervenciones en cáncer de mama en el Perú

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# Cost-effectiveness of Breast Cancer Control in Peru

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# Why are economic evaluations important?

- Answers questions like:
  - Is this intervention more valuable than another intervention?
  - What are the main costs of our healthcare system and how can we spend our money more efficient?
- Connects costs with consequences
- Contributes to insightfull decisions



# Objectives of economic analysis in Peru

- Recent developments in Peru:
  - Comprehensive cancer control strategies (2006)
  - Law on universal insurance coverage (2009)
  - Less than 60% coverage
  - Limited resources (300 million 2012)

Which breast cancer control interventions can we offer that provide value for money, within our budget?



# Cost-effectiveness analysis in Public Health



- Cost-effectiveness analysis aims to maximise health outcomes for a given budget
- For each intervention, assess costs and assess health outcomes

*Costs of an intervention*

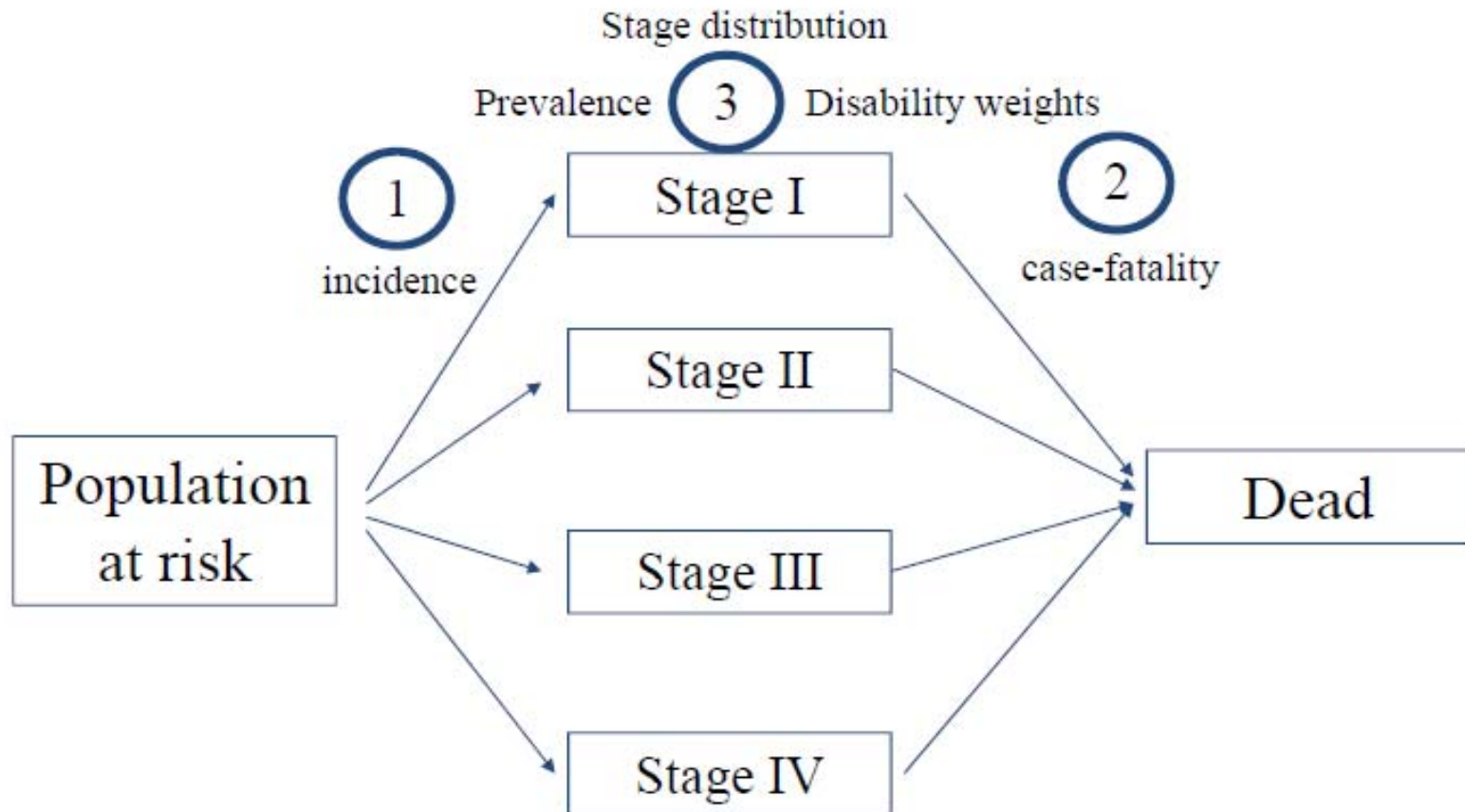
$CER = \frac{\text{-----}}{\text{-----}}$

*Effects of an intervention*

- Can guide decisions on health care spending from economic perspective



# Breast Cancer Model : Simplified

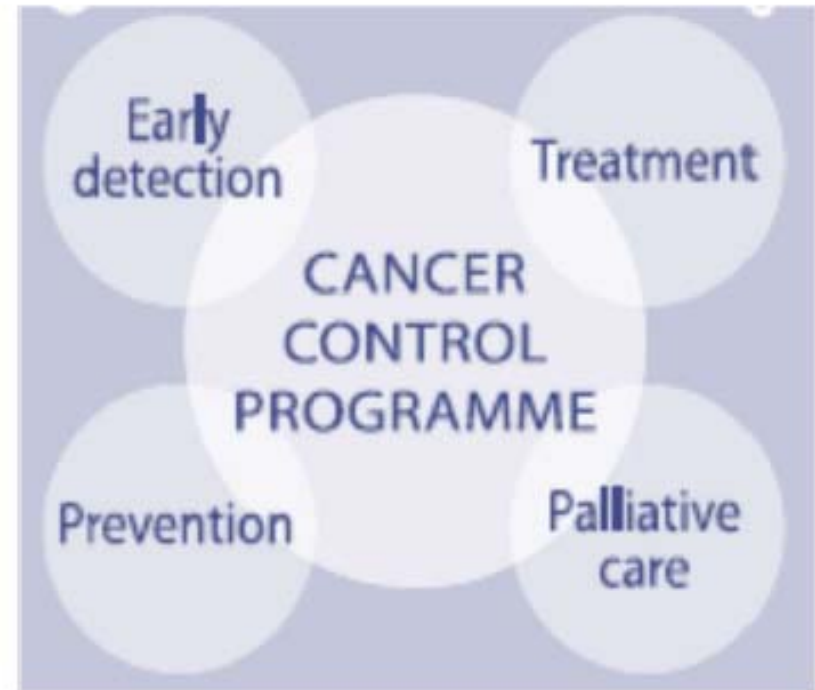




# Breast Cancer Interventions



- Prevention
  - Lifestyle
- Early detection
  - awareness campaigns
- Screening
  - Mammography screening
  - CBE screening
- Treatment
  - Local
  - Systemic
- Palliative care



## Treatment of individual stages

### Stage I treatment:

lumpectomy with axillary dissection and radiotherapy (33 fractions). Eligible patients receive tamoxifen

### Stage II treatment:

modified radical mastectomy followed by adjuvant chemotherapy and radiotherapy (33 fractions) Eligible patients receive tamoxifen or chemotherapy.

### Stage III treatment:

adjuvant chemotherapy and radiotherapy (10 fractions). Eligible patients receive tamoxifen.

### Stage IV treatment:

adjuvant chemotherapy and radiotherapy (10 fractions) + Standard Palliative Care. Eligible patients receive tamoxifen.

### Stage I to IV combined

- with Trastuzumab in HER2 positives.
- without trastuzumab



## Screening combinations

**clinical breast examination (CBE) screening** in asymptotically women: community nurses training program + active outreach screening by community nurses + limited media activities.

- with upfront FNA
- annual/biennial/triennial
- ages 40-69/40-64/45-64

**Mammography screening (60% fixed units)** in asymptomatic women limited media activities.

- biennial, ages 45-64
- biennial, ages 50-69
- triennial, ages 45-64

**Mammography screening (60% fixed + 40% mobile)** in asymptomatic women limited media activities.

- annual/biennial/ triennial
- ages 40-69/40-64/45-64

**Mammography screening (60% fixed + 40% mobile)** in ages >50 / combined with **CBE screening** in ages <50

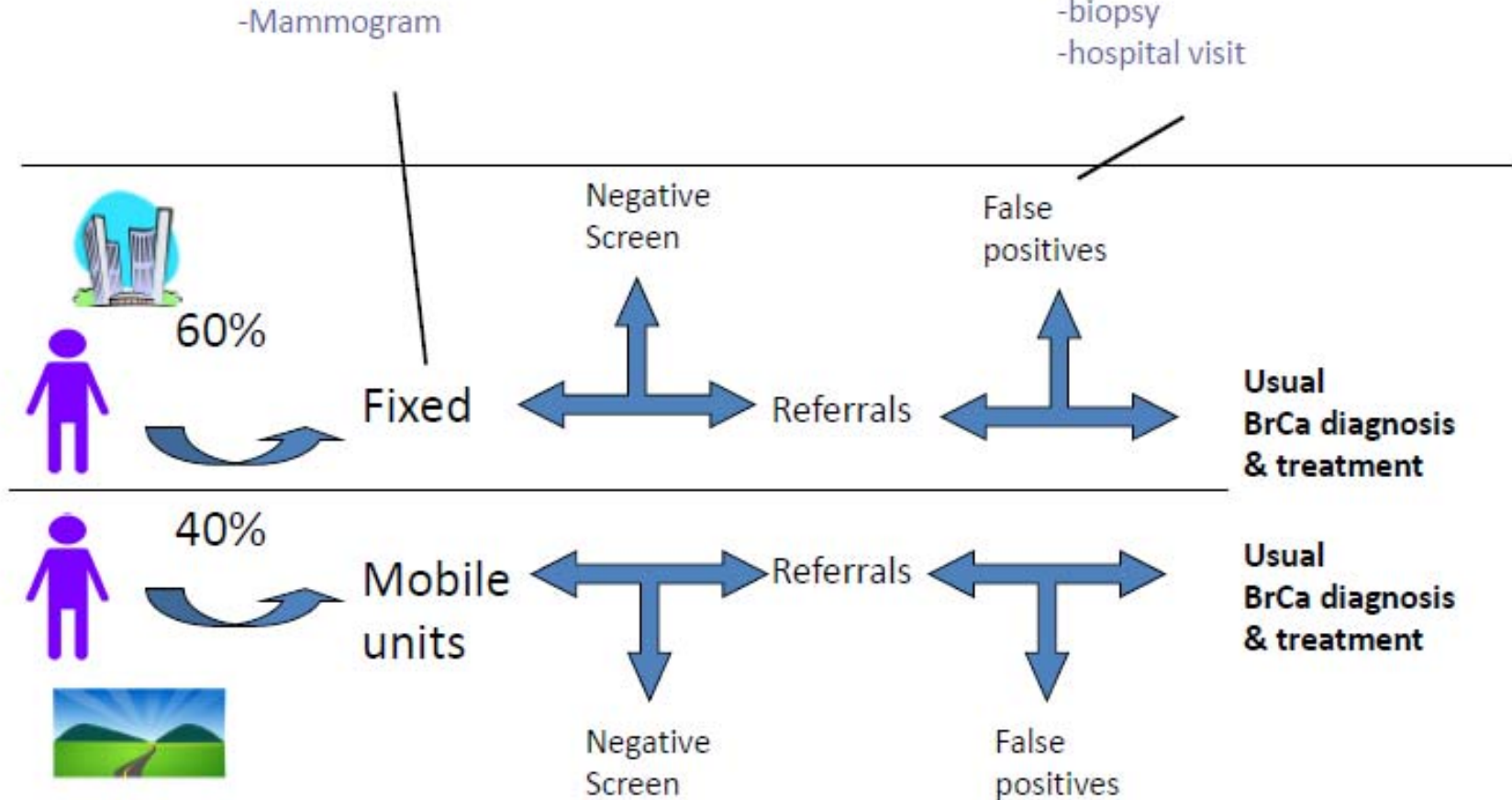
- with upfront FNA
- triennial/biennial
- ages 40-69/45-64



# Modelled mammography screening programs



- Mammogram
- Ultrasound
- FNA
- biopsy
- hospital visit



## **Palliative Care**

### **Standard Palliative Care (SPC):**

pain treatment through pain medication and anti-emetics, palliative radiotherapy (8 Gy in 1 boost) for eligible patients. Includes end of life hospitalization.

### **Basic Palliative Care (BPC):**

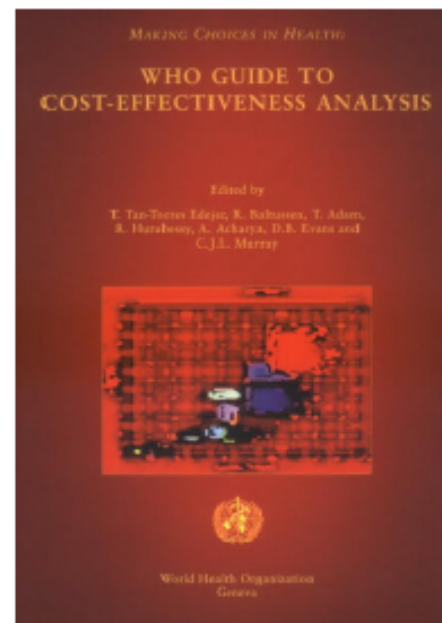
SPC + palliative care-volunteers training program + home based visits by volunteers every fortnight. Includes end of life hospitalization.

### **Extended Palliative Care (EPC):**

SPC+ BPC apart from community nurses instead of palliative care-volunteers, medication strengthened with anti-depressants, and bisphosphonates. Includes end of life hospitalization.



# Methods: estimating costs



Introduction

Interventions

Methods

Results

Discussion

# Costs

- ***Patient costs***
  - *e.g. hospital bed days, outpatient visits, drugs, PHC visits, diagnostic tests, surgery, follow-up.*
- ***Program costs***
  - *e.g. administration, salaries, supervision trips, office costs*
  - *Costs for training.*



# The (Cost) Perspective



The perspective is the point of view from which the costs and benefits are recorded and assessed.  
The choice of perspective must be derived logically from the research question.

<b>Patient</b>	fees, travel costs
<b>Insurance</b>	DRG product tariffs
<b>Health Care</b>	administration costs, staff, treatment costs, program cost
<b>Non-Healthcare</b>	productivity loss, travel costs, co-payments
<b>Societal</b>	Health care + non-healthcare



# Differences



	Difference in costs	disadvantage	advantage
<b>Insurance</b>	<ul style="list-style-type: none"><li>-tariffs by negotiating</li><li>-no program</li><li>-no training</li></ul>	<ul style="list-style-type: none"><li>-More narrow, 'real' cost may differ.</li><li>-No view on HR/capital/building costs.</li></ul>	<ul style="list-style-type: none"><li>-Is reflecting real flow of money</li><li>-could be close to real costs</li><li>-more practical</li></ul>
<b>Health Care</b>	<ul style="list-style-type: none"><li>-valuation by market prices, wages, annualization of capital</li><li>-program + training</li></ul>	<ul style="list-style-type: none"><li>-No non-healthcare costs.</li><li>-Takes a lot of time.</li></ul>	<ul style="list-style-type: none"><li>-gives insight into all components of the 'production factors'</li></ul>



# Calculating Procedures Microcosting of *Core biopsy*



## CORE BIOPSY MICRO COSTING

Multiplier  
drugs/good\*

HUMAN RESOURCES		Time (min)	HR wage	HR per min.	Cost per procedure		
Medical doctor		10	4,500,00	0,50000	5,00000		
Nursing assistant		10	1,800,00	0,20000	2,00000		
<u>Total</u>					<u>7,00000</u>		
REUSABLE ITEMS		Time (min)	Useful Life	Depredation per min.	Cost per procedure		
Trolley		500,00	10	0,00010	0,00096		
Metal stretcher		968,00	10	0,00019	0,00187		
<u>Total</u>					<u>0,00283</u>		
DISPOSABLE ITEMS		Presentation	Buying price	Unit definition	quantity used	Price per unit	Cost per procedure
1. Activity: Skin Cleaning							
Gauze (x 2 und)				Pack	3	0,45442	1,36325
Alcohol				ml	1	0,02079	0,02079
Formaldehyde				ml	5	0,02140	0,10700
Plaster				Cm	20	0,01067	0,21333
2. Activity: Procedure							
5cc disposable syringe. C / A 21x1 1/2"				Piece	1	0,13000	0,13000
Disposable needle 25X5/8X100				Piece	1	0,06800	0,06800
21x1 disposable needle 1/2X100				Piece	1	0,06800	0,06800
Biopsy Needle 14 x 10				Piece	1	90,25000	90,25000
25.10cm x 24.5 cm Paper Towel x 175 sheets		175	6,46	Sheet	4	0,03691	0,14766
Germicidal Soap Liquid x 800ml		800	11,00	ml	6	0,01375	0,08250
<u>Total</u>							<u>92,48053</u>
							<u>106,32366</u>
FAQUIEST		Time (min)	Size	Useful Life	Replacement costs per m2	cost per m2	Cost per procedure
Examination / procedure room		12,5	12,5	15	3120	0,17265	0,44962
DRUGS & MEDICATION		Presentation	Buying price	Unit definition	quantity used	Price per unit	Costs per procedure
Xilocaine 2%				Fco	1	3,50000	3,50000
							<u>3,50000</u>
							5,20205
<b>TOTAL COSTS</b>							<b>102,95</b>
							<b>118,52854</b>



# Procedures: price\*quantity

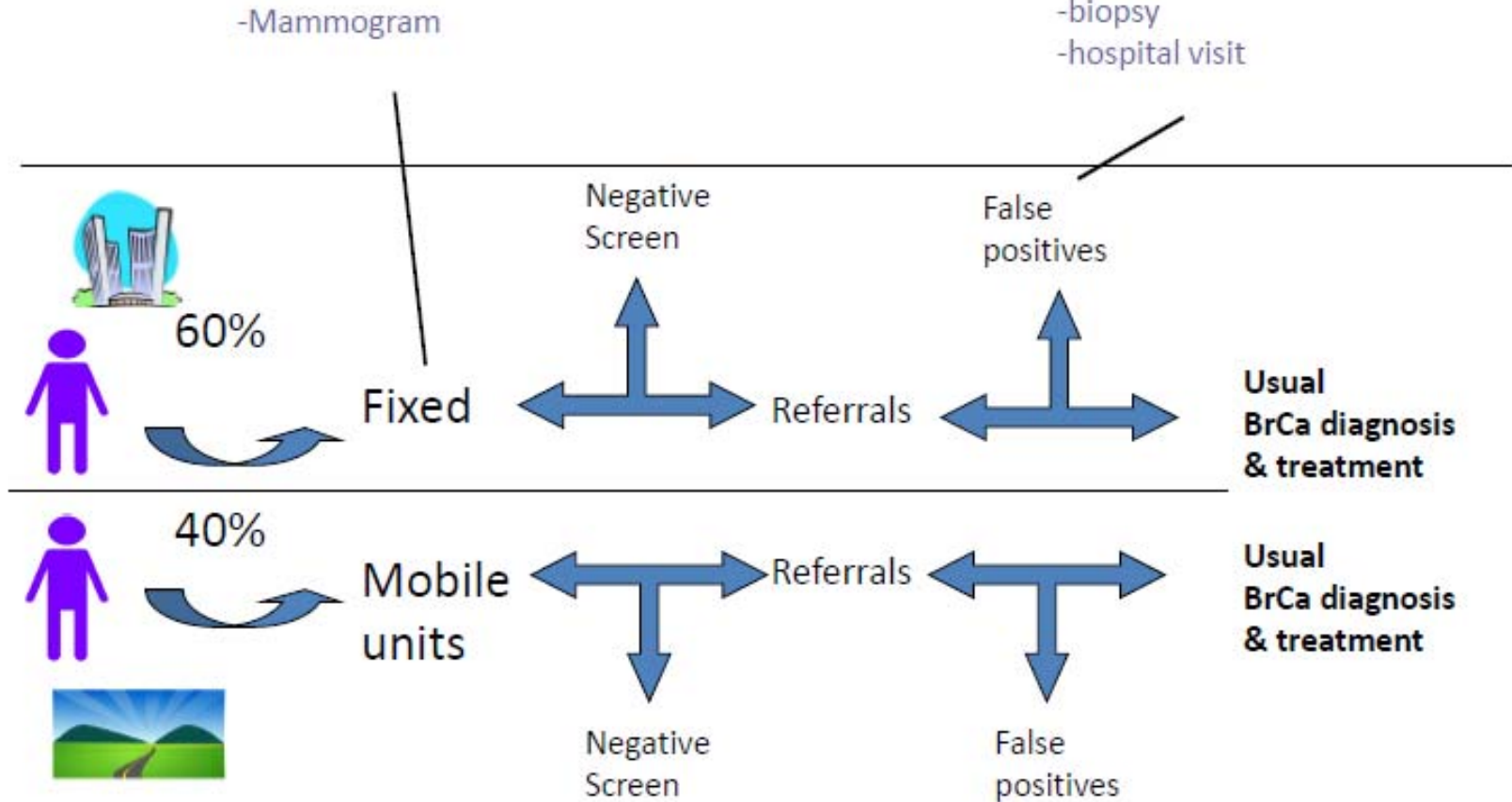
Procedure	Ingredients	Stage I	Stage II	Stage III	Stage IV	SPC	Unit cost per (US\$)
Initial diagnosis and evaluation during treatment	Medical consultation	2	2	2	2		6.22
	Core biopsy procedure	1	1	1	1		45.02
	Specimen examination	1	1	1	1		9.76
	Bilateral Mammography	1	1	1	1		14.24
	Echo of breast	1	1	1	1		6.20
	Echo of abdominal/pelvic area	1	1	1	1		10.49
	Liver function tests	1	1	1	1		2.07
	Chest X-ray	1	1	1	1		6.79
	Bone scan	1	1	1	1		46.01
	CT of chest	1	1	1	1		96.37
	CT of abdominal/pelvic area	1	1	1	1		115.50
Multidisciplinary consult	1	1	1	1		100.90	
Treatment	Pre-operative tests	1	1	-	-		86.57
	Surgical risk analysis	1	1	-	-		20.18
	Surgery	1 (lumpectomy)	1 (modified radical mastectomy)	-	-		835.88 / 951.77
	Radiotherapy consult	1	1	1	1		7.64
	Radiotherapy planning & first administration*	1	1	1	1		224.20
	Radiotherapy session administration*	32	32	9	9		23.36
	AC regimen†	-	4	4	4		104.00
	Taxol regimen‡	-	12	4	4		134.47
	Hepatic tests	-	12	12	12		22.14
	Renal tests	-	12	12	12		39.38
	Coagulation tests	-	12	12	12		115.40
	CT	-	2	4	4		115.50
	Bone scan	-	2	2	2		46.01
	% receiving endocrine treatment†	1680	1680	336	336		0.18
	% receiving pain medication					1	9136.87
% receiving emetics					1	1903.52	



# Modelled mammography screening programs



- Mammogram
- Ultrasound
- FNA
- biopsy
- hospital visit



# Cost & quantities used for organised screening

- Cost of every women screened per year
- Cost of false positives
- Based on interval (every 1/2/3 years) and 80% attendance

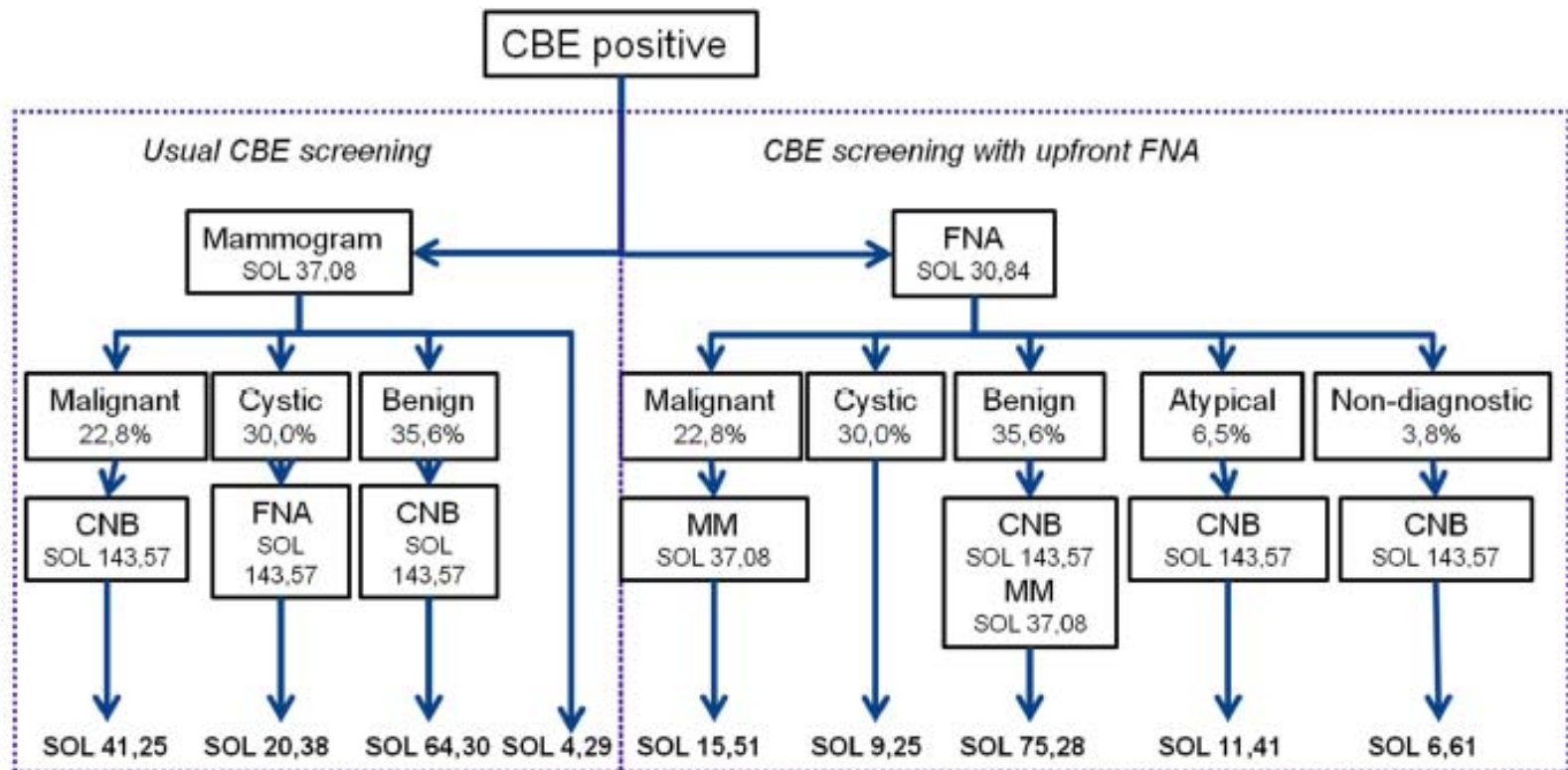
mammography	1	40,01
quality cotrol		
<b>Women presenting who dont have breast cancer</b>		
mammography	0,004964075	40,01
echo exam of pregnant u	0,002275201	16,14
quality cotrol	0,002094219	
outpatient visit hospital	0,005675075	16,18
FNA	0,000361964	30,84
Biopsy of breast	0,001292728	103,30

referral rate		0,82%
false positive rate		0,74%
attendance rate		80%
mobile mammography	percentage	costs differen
	40%	66,7579367
fixed mammography	60%	55,7141793
		1,19822167

- Cost per mammogram is higher in mobile unit

# Cost & quantities used for upfront FNA

- Upfront FNA (fine needle aspiration) after a positive CBE screen, only in combination with CBE screening





# Program cost



Administration					
<i>National</i>					
	FTE	Base Level Requirements	Total Needed	Base Level Requirements	Total Needed
Programme Director		1	1	1	1
Programme Manager		1	1	1	1
Administration Officer		1,5	1,5	1	1
Clerical Officer/Administrative Asst.		1,5	1,5	1	1
Personnel Secretary/Asst./Receptionist		1,5	1,5	1	1
Accountant		0,5	0,5	0,5	1
IT/Computing Officer		0,5	0,5	0,5	1
Transport Driver		0	0	0	0
Cleaner		1	1	1	1
Medical Officer		0	0	1	1
Public Health Specialist		1,5	1,5	1	1
<small>There will be a small number of staff needed.</small>					
<i>Province</i>					
	FTE	Base Level Requirements	Total Needed	Base Level Requirements	Total Needed
Programme Director		0	0,00	0,00	0,00
Programme Manager		1,5	1,50	1,50	1,50
Administration Officer		0,75	0,75	0,50	0,50
Clerical Officer/Administrative Asst.		0,75	0,75	0,50	0,50
Personnel Secretary/Asst./Receptionist		0,75	0,75	0,50	0,50
Accountant		0,75	0,75	0,75	0,75
IT/Computing Officer		0,75	0,75	0,75	0,75
Transport Driver		0,75	0,75	0,75	0,75
Cleaner		0,75	0,75	0,75	0,75
Medical Officer		1	1,00	0,67	0,67
Public Health Specialist		1	1,00	0,67	0,67
<i>District</i>					

gs)

Master program cost sheet
  **Basic Admin Assumptions**
 Fixed Training Assumptions
  Media Assumptions
  Enforcement

Introduction

Interventions

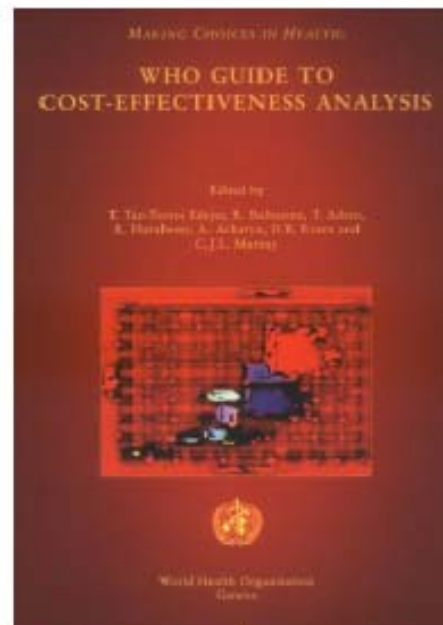
Methods

Results

Discussion



# Estimating effectiveness & data used



Introduction

Interventions

Methods

Results

Discussion



# Population & demography used in Peru



## Global burden of Disease provided

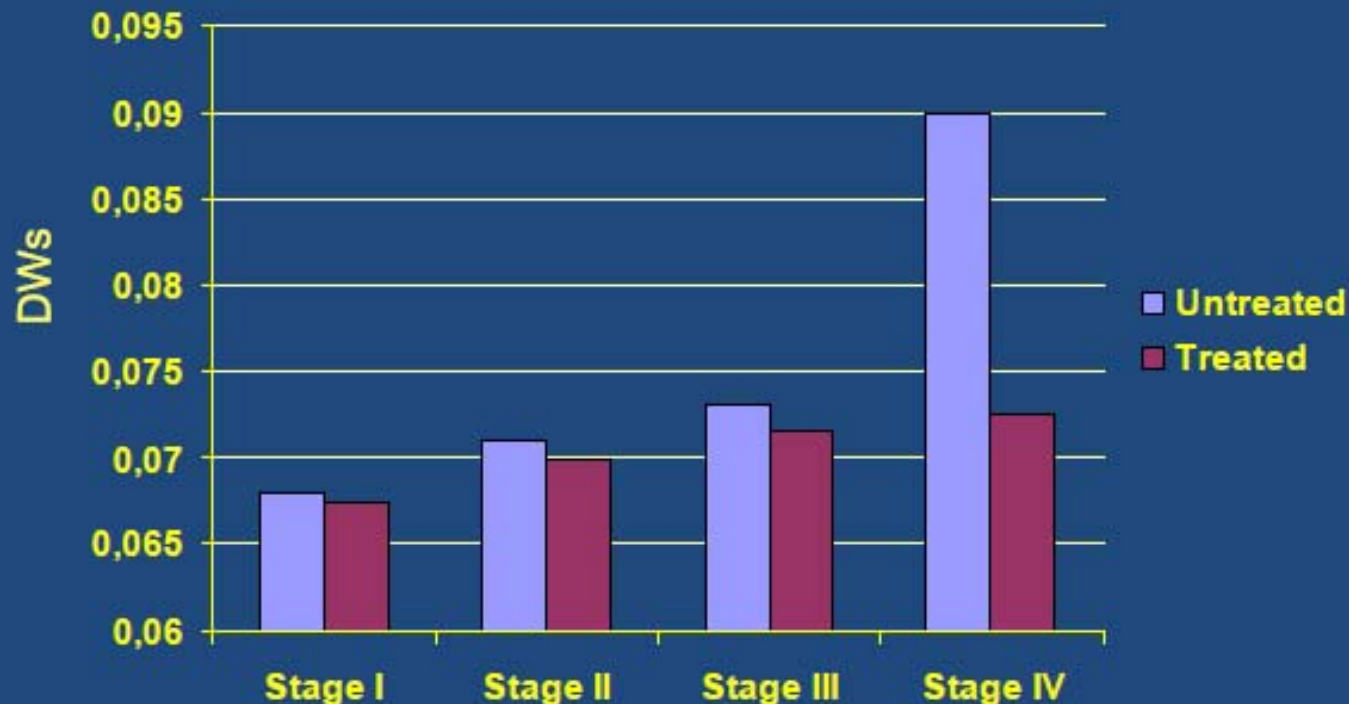
- Population numbers, incidence, prevalence, background mortality

Age groups	Female population (2005)	Incidence rate /100.000	Number of incident cases (%)	Mortality rate /100.000	Number of deaths (%)	Mortality / incidence ratio
0-4	1.382.448	0,0	0 (0%)	0,0	0 (0%)	n/a
5-14	2.860.994	0,0	0 (0%)	0,0	0 (0%)	n/a
15-29	3.801.363	1,28	49 (1,4%)	0,25	10 (0,5%)	0,20
30-44	2.736.393	31,69	867 (24,2%)	9,66	264 (12,7%)	0,30
45-59	1.654.473	85,79	1419 (39,6%)	46,22	765 (36,7%)	0,54
60-69	630.326	85,17	536 (15,0%)	64,45	406 (19,5%)	0,76
70-79	400.815	121,59	487 (13,6%)	104,57	419 (20,1%)	0,86
80+	142.471	158,61	226 (6,3%)	153,32	218 (10,5%)	0,98



# Effect of treatment on disability

Effect on Disability weights (1-QOL) with reference to the baseline (null scenario)  
-DWs for PC strategies are slightly lower in stage IV



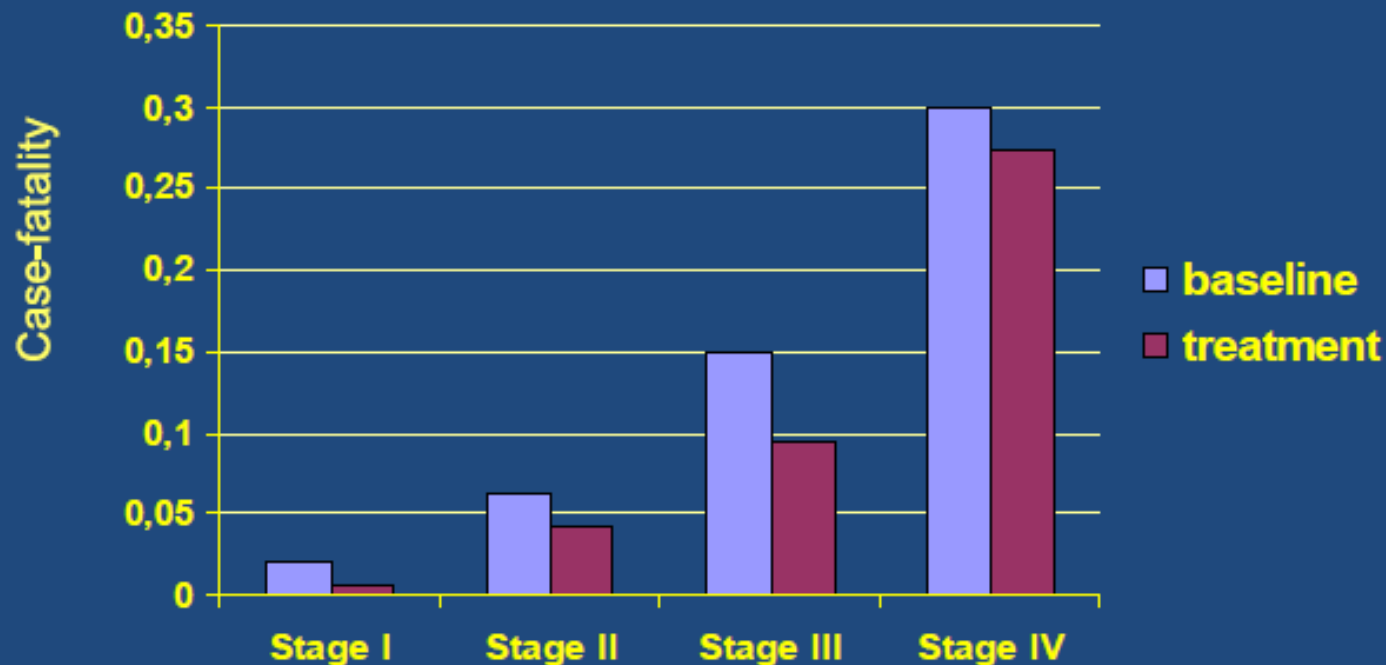
Based on GBD estimates and corrected according to QOL literature





# Effect of treatment on case-fatality

Effect on mortality (survival rates) with reference to the baseline (null scenario)  
-estimates represented are without trastuzumab



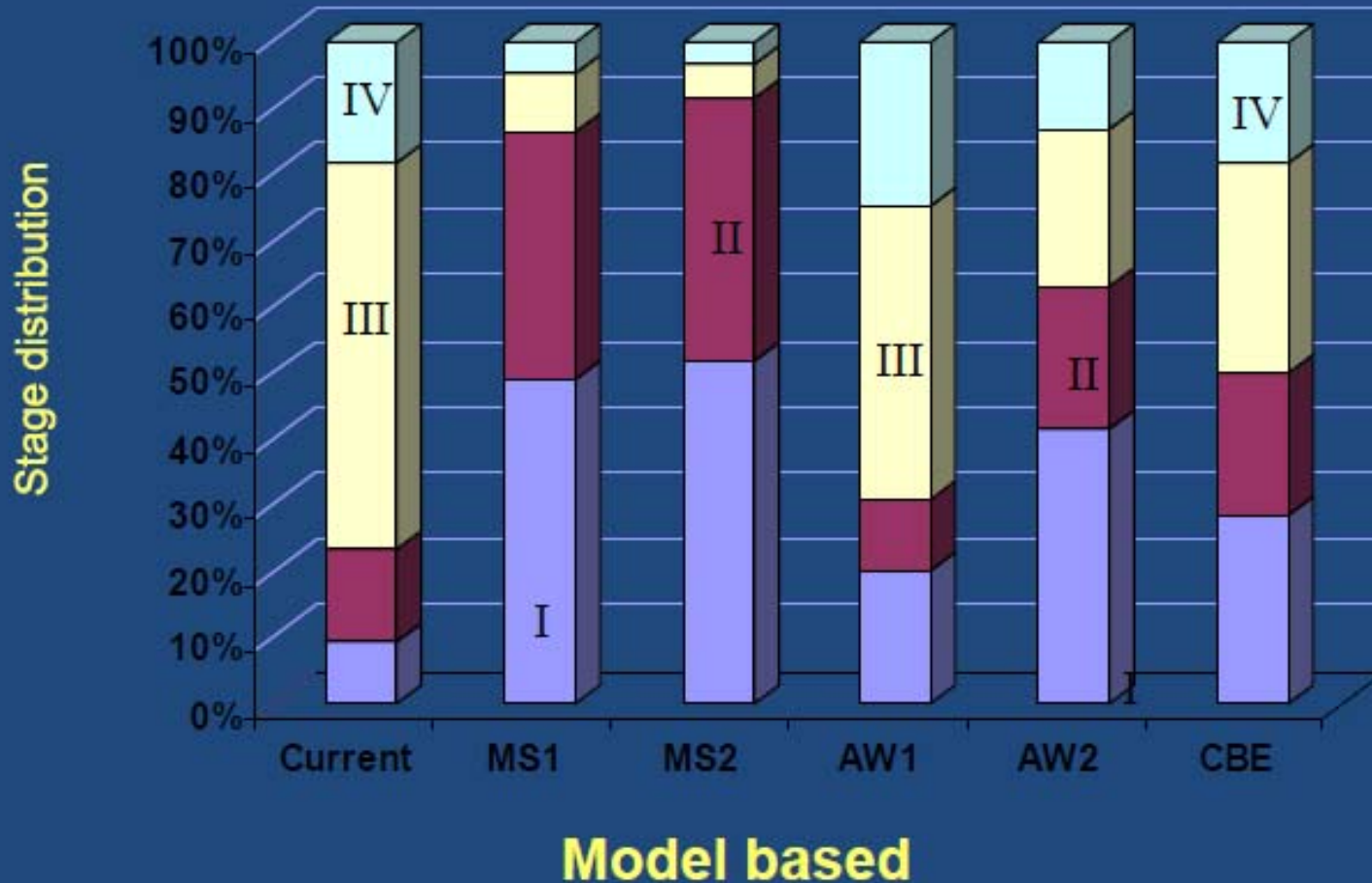
**Provided by INEN..?**



# Effect of treatment on stage distribution

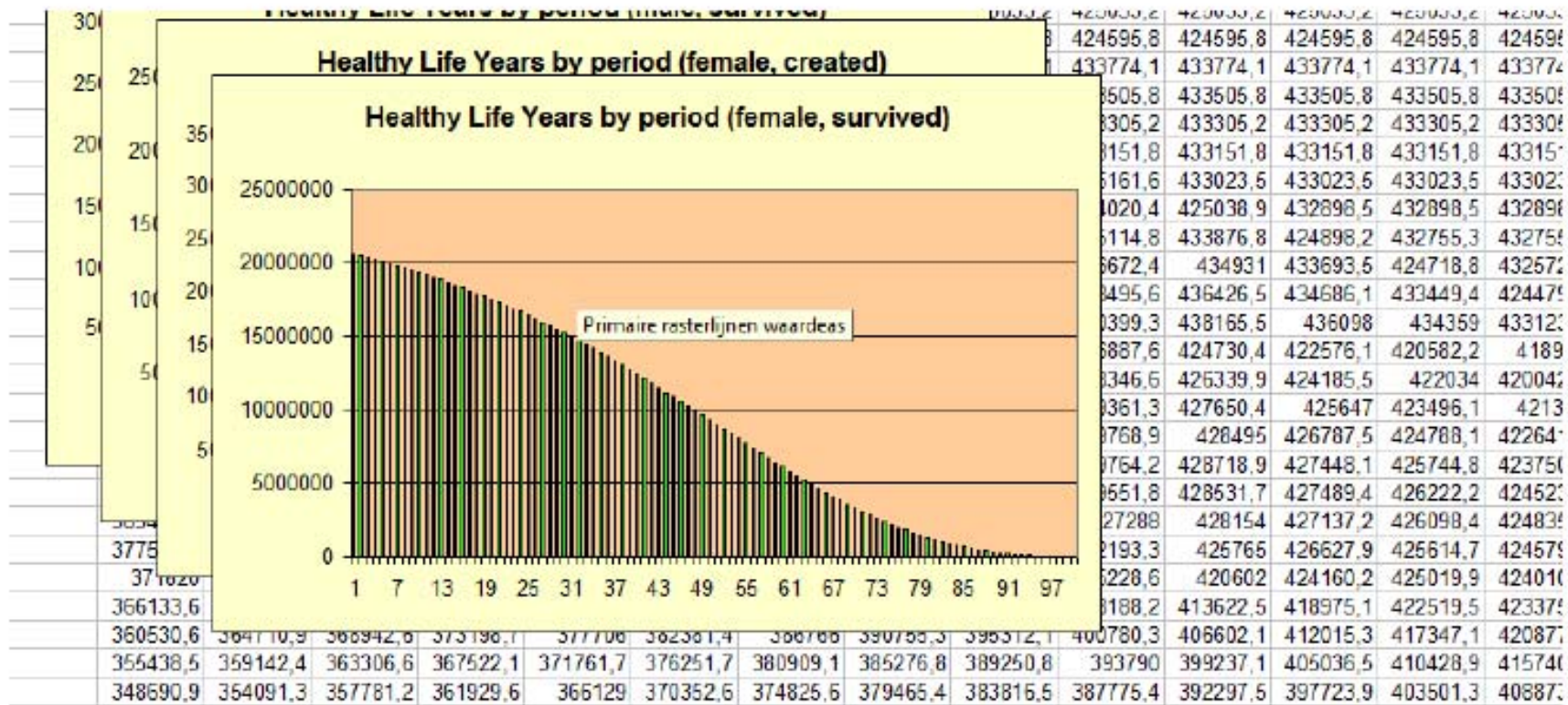


Effect on distribution of incident cases of intervention scenarios





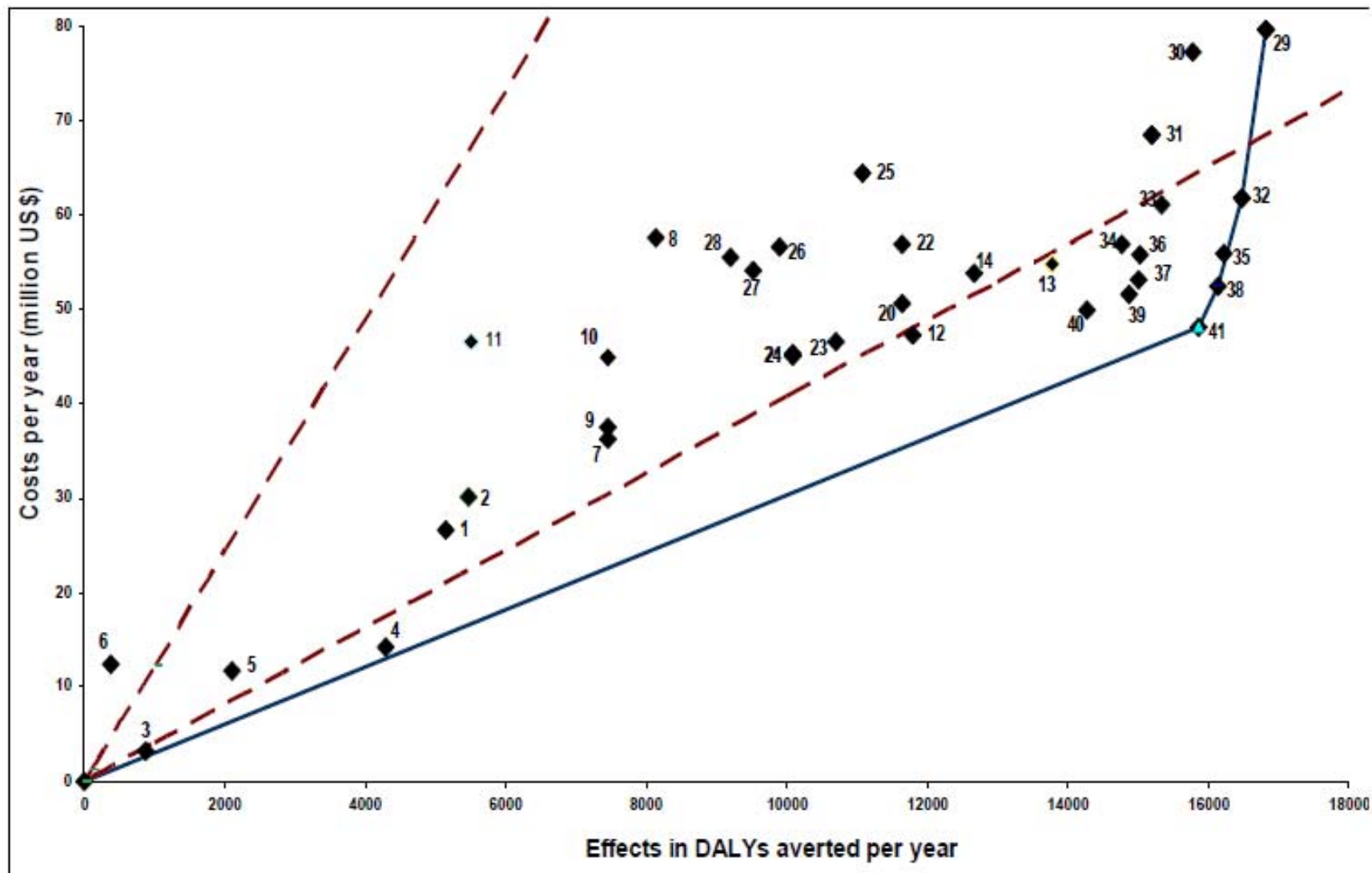
# Population effects : PopMod



	Intervention scenarios	Annual total costs†	DALYs averted a year‡	ACER	ICER
41	triennial MM + CBE screening (40-69) + FNA*	48.139.213	15.862	3.035	3.035
38	biennial MM + CBE screening (40-69) + FNA*	52.436.257	16.143	3.248	15.269
35	Stage I to IV treatment with triennial mammography screening (40-69 years) FIXED/MOBILE*	55.843.221	16.230	3.441	Dominated
32	Stage I to IV treatment with biennial mammography screening (40-69 years) FIXED/MOBILE*	61.700.123	16.480	3.744	27.543
29	Stage I to IV treatment with annual mammography screening (40-69 years) FIXED/MOBILE*	79.604.422	16.818	4.733	52.872
44	Stage I to IV treatment with annual mammography screening (40-69 years) FIXED/MOBILE + EPC	82.281.564	16.820	4.892	1.442.481

interventions that cost less than **3\*GDP/capita** are labelled cost-effective (**12.204 USD/DALY** averted, as cut-off point)

Project	Costs	Effects	Interpretation	Priority setting
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## Key results



- Tri- or biennial screening is most cost-effective, particularly when **CBE** screening (age 40-49) and mammography screening (age 50-69) are combined fixed (60%), mobile (40%).
- costs between 56 and 61 million US\$.
  
- When even more resources are available in Peru, consider tri- or biennial mammography screening fixed (60%), mobile (40%) (age 40-69)
- costs between 73 and 94 million US\$.



## Key recommendations



- Tri- or biennial screening, no annual screening
- Combine CBE with mammography
- As soon as targeted age group is < 50 or 45, → CBE
- Age >50 → mammography screening
- Decide on CBE vs mobile mammography in rural areas, and patient referral & reimbursement system
- FNA could be considered for feasibility reasons



## Key recommendations 2



- Decise on value of expanding palliative care (e.g. including home care)
- No trastuzumab
- Start research on how to sustain proper attendance rates for screening
- Current budget is not enough, so start gradually increase coverage of services to higher risk (older) women



**¡CON UN PERU UNIDO  
GANAREMOS LA BATALLA CONTRA EL CANCER!**

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