# Cancer incidence, mortality and survival for health policy and cancer control

Cáncer 2019: Impacto Social y Económico, y Alianzas Público-Privadas

Universidad Católica de Chile 23 de agosto de 2018

### World cancer control policy since 2011

- **2011 UN High-level Meeting**Cancer control plans, cancer registries
- **2012 WHO Global Monitoring Framework** 25% cut in global NCD mortality by 2025
- **2013 World Health Assembly Endorses control of NCDs as priority**
- **2013 UICC World Cancer Declaration**Single overarching goal includes survival
- **2015 Sustainable Development Goals** 33% cut in premature NCD mortality by 2030
- 2018 UN meeting on NCDs (follow-up)

### **Sustainable Development Goals 2015**

#### **Goal 3.4**

By 2030, reduce by one-third [the] premature mortality from non-communicable diseases through prevention and treatment ...

**Indicator 3.4.1** 

Mortality rate attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease

#### Global cancer burden and cost, 2009

	Population		Cases		Cost	
_	No	%	No	%	US\$M	%
Low Income	1,009,525	14.8	899,275	7.1	647	0.2
<b>Lower Middle Income</b>	3,791,610	55.7	4,953,671	39.0	8,209	2.9
<b>Upper Middle Income</b>	964,861	14.2	1,938,748	15.2	8,945	3.1
High Income	1,042,971	15.3	4,922,418	38.7	268,002	93.8
Total	6,808,967	100.0	12,714,112	100.0	285,803	100.0

**Economist Intelligence Unit Limited 2009** 

85% of world population 60% of all cancers Only 6% of expenditure on treatment



#### Statutory cancer registration – 50+ countries

**Australia** 

Canada

**Costa Rica** 

Cuba

**Czech Republic** 

**Denmark** 

**Estonia** 

Israel

Kuwait

from 2016

Japan

Latvia

**Malta** 

**New Zealand** 

**Norway** 

**Poland** 

**Puerto Rico** 

Slovenia

**Uruguay** 

**USA** 

**Switzerland** 

#### **Measures of cancer burden – definition**

- Incidence new cases (number, rate)
- Survival probability alive at time "t"
- Prevalence survivors (number, %)
- Mortality deaths (number, rate)

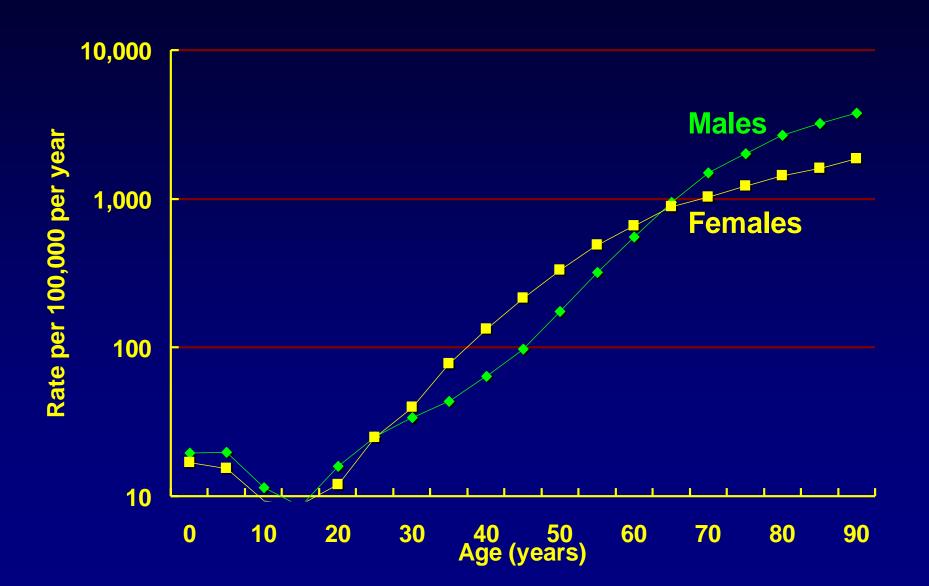
#### **Measures of cancer burden – for me**

- Incidence what is my risk?
- Survival what are my chances?
- Prevalence how many of us are there?
- Mortality those we have lost …

#### Measures of cancer burden - application

- Incidence prevention, planning
- Survival effectiveness of health care
- Prevalence care, survivorship
- Mortality priorities

### Cancer incidence by age, sex ...

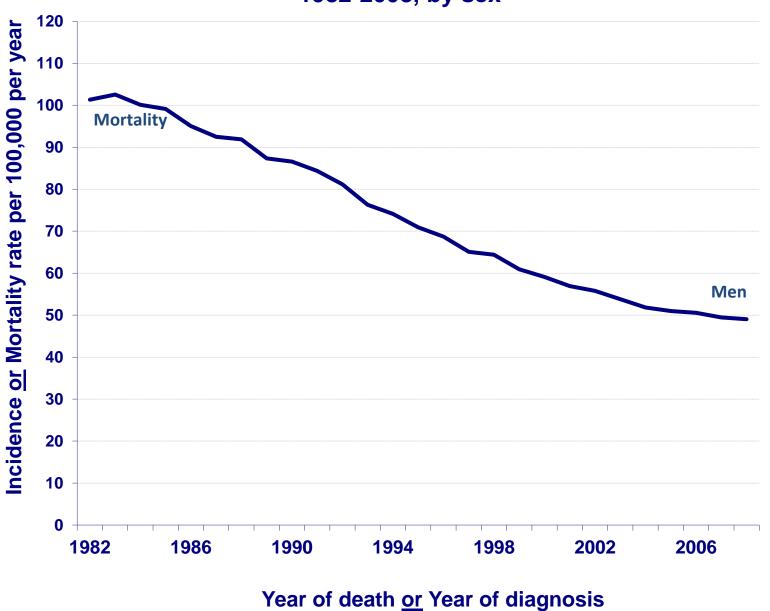


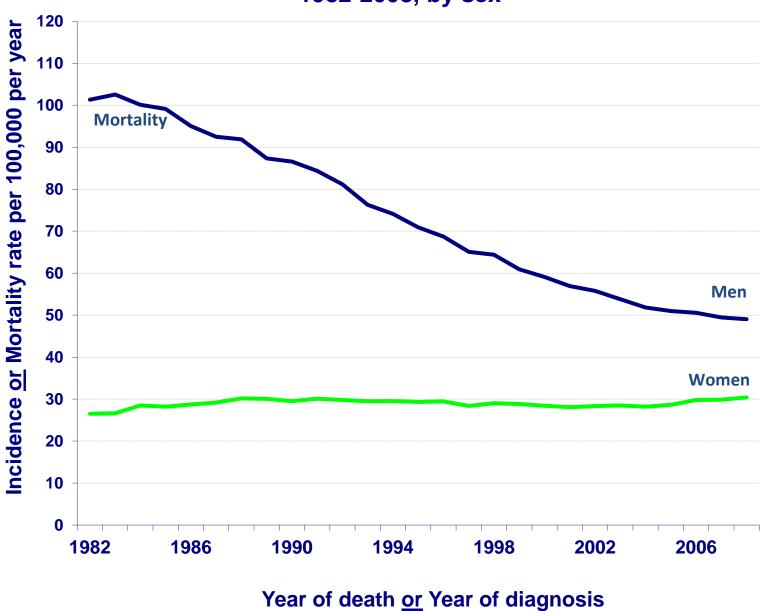
#### Global cancer burden, around 2012

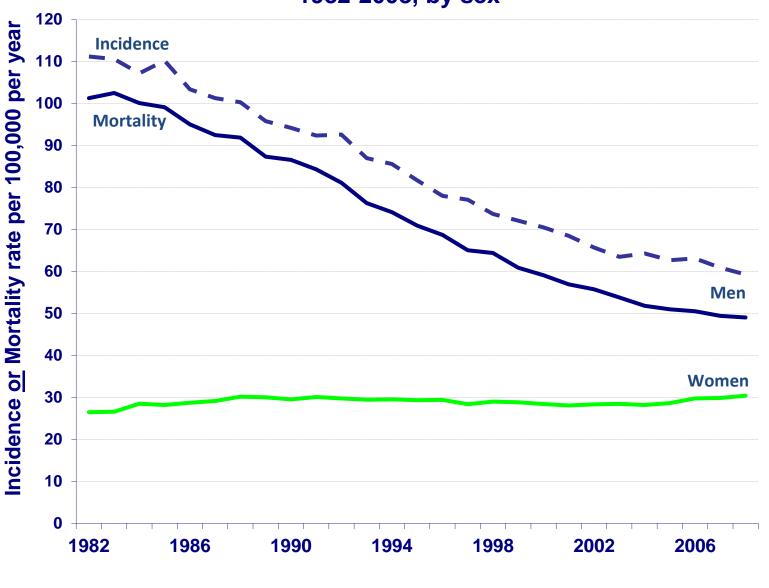
#### Cases and deaths per year, by economic development

		Overall		Develop	Developed		Developing	
NEW	DIAGNOSES	No.	%	No.	%	No.	%	
	Oesophagus	455,784	3.2	86,144	1.9	369,640	6.2	
	Stomach	951,594	6.8	274,509	4.5	677,085	8.4	
	Colorectum	1,360,602	9.7	736,867	12.2	623,735	7.8	
	Liver	782,451	5.6	134,302	2.2	648,149	8.1	
	<b>Pancreas</b>	337,872	2.4	187,465	4.1	150,407	2.5	
	Lung	1,824,701	13.0	758,214	12.5	1,066,487	13.3	
	Melanoma	232,130	1.7	191,066	3.2	41,064	0.5	
	Breast (F)	1,671,149	25.1	788,200	27.9	882,949	23.0	
	Cervix	527,624	7.9	83,078	2.9	444,546	11.6	
	Ovary	238,719	3.6	99,752	3.5	138,967	3.6	
	Prostate	1,094,916	14.8	741,966	23.0	352,950	8.4	
Br	ain and CNS	256,213	1.8	88,967	1.5	167,246	2.1	
	Lymphomas	451,691	3.2	219,255	3.6	232,436	2.9	
	Leukaemias	351,965	2.5	141,274	2.3	210,691	2.6	
	All cancers	14,067,894	100.0	6,053,621	100.0	8,014,273	100.0	
	DEATHS	8,201,575	100.0	2,878,462	100.0	5,323,113	100.0	

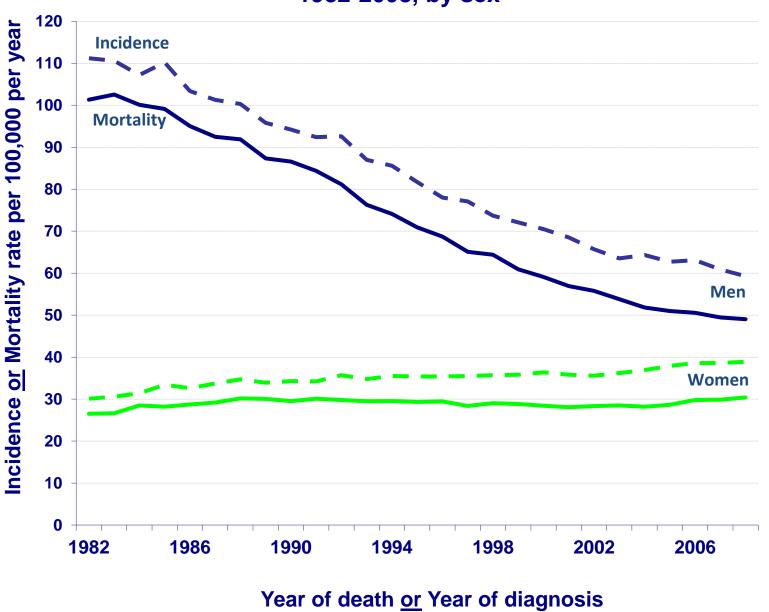
Lung cancer: age-standardised trends, England 1982-2008, by sex

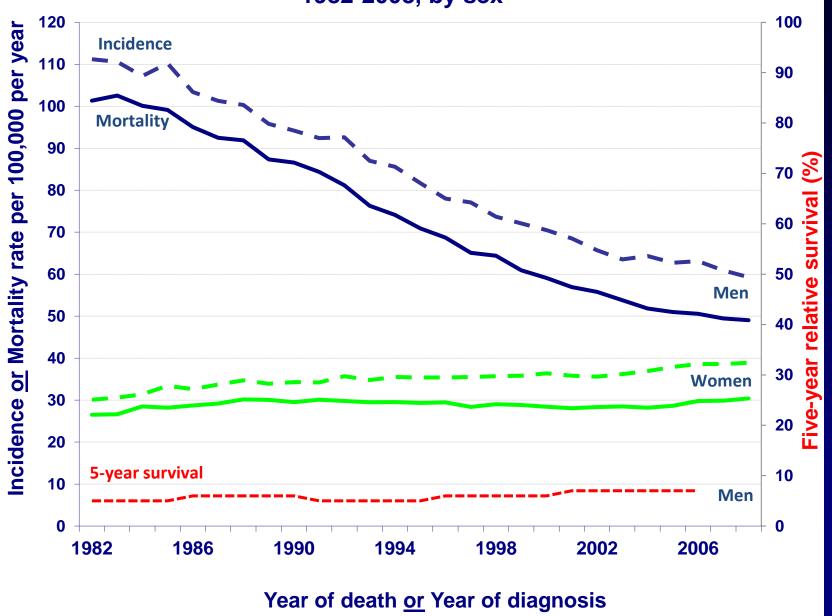


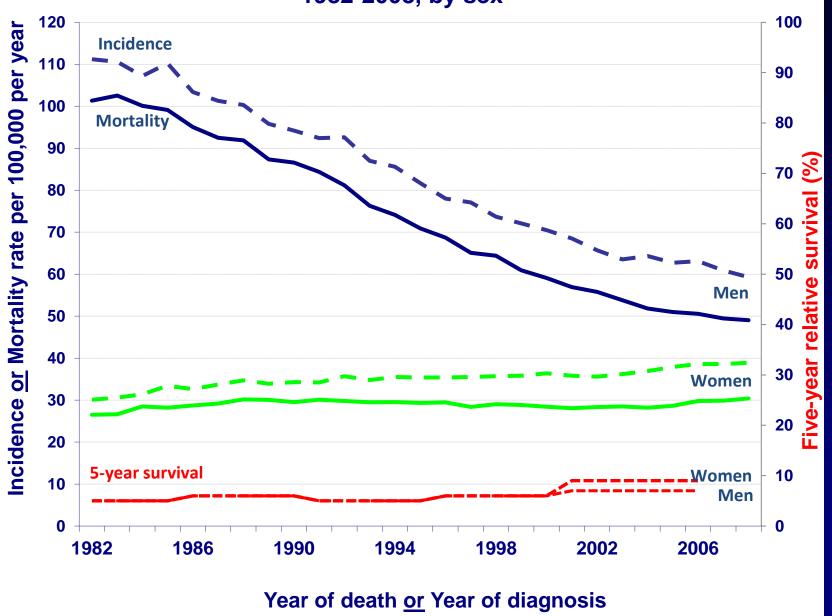




Year of death or Year of diagnosis







#### Clinical research and public health

Clinical trials highest achievable survival

Public health average survival achieved

Translational research to reduce the difference

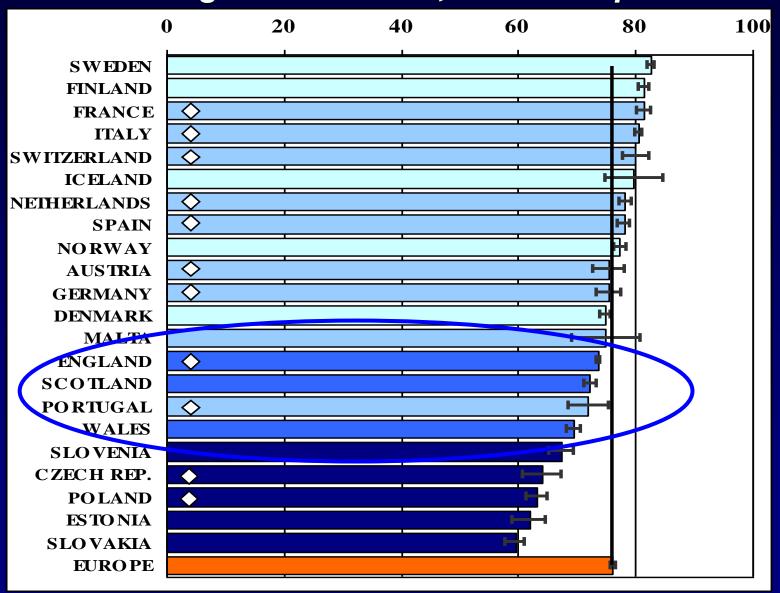
## **National policy concerns**

Is survival equitable?
Is survival as high as other countries?
Is national cancer plan effective?

#### If not:

- Why not?
- How many premature deaths?
- What policy is required?
- Can we see any improvements?

# Breast cancer, five-year survival (%) Women diagnosed 1990-94, followed up to 1999



## UK cancer care worst in Europe doctors say

DR KENNETH Calman, the chief medical officer, will con-

by Lois Rogers

## **UK** 'failing in diagnosis of cancer patients'

# Losing the cancer war

ngland and Scotland ave less chance of surival than those in the rest

By JAMES DAVIES Europe. And those suffering from cancer of the breast, ovary and cervix also have a poorer prognosis.

eight per cent of patients in the UK with stomach cancer live for five years after being diagnosed — half

lower chance of life

breast, large bowel and stomach — there are sub-stantial differences. Overall, patients in Fi

Survival rate below norm in British cancer cases

> Breast cancer survival in UK lowest in West

Stiff upper lip that leaves British women more likely to die from cancer

#### Prime Minister's "cancer summit"

"We don't match other countries in its prevention, diagnosis and treatment."

"It's not good enough."

"England and Wales lag behind Europe."

### NHS Cancer Plan, England, 2000

to save more lives

- to ensure cancer patients get the right professional treatment, care and support
- to tackle inequalities in health
- to build for the future workforce, research, genetics

"... so that the NHS never falls behind in cancer care again."

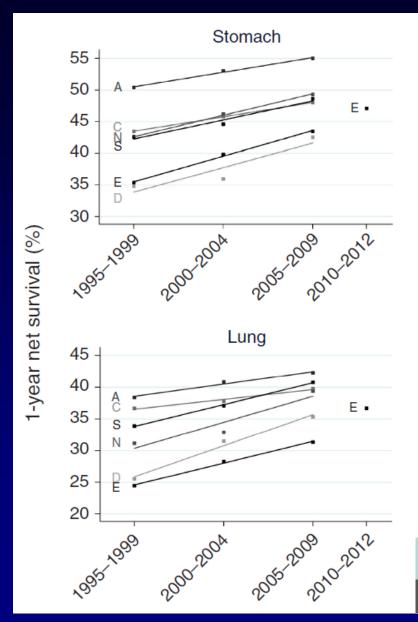
## NHS Cancer Plan 2000 - England

- 35% real-terms rise in funding 2000-3
- Prevention, screening, treatment
- More specialist staff, better training
- Earlier diagnosis
- Multi-disciplinary teams
- Reduction of inequalities

### Health minister responds to EUROCARE

"The NHS Cancer Plan ... will speed up access to high quality services across the country to bring cancer services in line with the rest of Europe"

#### Is England closing the survival "gap"?



### ACHIEVING WORLD-CLASS CANCER OUTCOMES

A STRATEGY FOR ENGLAND 2015-2020



#### Global surveillance of survival (CONCORD-3)

Protocol: Arabic, Chinese, English, French, Italian,

Japanese, Portuguese, Russian, Spanish

Diagnosis: 2000-2014 ..., follow-up to 2014...

Data call: 11 May 2016

71 countries and territories

322 registries

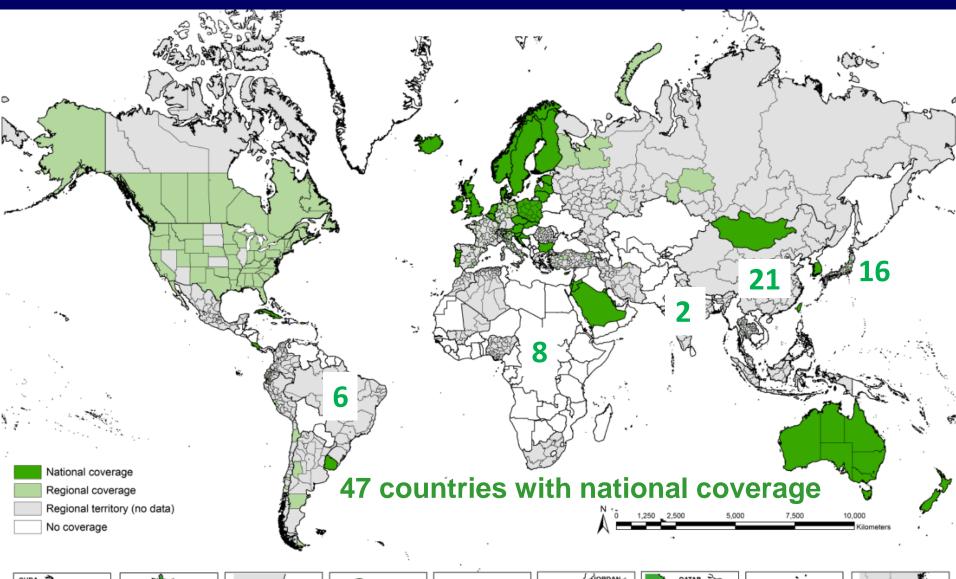
989,082,244 total population covered (2014)

Oesophagus	Pancreas	Ovary
Stomach	Lung	Prostate
Colon	Melanoma (skin)	Brain
Rectum	Breast (women)	Lymphoma
Liver	Cervix uteri	Leukaemia

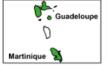
### Surveillance of cancer survival (CONCORD-3)

	Countries	Registries	Files	Patients
Africa	6	8	113	40,197
America C+S	13	33	413	700,946
America N	2	<b>57</b>	880	14,320,034
Asia	17	66	1,014	5,976,959
Europe	31	149	2,154	14,991,316
Oceania	2	9	144	1,483,573
	71	322	4,718	37,513,025

### 71 countries – 322 registries























# **Latin America and the Caribbean**

2000-2014 (CONCORD-3)

13 countries

33 cancer registries

700,946 cancer patients

#### **CONCORD-2: 1995-2009**

#### CONCORD-3: 2000-2014





**CONCORD-3** 

**Argentina** 

4 registries 3,973,922 (9%) 64,151 patients

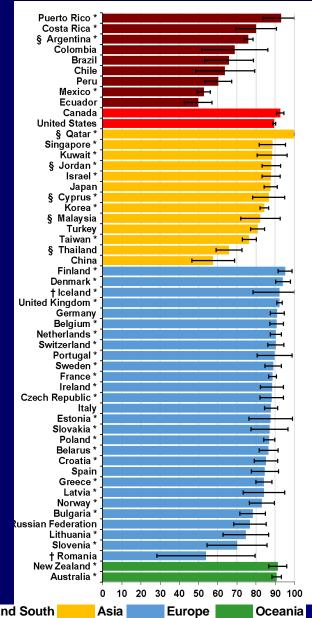
**Chile** 

4 registries 2,459,133 (14%) 26,363 patients

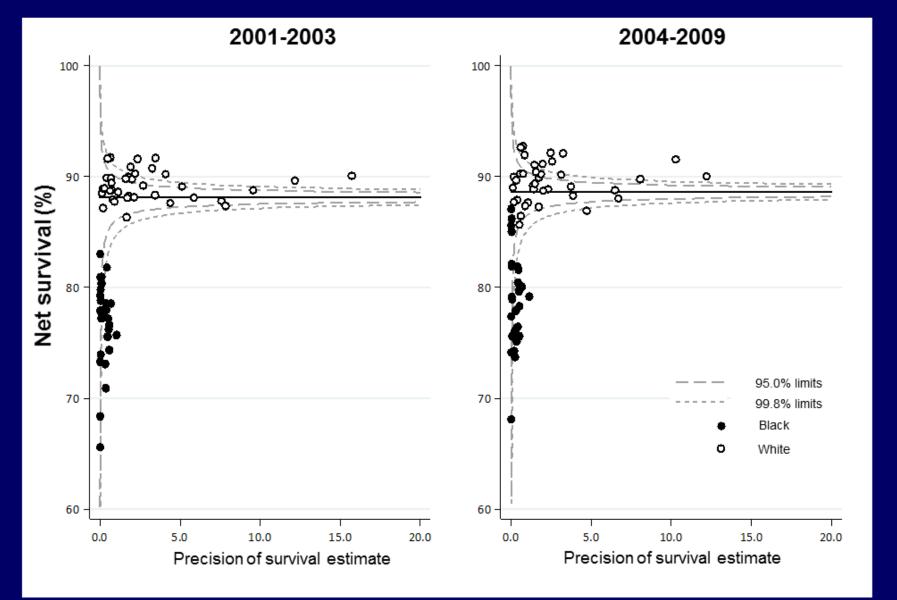
> Allemani et al., Lancet 2018

#### Age-standardised 5-year net survival – 2010-2014

**ALL** (children) men)



# Breast cancer: 5-year net survival (%), standardised USA, women (15-99 years), by race and state



#### What could explain survival differences?

- Longer delays, more advanced stage
- Availability and uptake of screening
- Access to treatment
- Differences in co-morbidity
- Quality of treatment
- Organisation of treatment services
- Human and financial resources

### Policy applications of cancer survival

- Effectiveness of health system
- Impact of treatment guidelines
- Monitoring change in survival deficits
- Surveillance of equity avoidable deaths
- National cancer plans impact
- International differences and trends

#### Policy impact of cancer survival (CONCORD)

Algeria – registry network, cervical screening Canada – survival by SES

England, France, Poland ... – national plans

**USA** – survival by state, race, stage at diagnosis

**European Union – cancer control strategy** 

**OECD** – healthcare quality index: 48 countries

IAEA – campaign to reduce global inequalities

# World Health Organisation

Global surveillance of cancer survival (CONCORD)...

- Evidence base for health care effectiveness
- High-quality evidence
- Coherent with WHO strategic objectives
- Enables comparison between low-income countries
- Fills a huge gap in knowledge of cancer survival world-wide



#### Cancer survival should not be left to chance.





"PACT launches campaign to raise awareness of the persistent inequalities in access to lifesaving cancer services."





#### Health at a Glance 2017

Includes CONCORD-3 survival estimates for 5 cancers in 48 countries



http://www.oecd.org/health/health-systems/health-at-a-glance-19991312.htm

## **CONCORD-3 collaborators in Argentina and Chile**

#### Registros Poblacionales de Cáncer de Chile

Antofagasta – J C Galaz

Biobio y Concepción – M Aparicio Aravena, J Sanhueza Monsalve

Los Rios – D A Herrmann, S Vargas

#### Registros Provinciales de Tumores de Argentina

**Chubut** – G H Calabrano, S B Espinola

Córdoba – B Carballo Quintero, R Fita

Mendoza – M C Diumenjo, W D Laspada

Tierra del Fuego – S G Ibañez

National Childhood Cancer Registry – I Kumcher, F Moreno

Lancet. 2018 Mar 17;391(10125):1023-1075. doi: 10.1016/S0140-6736(17)33326-3. Epub 2018 Jan 31.

#### Global surveillance of trends in cancer survival 2000-14 (CONCORD-3): analysis of individual records for 37 513 025 patients diagnosed with one of 18 cancers from 322 population-based registries in 71 countries.

Allemani C, Matsuda T, Di Carlo V, Harewood R, Matz M, Nikšić M, Bonaventure A, Valkov M, Johnson CJ, Estève J, Ogunbiyi OJ, Azevedo E Silva G Chen WQ, Eser S, Engholm G, Stiller CA, Monnereau A, Woods RR, Visser O, Lim GH, Aitken J, Weir HK, Coleman MP; CONCORD Working Group.

- Collaborators (572)
- Bouzbid S, Hamdi-Chérif M, Zaidi Z, Mequenni K, Regagba D, Bayo S, Cheick Bougadari T, Manraj SS, Bendahhou K, Fabowale A, Bradshaw D, Somdyala NIM, Kumcher I, Moreno F, Calabrano GH, Espinola SB, Carballo Quintero B, Fita R, Diumenjo MC, Laspada WD, Ibañez SG, Lima CA, De
- CLA Veneziano DB, Latorre MRDO, Tanaka LF, Rebelo MS, Santos MO, Galaz JC, Aparicio Aravena M, Sanhueza Monsalve J, Herrmann DA, Vargas S Herrera VM, Uribe CJ, Bravo LE, Garcia LS, Arias-Ortiz NE
- arez YH. Torres P. Martínez-Reves F. Jaramillo L. Quinto R. Castillo
- J, Mendoza M, Cueva P, Yépez JG, Bhakkan B, Deloumeaux J, Joachim C, Macni J, Carrillo R, Shalkow Klincovstein J, Rivera Gomez R, Poquioma
- E, Tortolero-Luna G, Zavala D, Alonso R, Barrios E, Eckstrand A, Nikiforuk C, Noonan G, Turner D, Kumar E, Zhang B, McCrate FR, Ryan S,
- MacIntyre M, Saint-Jacques N, Nishri DE, McClure CA, Vriends KA, Kozie S, Stuart-Panko H, Freeman T, George JT, Brockhouse JT, O'Brien DK, Holt A, Almon L, Kwong S, Morris C, Rycroft R, Mueller L, Phillips CE, Brown H, Cromartie B, Schwartz AG, Vigneau F, Levin GM, Wohler B,
- Bayakly R, Ward KC, Gomez SL, McKinley M, Cress R, Green MD, Miyaqi K, Ruppert LP, Lynch CF, Huang B, Tucker TC, Deapen D, Liu L, Hsieh
- MC, Wu XC, Schwenn M, Gershman ST, Knowlton RC, Alverson G, Copeland GE, Bushhouse S, Rogers DB, Jackson-Thompson J, Lemons D, Zimmerman HJ, Hood M, Roberts-Johnson J, Rees JR, Riddle B, Pawlish KS, Stroup A, Key C, Wiggins C, Kahn AR, Schymura MJ, Radhakrishnan
- S, Rao C, Giljahn LK, Slocumb RM, Espinoza RE, Khan F, Aird KG, Beran T, Rubertone JJ, Slack SJ, Garcia L, Rousseau DL, Janes TA, Schwartz SM, Bolick SW, Hurley DM, Whiteside MA, Miller-Gianturco P, Williams MA, Herget K, Sweeney C, Johnson AT, Keitheri Cheteri MB, Migliore Santiago P, Blankenship SE, Farley S, Borchers R, Malicki R, Espinoza JR, Grandpre J, Wilson R, Edwards BK, Mariotto A, Lei Y, Wang N, Chen JS, Zhou Y,
- He YT, Song GH, Gu XP, Mei D, Mu HJ, Ge HM, Wu TH, Li YY, Zhao DL, Jin F, Zhang JH, Zhu FD, Junhua Q, Yang YL, Jiang CX, Biao W, Wang J, Li QL, Yi H, Zhou X, Dong J, Li W, Fu FX, Liu SZ, Chen JG, Zhu J, Li YH, Lu YQ, Fan M, Huang SQ, Guo GP, Zhaolai H, Wei K, Zeng H, Demetriou AV,
- Mang WK, Ngan KC, Kataki AC, Krishnatreya M, Jayalekshmi PA, Sebastian P, Nandakumar A, Malekzadeh R, Roshandel G, Keinan-Boker L Silverman BG, Ito H, Nakagawa H, Sato M, Tobori F, Nakata I, Teramoto N, Hattori M, Kaizaki Y, Moki F, Sugiyama H, Utada M, Nishimura M, Yoshida
- K, Kurosawa K, Nemoto Y, Narimatsu H, Sakaquchi M, Kanemura S, Naito M, Narisawa R, Miyashiro I, Nakata K, Sato S, Yoshii M, Oki I, Fukushima N, Shibata A, Iwasa K, Ono C, Nimri O, Jung KW, Won YJ, Alawadhi E, Elbasmi A, Ab Manan A, Adam F, Sanjaajmats E, Tudev U, Ochir C, Al
- Khater AM, El Mistiri MM, Teo YY, Chiang CJ, Lee WC, Buasom R, Sangrajrang S, Kamsa-Ard S, Wiangnon S, Daoprasert K, Pongnikorn D, Leklob A, Sangkitipaiboon S, Geater SL, Sriplung H, Ceylan O, Kög I, Dirican O, Köse T, Gurbuz T, Karaşahin FE, Turhan D, Aktas U, Halat Y, Yakut CI,
- <u>Altinisik M, Cavusoqlu Y, Türkköylü A, Üçüncü N, Hackl M, Zborovskaya AA, Aleinikova OV, Henau K, Van Eycken L, Valerianova Z, Yordanova</u>
- MR, Śekerija M, Dušek L, Zvolský M, Storm H, Innos K, Mägi M, Malila N, Seppä K, Jégu J, Velten M, Cornet E, Troussard X, Bouvier AM, Guizard
- AV, Bouvier V, Launoy G, Arveux P, Maynadié M, Mounier M, Woronoff AS, Daoulas M, Robaszkiewicz M, Clavel J, Goujon S, Lacour B, Baldi I,
- Pouchieu C, Amadeo B, Coureau G, Orazio S, Preux PM, Rharbaoui F, Marrer E, Trétarre B, Colonna M, Delafosse P, Ligier K, Plouvier S, Cowppli-Bony A, Molinié F, Bara S, Ganry O, Lapôtre-Ledoux B, Grosclaude P, Bossard N, Uhry Z, Bray F, Piñeros M, Stabenow R, Wilsdorf-Köhler H,
- Eberle A, Luttmann S, Löhden I, Nennecke AL, Kieschke J, Sirri E, Emrich K, Zeissig SR, Holleczek B, Eisemann N, Katalinic A, Asquez RA, Kumar V, Petridou E, Ólafsdóttir EJ, Tryggvadóttir L, Clough-Gorr K, Walsh PM, Sundseth H, Mazzoleni G, Vittadello F, Coviello E, Cuccaro F, Galasso R, Sampietro G, Giacomin A, Magoni M, Ardizzone A, D'Argenzio A, Castaing M, Grosso G, Lavecchia AM, Sutera Sardo A, Gola G, Gatti L, Ricci P,
- Ferretti S, Serraino D, Zucchetto A, Celesia MV, Filiberti RA, Pannozzo F, Melcarne A, Quarta F, Russo AG, Carrozzi G, Cirilli C, Cavalieri d'Oro L, Rognoni M, Fusco M, Vitale MF, Usala M, Cusimano R, Mazzucco W, Michiara M, Sgargi P, Boschetti L, Borciani E, Seghini P, Maule MM, Merletti F, Tumino R, Mancuso P, Vicentini M, Cassetti T, Sassatelli R, Falcini F, Giorgetti S, Caiazzo AL, Cavallo R, Cesaraccio R, Pirino DR, Contrino ML,
- Tisano F, Fanetti AC, Maspero S, Carone S, Mincuzzi A, Candela G, Scuderi T, Gentilini MA, Piffer S, Rosso S, Barchielli A, Caldarella A, Bianconi F,
- Stracci F, Contiero P, Tagliabue G, Rugge M, Zorzi M, Beggiato S, Brustolin A, Berrino F, Gatta G, Sant M, Buzzoni C, Mangone L, Capocaccia R, De
- Angelis R, Zanetti R, Maurina A, Pildava S, Lipunova N, Vincerževskiené I, Agius D, Calleja N, Siesling S, Larønningen S, Møller B, Dyzmann-Sroka A, Trojanowski M, Góźdź S, Meżyk R, Mierzwa T, Molong L, Rachtan J, Szewczyk S, Błaszczyk J, Kepska K. Kościańska B. Tarocińska K.
- Zwierko M, Drosik K, Maksimowicz KM, Purwin-Porowska E, Reca E, Wójcik-Tomaszewska J, Tukiendorf A, Gradalska-Lampart M, Radziszewska AU, Gos A, Talerczyk M, Wyborska M, Didkowska JA, Wojciechowska U, Bielska-Lasota M, Forjaz de Lacerda G, Rego RA, Bastos J, Silva MA,
- Antunes L, Laranja Pontes J, Mayer-da-Silva A, Miranda A, Blaga LM, Coza D, Gusenkova L, Lazarevich O, Prudnikova O, Vjushkov DM, Egorova AG, Orlov AE, Kudyakov LA, Pikalova LV, Adamcik J, Safaei Diba C, Primic-Žakelj M, Zadnik V, Larrañaga N, Lopez de Munain A, Herrera AA, Redondas R, Marcos-Gragera R, Vilardell Gil ML, Molina E, Sánchez Perez MJ, Franch Sureda P, Ramos Montserrat M, Chirlague MD, Navarro C,
- Ardanaz EE, Guevara MM, Fernández-Delgado R, Peris-Bonet R, Carulla M, Galceran J, Alberich C, Vicente-Raneda M, Khan S, Pettersson D, Dickman P, Avelina I, Staehelin K, Camey B, Bouchardy C, Schaffar R, Frick H, Herrmann C, Bulliard JL, Maspoli-Conconi M, Kuehni CE, Redmond SM, Bordoni A, Ortelli L, Chiolero A, Konzelmann I, Matthes KL, Rohrmann S, Broggio J, Rashbass J, Fitzpatrick D, Gavin A, Clark DI, Deas AJ, Huws DW, White C, Montel L, Rachet B, Turculet AD, Stephens R, Chalker E, Phung H, Walton R, You H, Guthridge S, Johnson F, Gordon P, D'Onise

K, Priest K, Stokes BC, Venn A, Farrugia H, Thursfield V, Dowling J, Currow D, Hendrix J, Lewis C.

## **AII 572** co-authors are indexed in **PubMed**



US National Library of Medicine National Institutes of Health

www.ncbi.nlm.nih. gov/pubmed/ 29395269

# The time to deliver is now

There is no excuse for inaction, [because] we have evidence-based solutions (WHO)

- ✓ Good technology, communications
- ✓ Medical, health and academic skills
- ✓ Public health expertise
- ✓ Low costs base for clinical trials
- ✓ Population-based registries



#### **Swiss Re**















krebsliga schweiz lique suisse contre le cancer lega svizzera contro il cancro krebsforschung schweiz recherche suisse contre le cancer ricerca svizzera contro il cancro swiss cancer research















#### THE WORLD BANK













Setting the Agenda in Women's Health

**European Institute of Women's Health** 







International Network for Cancer Treatment and Research

















**Cancer Leagues** 

Association of European



National Institute

and Registration

for Cancer Epidemiology







# Time to deliver

There is no excuse for inaction, [because] we have evidence-based solutions.

# Parliament should explain to the public why...

... despite the underlying principle of consent for data collection,

identifiable data on some diseases must be collected without consent,

for public health research that harms noone and benefits everyone.

# Using identifiable data in the public interest

Potential risk to individuals

Some loss of autonomy

Low risk of breach of confidentiality, and harm

Proven benefit to individuals and society
Information on causes of disease – prevention
Public health surveillance – protection
Understanding outcomes – recurrence, survival

## Use of identifiable information is unavoidable

- Quality assurance (validity)
- Elimination of duplicate records (inflation)
- Clinical data not routinely captured (scope)
- Linkage of events (cause, relapse, outcome)
- Assessment of survival (event-to-death link)
- Small area analyses (clusters)
- Assessment of genetic risks
- Surveillance, audit and research

# Informed consent will not work – 1 Unquantifiable loss of information

- Most patients would consent, some would not
- Many patients would not be asked
- Complete, unbiased coverage would be lost
- True disease burden would be unknown
- Comparisons would become unreliable:
  - time, geographic area, population sub-group
- Projections of future burden unreliable
- Health inequalities no longer reliably measured

# Informed consent will not work - 2

No effective cancer registry with informed consent

- West Germany informed consent, 1990-
  - Unacceptable loss of completeness (under 70%)
  - Hamburg and Saarland registries closed for 2 years
  - Dropped from international compendia
  - Minimal research output
- East Germany informed consent, 1990-
  - Disruption of largest European cancer registry (1953-)
- Hungary Personal Data Protection Act 1992
  - Cancer registration stopped until 1999
- Nordic countries statutory, no consent
  - Efficient, complete, productive cancer registries

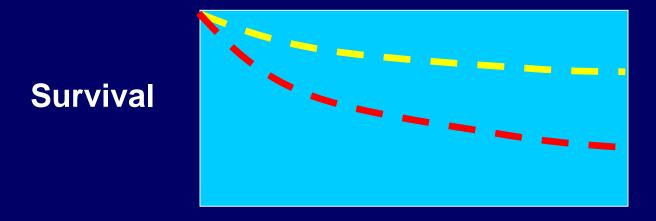
# **Mortality-incidence ratio**

- Not a case-fatality ratio
- Independent data streams time-lag
- Depends on accuracy of cause of death
- No hazard by time since diagnosis
- Not a direct index of effectiveness (I, S)

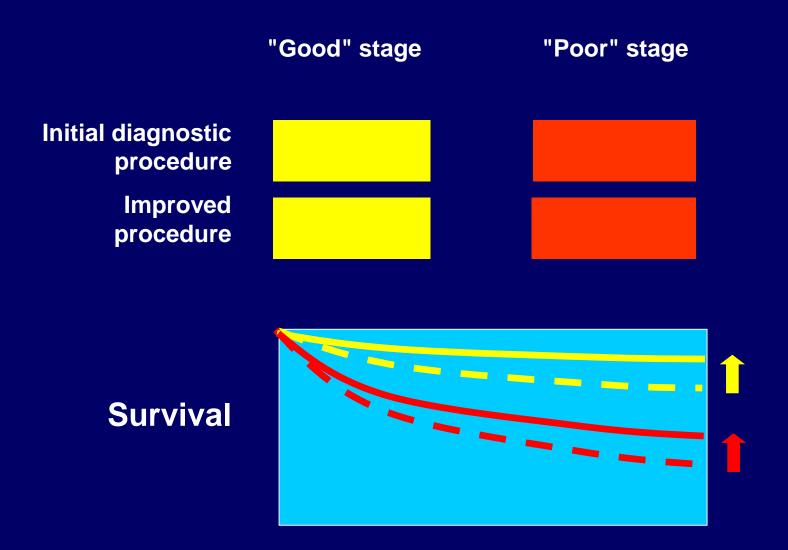
#### Stage migration, or the "Will Rogers phenomenon"



A cohort is classified into early and advanced stage



### Stage migration, or the "Will Rogers phenomenon"



## **Effect of stage migration**

	Initial diagnostic procedure		Improved procedure	
Stage	Cases	Survival	Cases	Survival
Localised	170	53.3	122	55.9
Regional	307	40.6	250	42.6
Metastatic	250	33.2	355	34.8
All stages	727	41.0	727	41.0