Overview of Global Trends:

Cancer Prevention and Screening

Lisa Stevens, Ph.D.
Deputy Director, Center for Global Health
National Cancer Institute, Bethesda

Benjamin O. Anderson, M.D.
Chair and Director, Breast Health Global Initiative
Fred Hutchinson Cancer Research Center
Professor of Surgery & Global Health Medicine
University of Washington, Seattle, Washington

Cancer Prevention & Screening

- Global Cancer Trends
- Cancer Prevention Strategies
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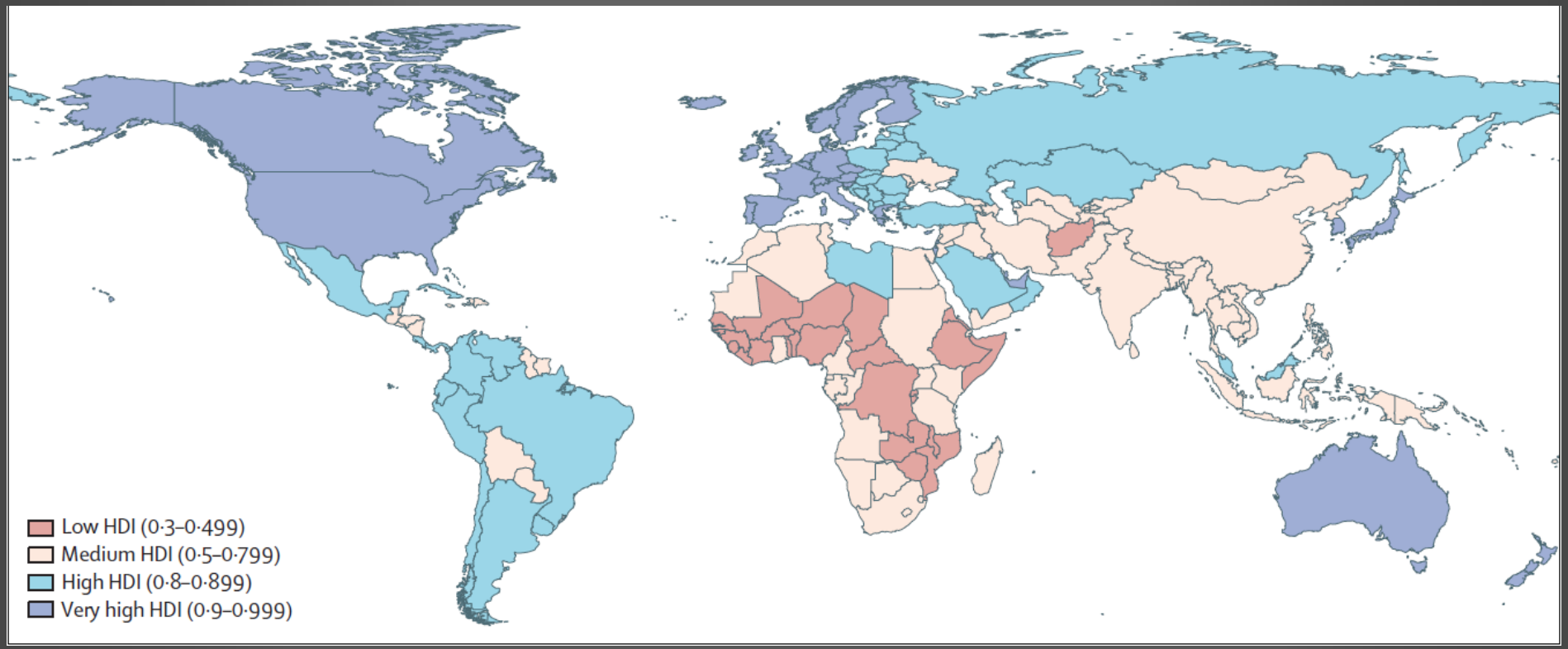
GLOBAL CANCER TRENDS (IARC)

HUMAN DEVELOPMENT INDEX (2008-2030)



- Highest HDI: Breast, lung, colorectum, prostate cancers (over 50%)
- Medium HDI: Add esophagus, stomach, liver; Low HDI: cervical cancer

Bray, et al, Lancet Oncol 13:790, 2012

GLOBAL CANCER TRENDS (IARC)

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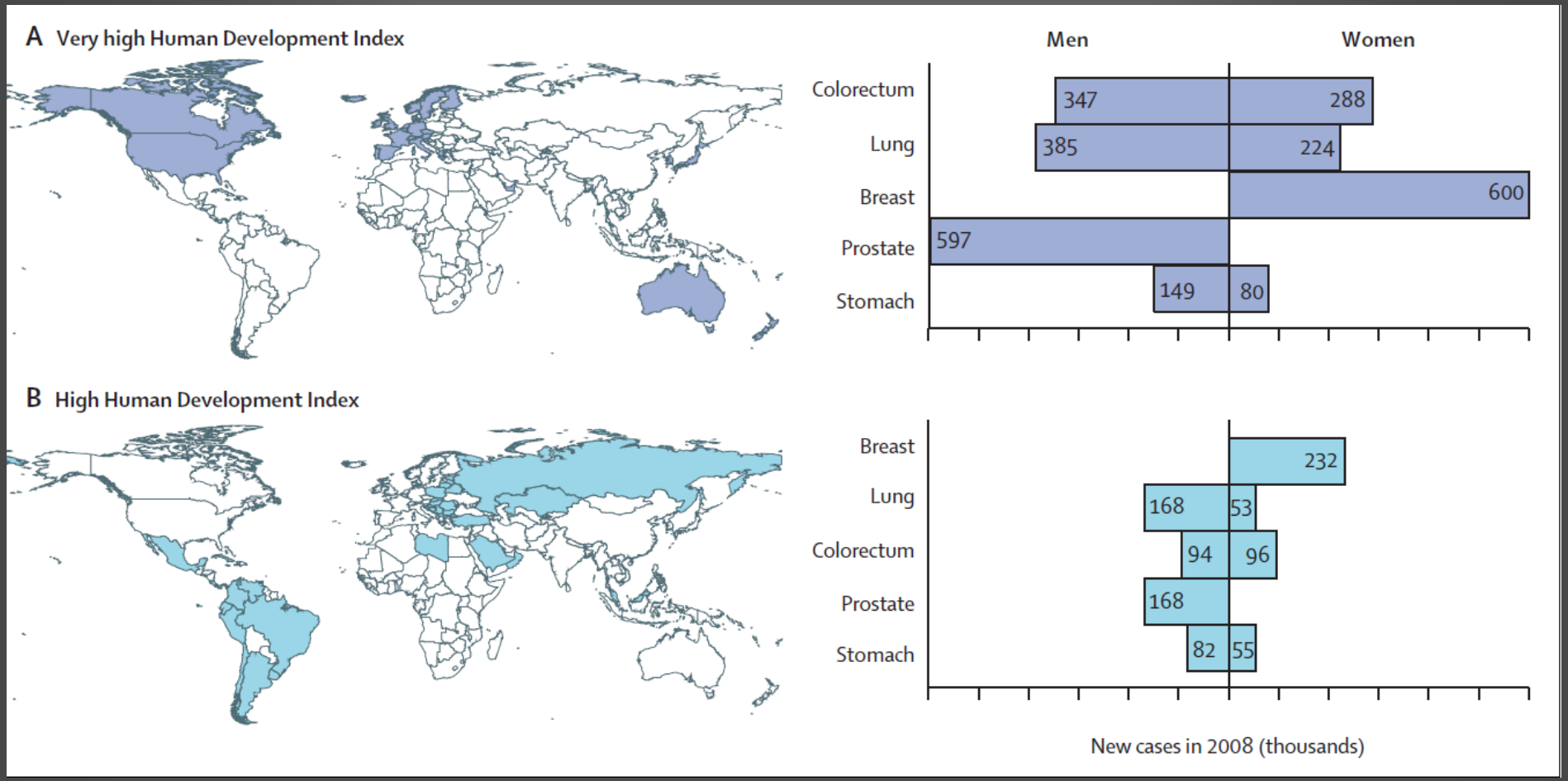

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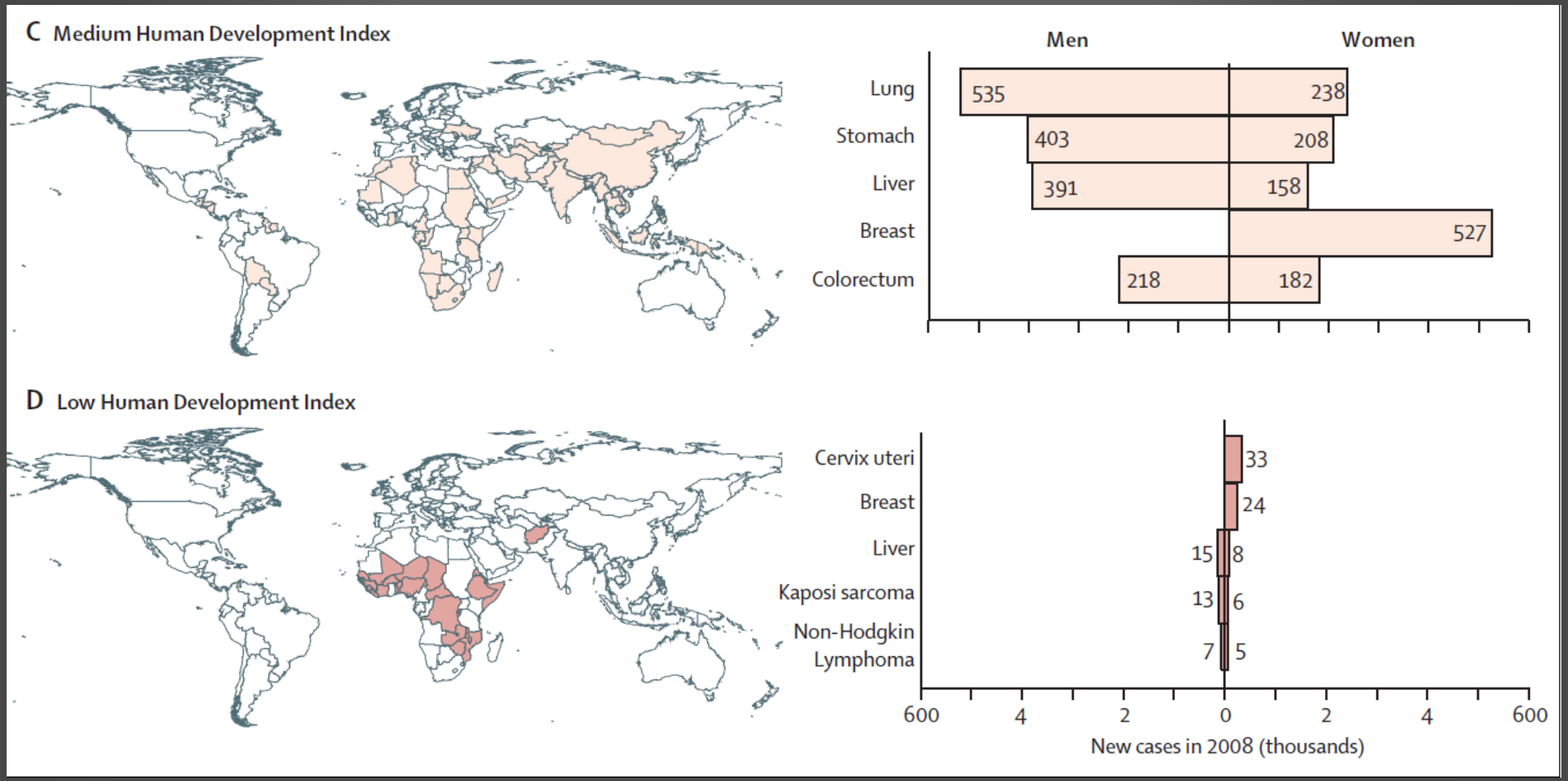


Bray, et al, Lancet Oncol 13:790, 2012

GLOBAL CANCER TRENDS (IARC)

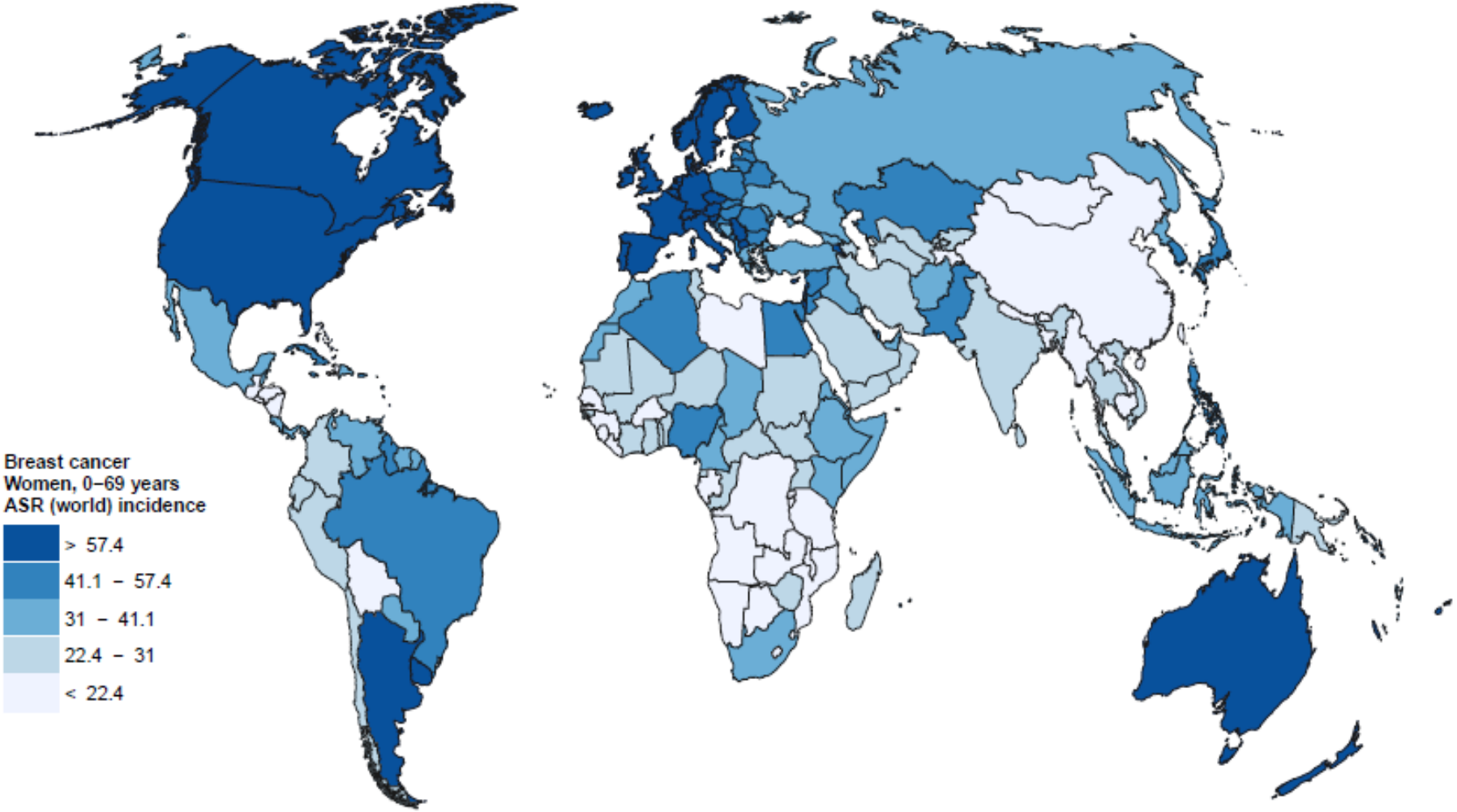
HUMAN DEVELOPMENT INDEX (2008-2030)

	Men			Women			Scenario-based prediction for 2030*
	Medium HDI	High HDI	Very high HDI	Medium HDI	High HDI	Very high HDI	
Stomach	−2·7%	−2·6%	−2·8%	−1·9%	−2·5%	−2·5%	2·5% annual decrease in all HDI areas per year
Cervix uteri	..	..	..	−1·8%	−1·2%	−2·6%	2% annual decrease in all HDI areas per year
Lung	−1·5%	−1·3%	−1·6%	−0·5%	0·5%	1·8%	1% annual decrease in high HDI and very high HDI areas (men) 1% annual increase in high HDI and very high HDI areas (women)
Liver	0·1%	0·2%	2·5%	−0·4%	0·4%	2·1%	Difficult to generalise, assume no change
Colorectum	1·5%	2·8%	0·6%	1·5%	1·8%	0·3%	1% annual increase in all HDI areas per year
Breast	..	..	..	2·1%	2·6%	1·6%	2% annual increase in all HDI areas per year
Prostate	3·2%	7·0%	4·4%	..	..	..	3% annual increase in all HDI areas per year

- 12.7 million cases in 2008 predicted to rise to 22.2 million by 2030
- Reductions in infection-related cancers are offset by increases in cancers associated with reproductive, dietary and hormonal factors

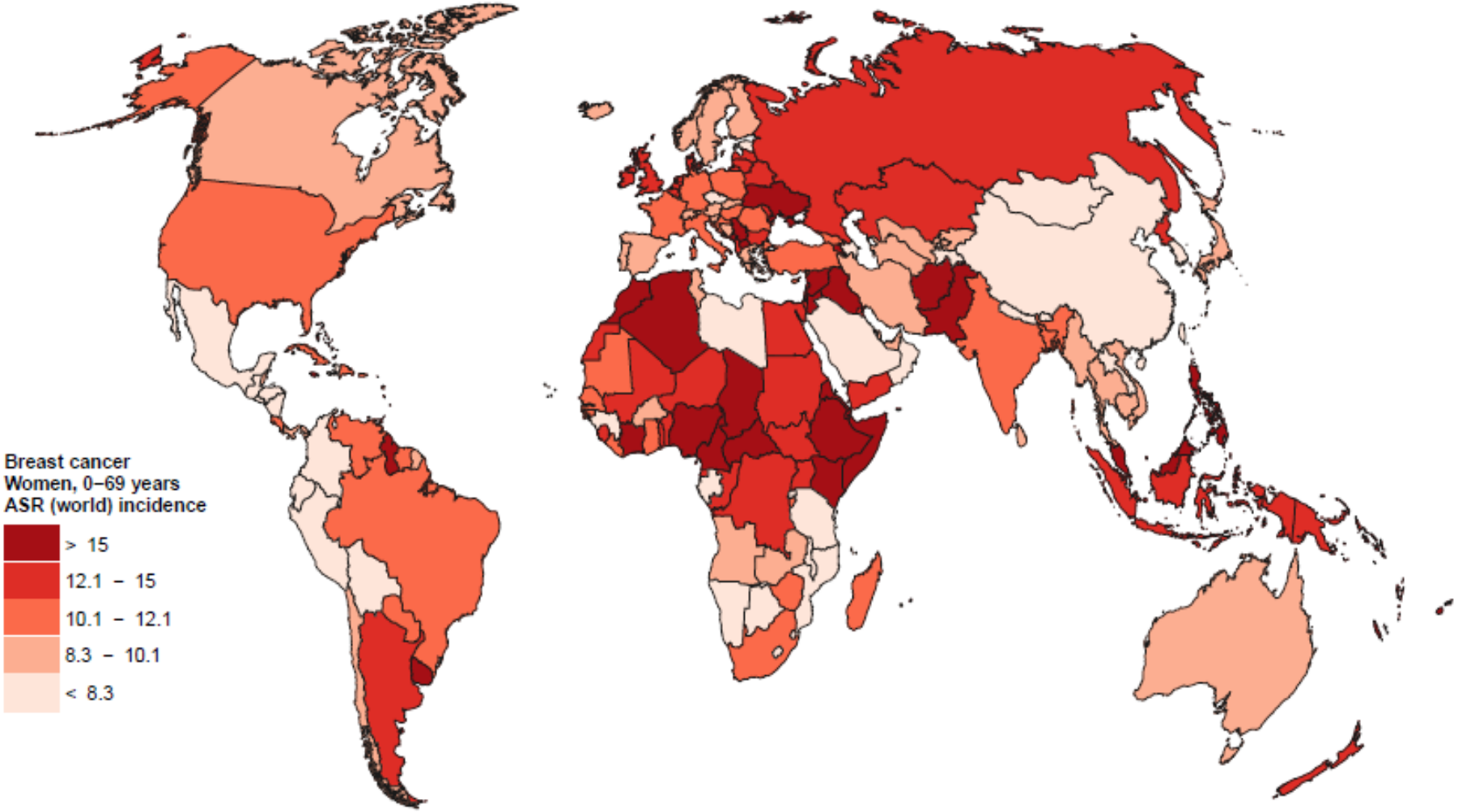
Bray, et al, Lancet Oncol 13:790, 2012

BREAST CANCER GLOBAL INCIDENCE



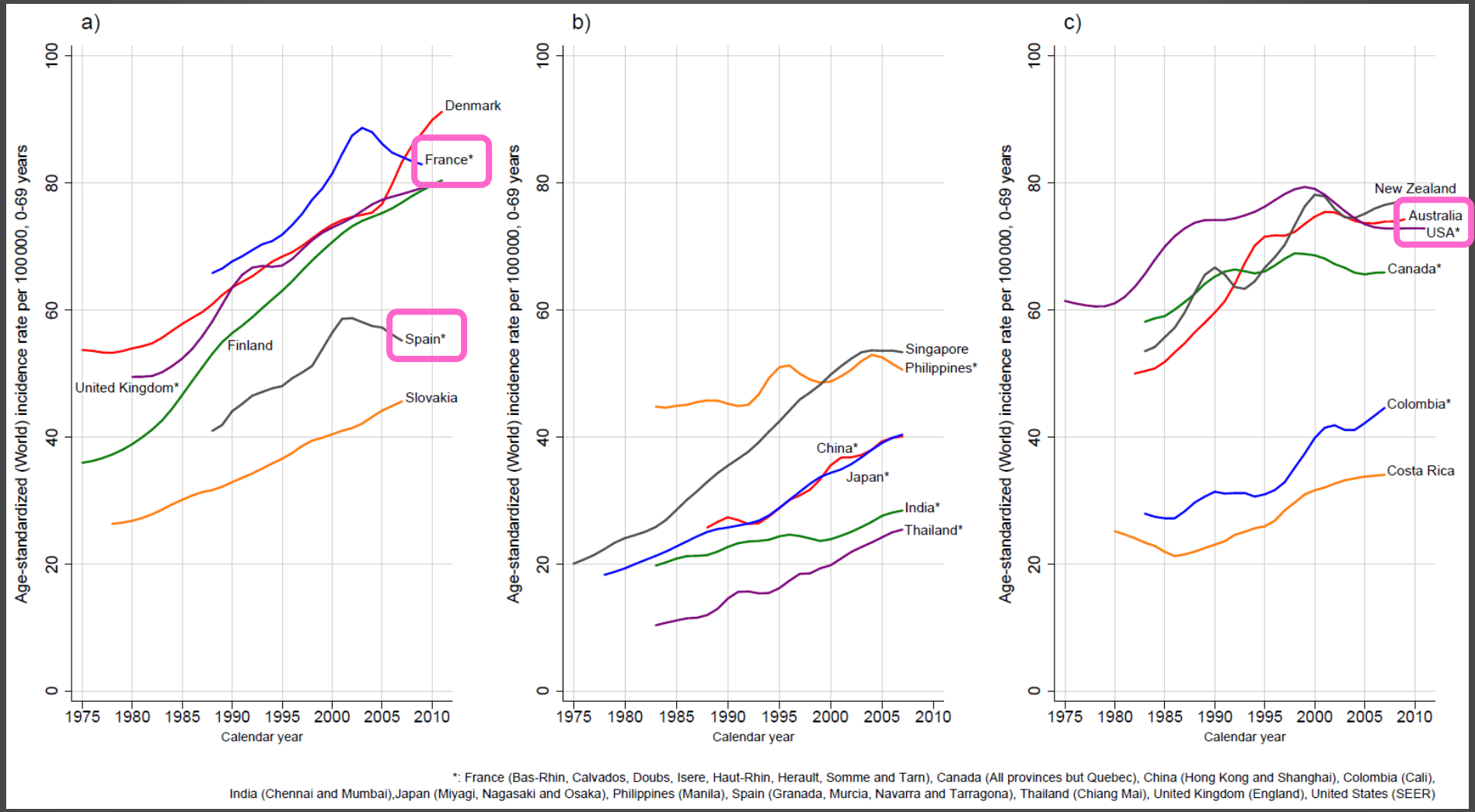
SOURCE: Globocan 2012 (IARC)

BREAST CANCER GLOBAL MORTALITY



SOURCE: Globocan 2012 (IARC)

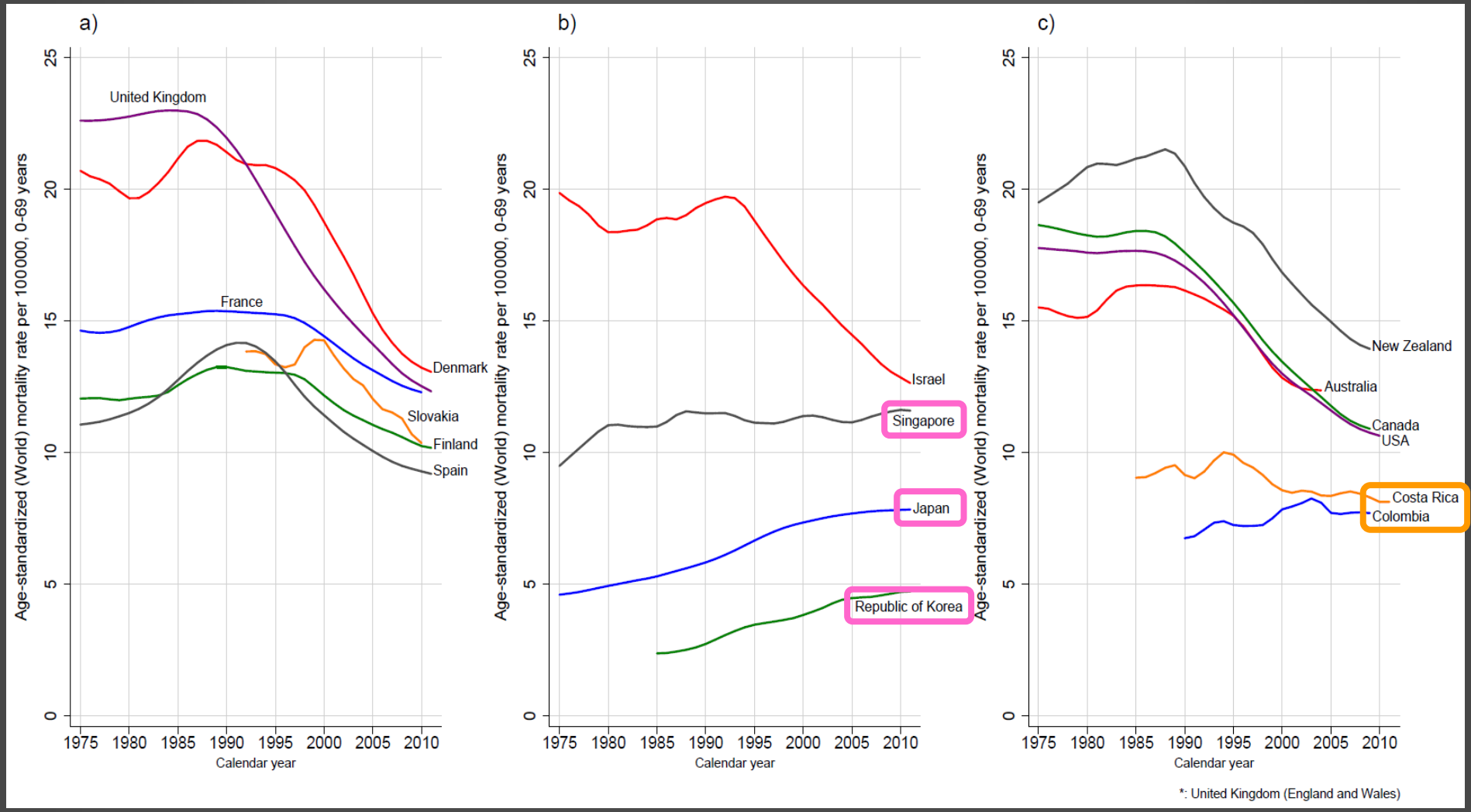
BREAST CANCER INCIDENCE (1975-2011)



*: France (Bas-Rhin, Calvados, Doubs, Isere, Haut-Rhin, Herault, Somme and Tarn), Canada (All provinces but Quebec), China (Hong Kong and Shanghai), Colombia (Cali), India (Chennai and Mumbai),Japan (Miyagi, Nagasaki and Osaka), Philippines (Manila), Spain (Granada, Murcia, Navarra and Tarragona), Thailand (Chiang Mai), United Kingdom (England), United States (SEER)

SOURCE: Globocan 2012 (IARC)

BREAST CANCER DEATHS (1975-2011)



SOURCE: Globocan 2012 (IARC)

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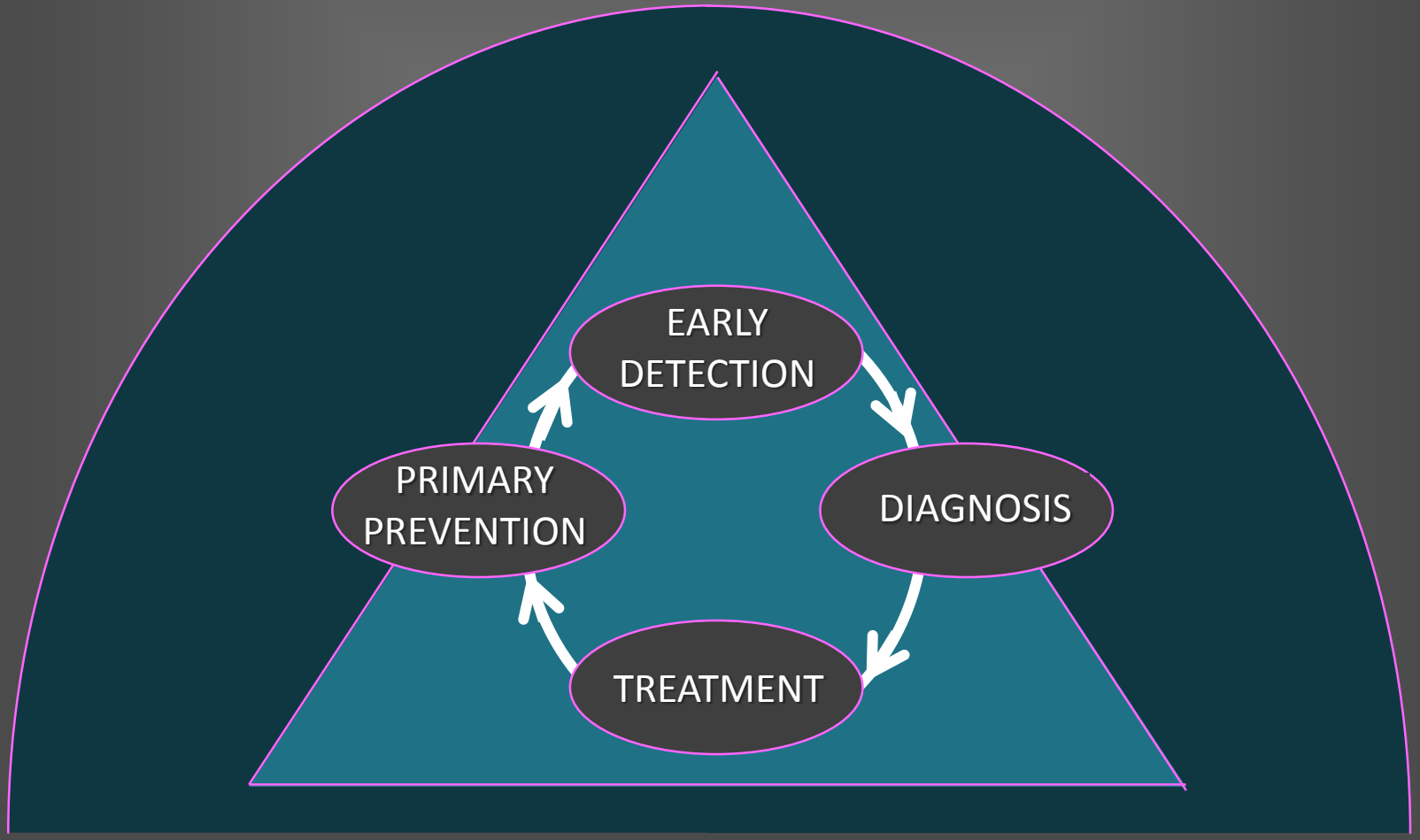
CANCER CONTROL STRATEGIES

DISEASE-BASED APPROACH



CANCER PREVENTION STRATEGIES

POPULATION-ATTRIBUTABLE FRACTION (PAF)

Table 2. Prevention program types. The estimated PAF provides an indirect measure of the potential impact for a given prevention program. HPV, human papilloma virus; HCC, hepatocellular carcinoma.

Etiology	Carcinogenic risk factor (associated PAF)	Overall PAF (%)	Risk reduction programs	Key multisectoral partners	Estimated cost-effectiveness
Infectious etiologies	HPV (cervical cancer 90–100%)* Hepatitis B and C (HCC 77%)* *H. pylori* (gastric cancer 75%)*	18	Vaccinations	Health care workers Pharmaceutical companies Legislative bodies	Very cost-effective
Behavioral factors	Tobacco (30%)† Obesity (20%)† Diet (5%)† Alcohol (4%)†	66	Tobacco cessation Exercise programs Public education and outreach	General population (health literacy) Legislative bodies Health care workers	Very cost-effective
Environmental factors	Air pollution Aflatoxins	4	Environmental regulations	Legislative bodies Business sector	Potentially cost-effective
Clinical interventions	Chemoprevention (such as tamoxifen, aspirin, celecoxib, or finasteride) Surgical procedures (such as prophylactic mastectomy or prophylactic oophorectomy)	N/A	Insurance coverage for correctly selected individuals at elevated risk	Health care workers Pharmaceutical companies General population	Cost-effective

Ilbawi, Science Trans Med, 7:278cm1, 2015

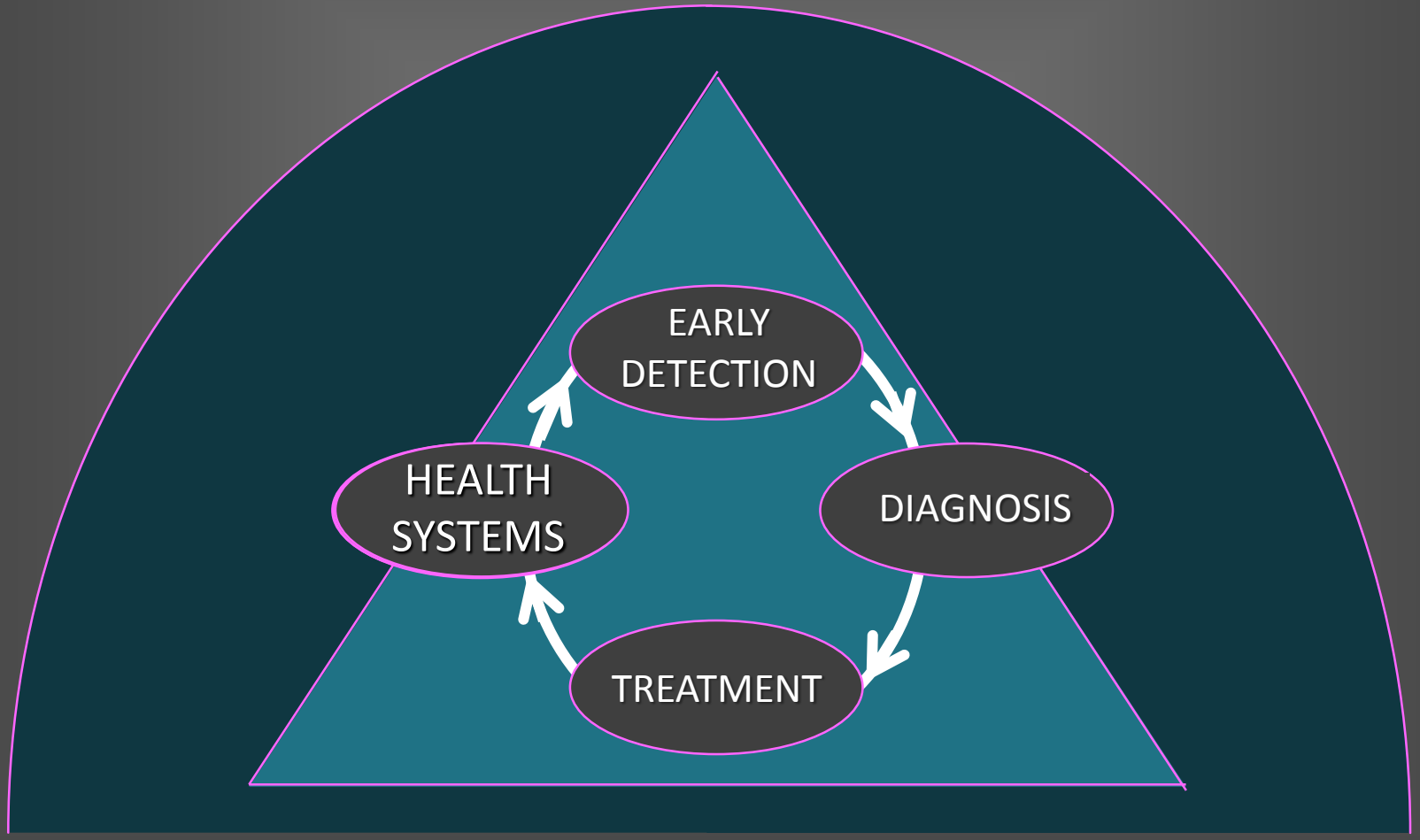
CANCER CONTROL STRATEGIES
PRIMARY PREVENTION

Health behaviors associated with reduced breast cancer risk

1. Prolonged lactation
2. Regular physical activity
3. Weight control
4. Avoid excess alcohol intake
5. Avoid prolonged use of exogenous hormones
6. Avoid excessive radiation exposure

McTiernan, et al, Cancer, 113:2325, 2008

CANCER CONTROL STRATEGIES
COMPREHENSIVE APPROACH



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U.S. CANCER INCIDENCE 2015 (EST.)

Females

Breast	231,840	29%
Lung & bronchus	105,590	13%
Colon & rectum	63,610	8%
Uterine corpus	54,870	7%
Thyroid	47,230	6%
Non-Hodgkin lymphoma	32,000	4%
Melanoma of the skin	31,200	4%
Pancreas	24,120	3%
Leukemia	23,370	3%
Kidney & renal pelvis	23,290	3%
All Sites	**810,170**	**100%**

SOURCE: Seigel Ca Cancer J Clin 65:5, 2015

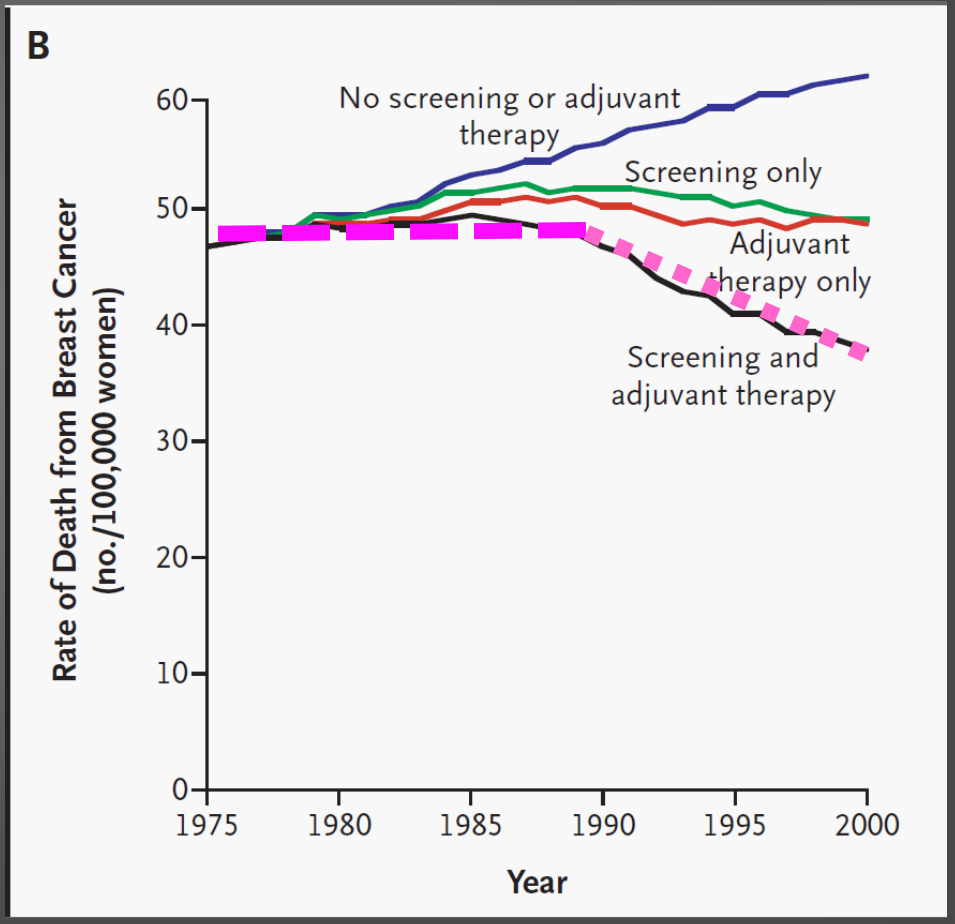
U.S. CANCER MORTALITY 2015 (EST.)

Females		
Lung & bronchus	71,660	26%
Breast	40,290	15%
Colon & rectum	23,600	9%
Pancreas	19,850	7%
Ovary	14,180	5%
Leukemia	10,240	4%
Uterine corpus	10,170	4%
Non-Hodgkin lymphoma	8,310	3%
Liver & intrahepatic bile duct	7,520	3%
Brain & other nervous system	6,380	2%
All Sites	**277,280**	**100%**

SOURCE: Seigel Ca Cancer J Clin 65:5, 2015

MORTALITY MODELING
SCREENING AND ADJUVANT THERAPY

- Early detection is essential to improving outcome.
- Early detection works when followed by appropriate breast cancer treatment.
- To save lives, screening programs must be linked to timely, effective treatment.



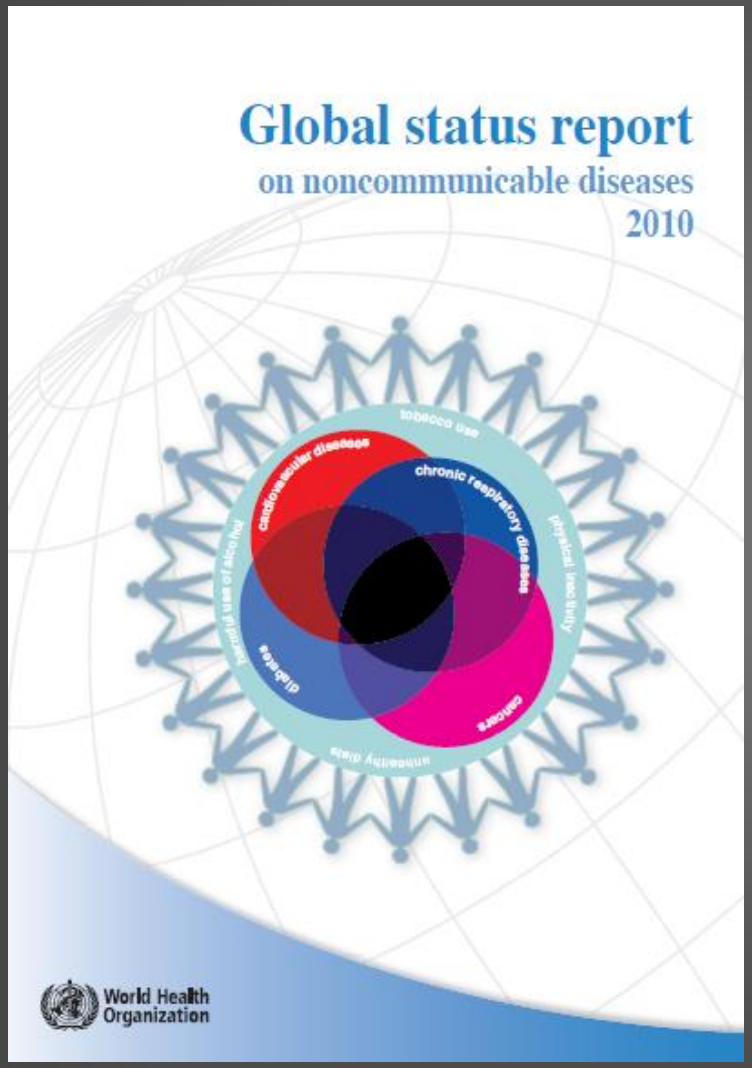
Berry, et al. (CISNET), NEJM 353:1784, 2005

IARC WORKING GROUP 2014

BREAST CANCER SCREENING

- Mammography screening reduces breast cancer mortality
  - Women aged 50 -74 years (sufficient)
  - Women aged 45 – 49 years (limited / sufficient)
  - Women aged 40 – 44 years (limited)
- Mammographic screening can be cost effective for women aged 50 – 69 in countries with high breast cancer incidence (sufficient)
- Mammographic screening can be cost effective in low and middle income countries (limited)

Lauby-Secretan et al, NEJM, June 3, 2015



- Biennial mammographic screening (50–70 years) with breast cancer treatment are among "best buys"
- Could avert 19% of cancer burden
- BUT breast cancer interventions impractical for poorer countries:
  - implementation costs
  - limited feasibility of treatment in primary care setting in LMCs

BREAST CANCER EPIDEMIOLOGY

STAGE AT DIAGNOSIS: UNITED STATES VS. INDIA

STAGE	EXTENT	5 year SURVIVAL	DISTRIBUTION	
			USA	INDIA
0	Noninvasive	100%	**16%**	----
I	Early stage disease	100%	**40%**	1%
II	Early stage disease	86%	**34%**	23%
III	Locally advanced	57%	6%	**52%**
IV	Metastatic disease	20%	4%	**24%**

USA: 90% DCIS or early staged invasive disease at diagnosis

INDIA: 76% locally advanced or metastatic at diagnosis

Sources: SEER Survival Monograph (NCI), 2007; Chopra, Cancer Institute Chennai, 2001

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WORLD BANK COUNTRY GROUPS

WORLD BANK CLASSIFICATION (ATLAS METHOD)

World Bank Country Groups *(GNI per capita)*	Low Income *($995 or less)*	Lower Middle Income *($996 - $3,945)*	Upper Middle Income *($3,946 - $12,195)*	High Income *($12,196 or more)*
Average female life expectancy at birth	57.8 yrs	69.3 yrs	74.4 yrs	82.4 yrs
Average GNI per capita (2009 US dollars)	$403	$1,723	$6,314	$36,953
Total national health expenditure per capita	$22	$76	$458	$4,266
Fraction of GDP spent on health care	5.1%	4.3%	6.4%	11.2%

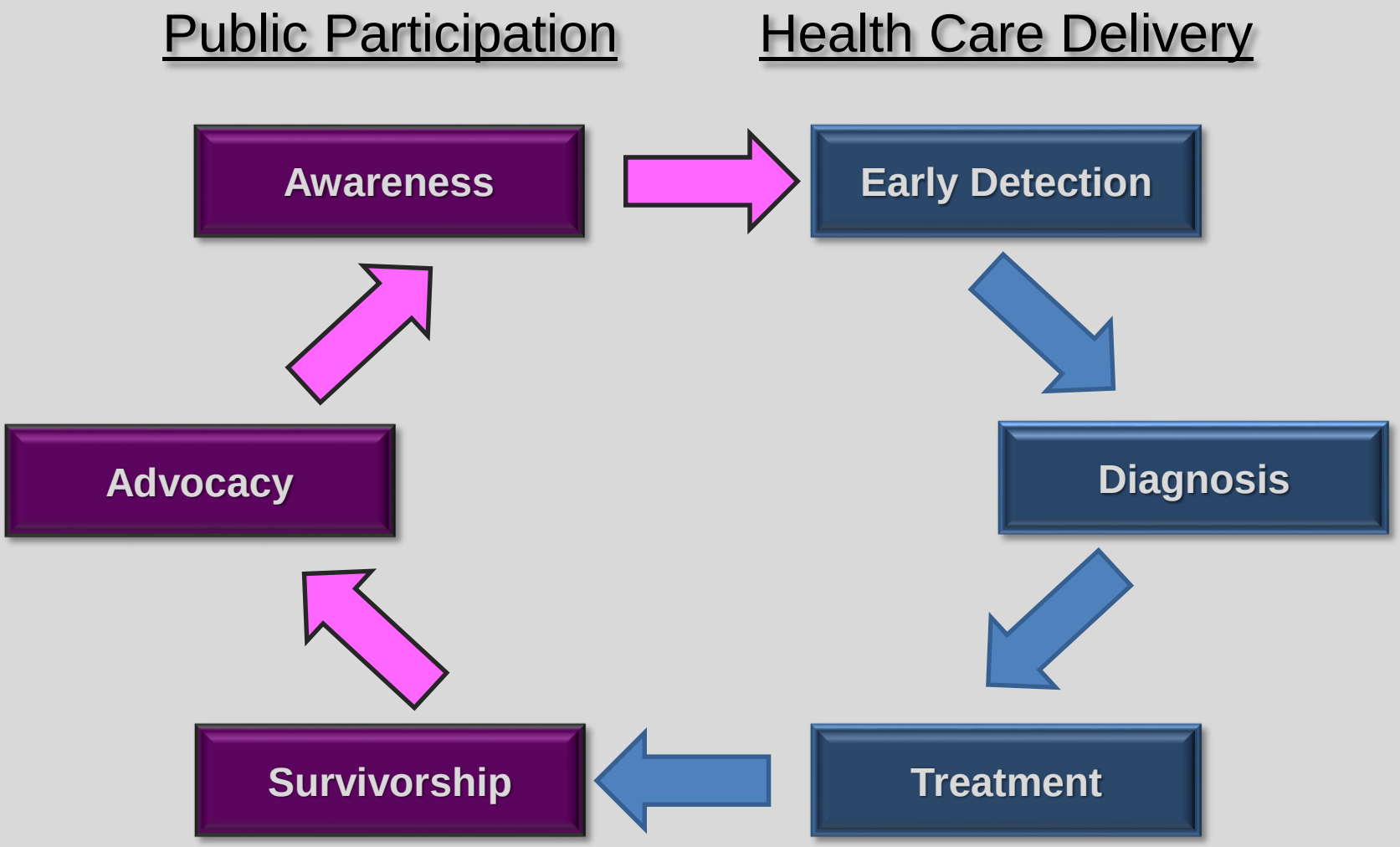
Health expenditure figures 2010 for calendar year 2007; GNI = gross national income
http://data.worldbank.org/data-catalog/health-nutrition-and-population-statistics.

HEALTH POLICY PRIORITIZATION

INCIDENCE, PREVENTION POTENTIAL, SCREENING EFFECTIVENESS, AND MORTALITY-TO-INCIDENCE RATIOS

Cancer type	Relative incidence in LMICs (%)	Prevention potential (PAF) (%)	Screening effectiveness (estimated mortality benefit, %)	MIR in HICs (%)	Difference in MIR between HICs and LMICs (%)	Health policy priority
Breast	15.6	21	Yes (20–40)	22	28	Early detection and treatment
Prostate	5.1	0	No* (0–30)	18	64	Treatment
Lung	4.1	74	Unknown (0–20)	82	7	Prevention
Colorectum	4.2	13-15	Yes (12–32)	42	34	Early detection and treatment
Cervix uteri	11.7	95–100	Yes (20–70)	42	19	Prevention > early detection
Stomach	3.7	69	No†	56	38	Prevention > treatment
Liver	5.3	81	No*	86	9	Prevention
Corpus uteri	1.3	37	No*	19	20	Prevention > treatment
Ovary	2.2	12	No*	67	9	Additional research
Esophagus	4.9	46–58	No*	81	11	Prevention

Ilbawi, Science Trans Med, 7:278cm1, 2015



CANCER PREVENTION & SCREENING

SUMMARY

- The global cancer burden is rising in countries at all economic levels.
- Reductions in infection-related cancers are offset by increases in cancers associated with reproductive, dietary and hormonal factors.
- Infection-associated and some environmental cancers are more amenable to cost-effective prevention strategies.
- Screening has been effective in reducing breast cancer mortality in high-income countries, but are not realistic in low-resource settings.
- Early detection strategies are necessary for improving breast cancer outcomes, but additional research is needed to assess what works.

The Breast Health Global Initiative

www.bhgi.info

FRED HUTCH
CURES START HERE