Emerging Risk: Cancer Products and Associated Risks

Zhee Koh, FSA, Head of L&H Pricing (India)
4th IAI Seminar on ERM
3 December 2015

People hear the word cancer and they immediately think death sentence. I was told to keep quiet about my illness – **Lisa Ray**

By the end of it, I would have run away if a fourth cycle (of chemo) was necessary, even if it meant I'd die... I didn't want to enter the hospital again – **Yuvraj Singh**

The worst pain I suffered was because of the injections given to increase the white blood cell count. I remember telling my mother, 'If this is the pain I have to go through I rather die.' – **Manisha Koirala**
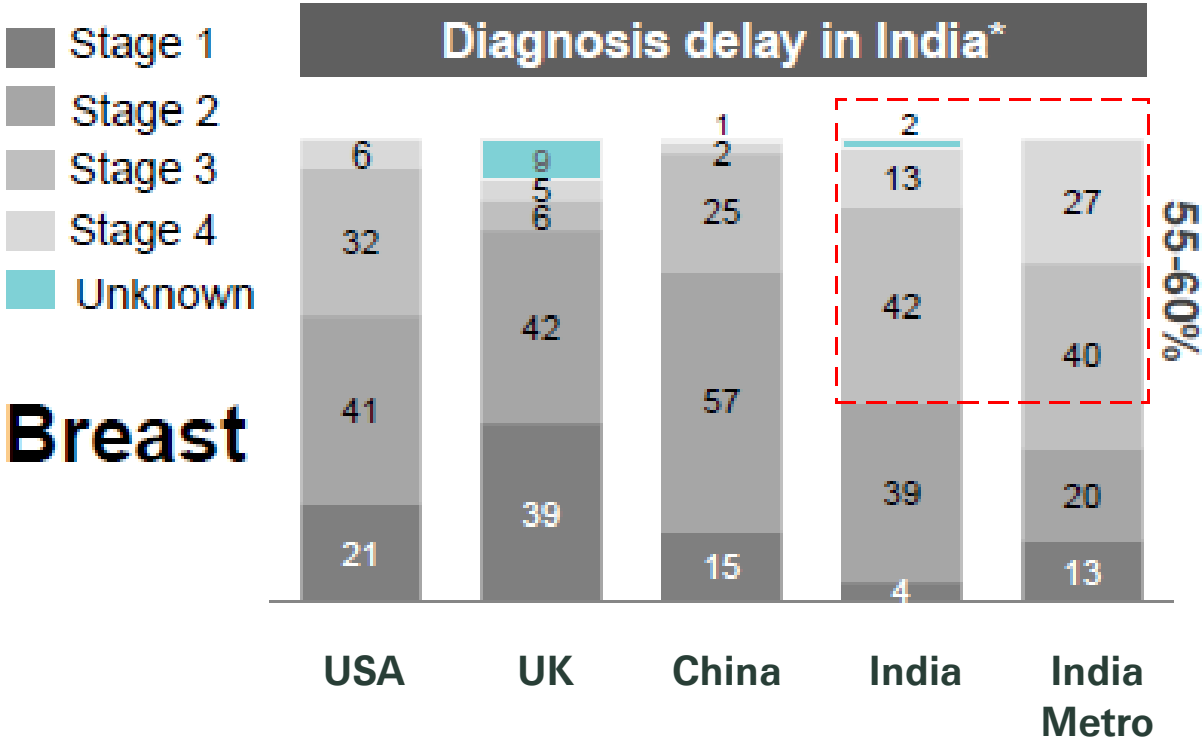
The "good" news…

- India is estimated to have around 1 million new cases per year, with incidence rate around 94 per 100,000 (weighted mean of the age-specific rates)

- Lower than most emerging and developed markets across the globe

Incidence per 100,000 (ASR-W)

Country	Incidence
India	94
Africa	123
China	174
UK	273
USA	318
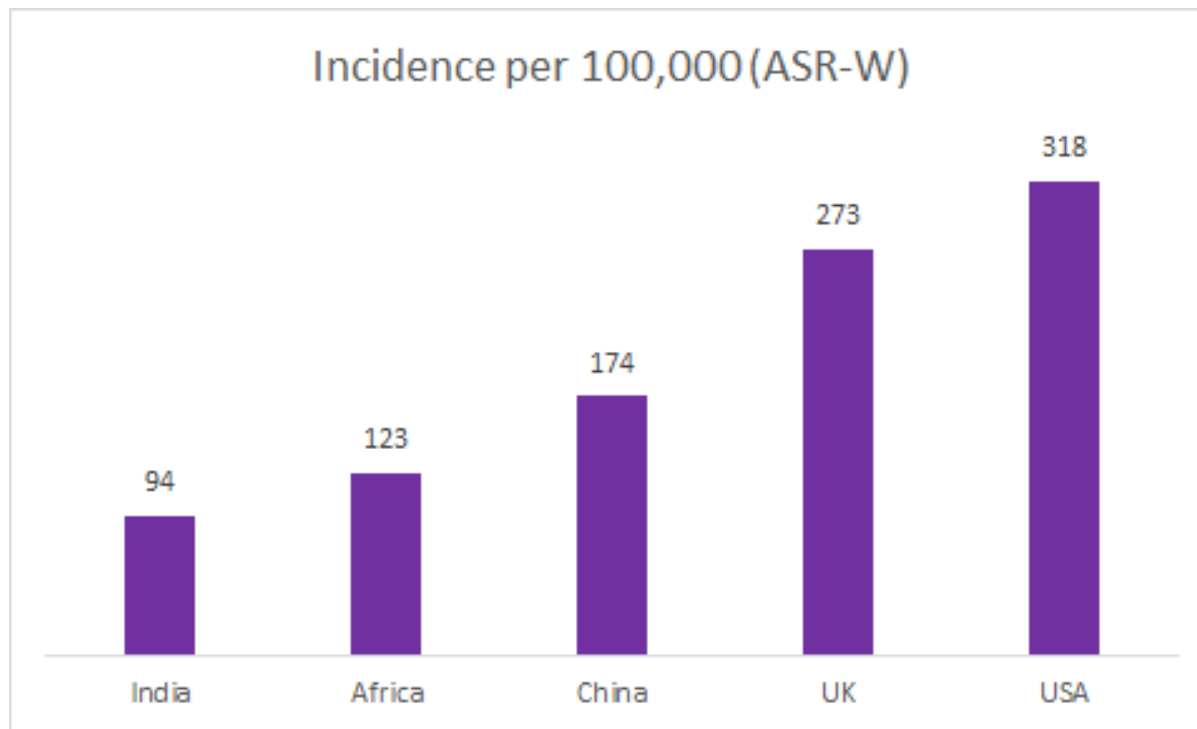
Sources: Globocan 2012, EY analysis

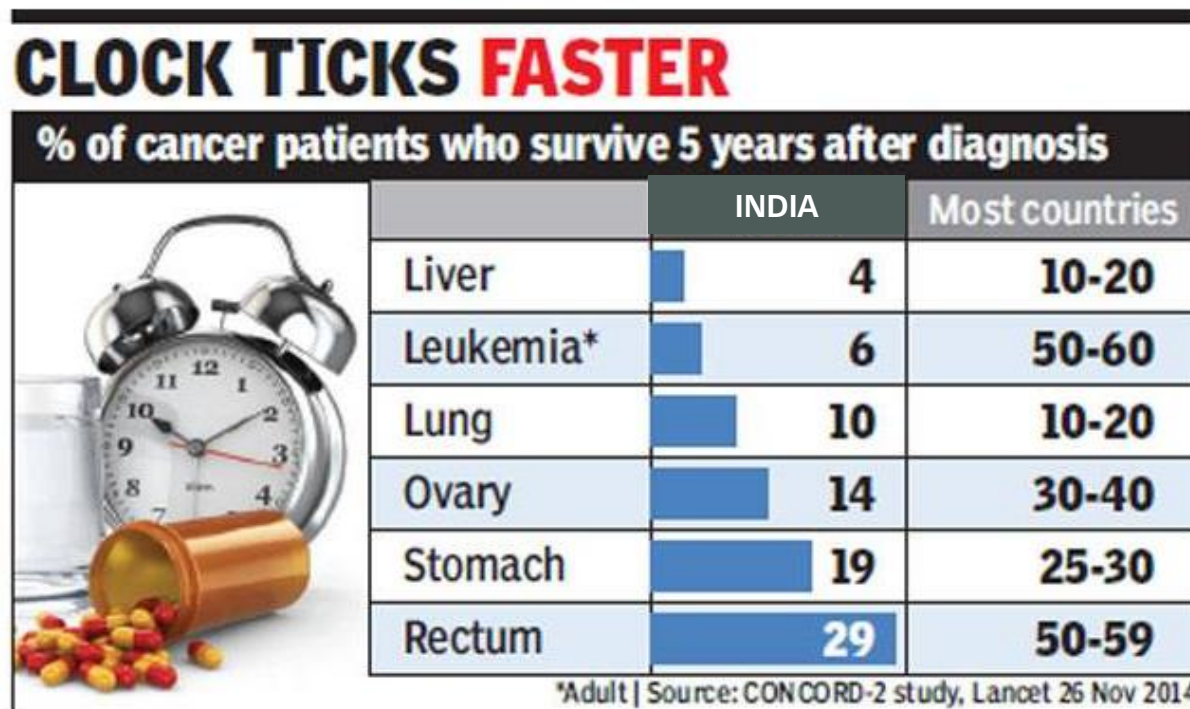Swiss Re

The not-so-good news...

- India has a poor detection rate with only 20-30% of cancers being diagnosed in stages I and II, which is less than half of that in China, the UK and the US

Diagnosis delay in India*

Legend: Stage 1, Stage 2, Stage 3, Stage 4, Unknown — Breast

|	USA	UK	China	India	India Metro
Unknown		9		2	
Stage 4	6	5	1	13	27
Stage 3	32	6	2		
Stage 2	41	42	25	42	40
			57	39	20
Stage 1	21	39	15	4	13

55-60%

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The not-so-good news…

- Mortality rates (due to cancer) are four to six times higher in India than other developed nations (e.g. US)

- Less than 1/3 of patients are alive more than 5 years after their diagnosis, and

- Three quarters of cancer deaths occur during their prime productive years

CLOCK TICKS FASTER

% of cancer patients who survive 5 years after diagnosis

	INDIA	Most countries
Liver	4	10-20
Leukemia*	6	50-60
Lung	10	10-20
Ovary	14	30-40
Stomach	19	25-30
Rectum	29	50-59

*Adult | Source: CONCORD-2 study, Lancet 26 Nov 2014

The not-so-good news…

- World's highest rates of cervical, gall bladder, oral, pharynx cancers are in India
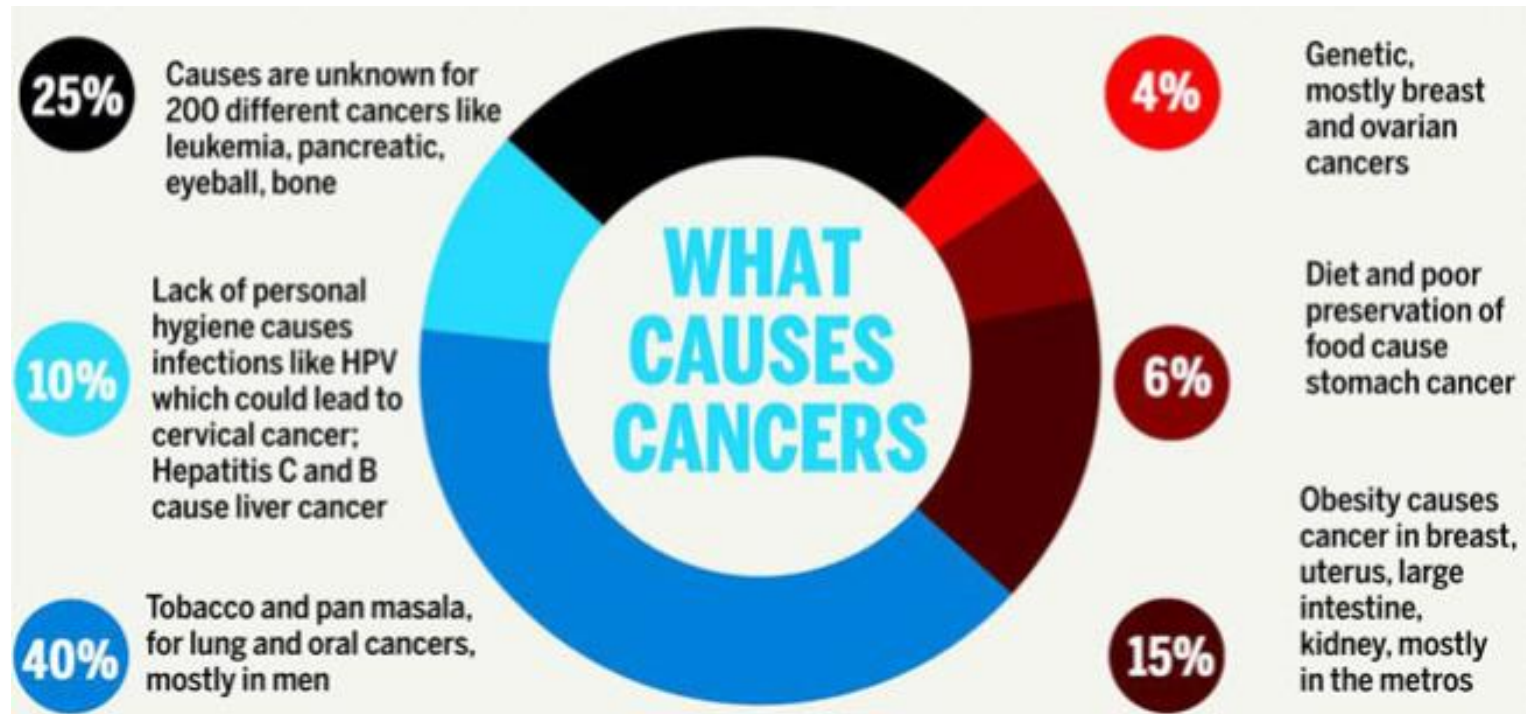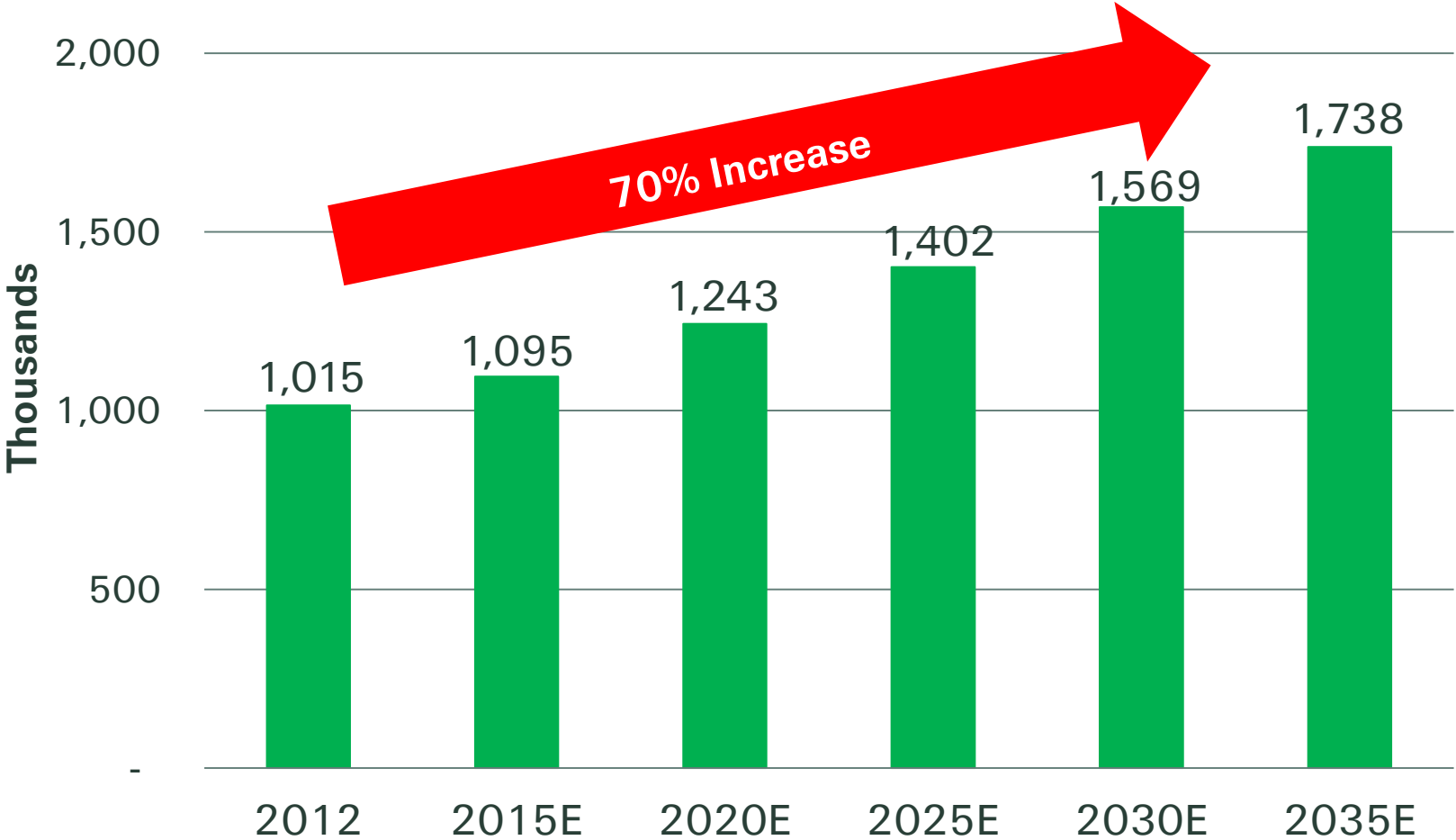
The bad news…

Sources: Global Burden of Cancer Studies, GLOBOCAN, WHO, 2012

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The bad news... Cancer Treatment Cost Scenario

- Female, age 45 years, diagnosed with breast cancer

- Initial Lumpectomy was done. Surgery Cost INR 1.25 lac

- HER positive – will respond to "wonder drug" HERCEPTIN (very high success rate/less side effects compared to normal chemo

- HERCEPTION costs INR 75,000 per vial of 440 mgs
  - Need may be 15-20 doses over a period of 1-2 yrs= INR 11-15 lacs

- This is given with conventional chemo- costing around INR 1.5 to 2 lac

- Radiation may be required in some cases : range from INR 1.5-3 lac

- Total cost of the **first battle** with cancer was approximately INR 15-20 lac

Swiss drugmaker Roche launches costliest cancer drugs in India

By *DIVYA RAJAGOPAL*, ET Bureau | 26 Nov, 2015, 06.34AM IST

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READ MORE ON » Roche | Perjeta | Kadcyla | Cancer | Biocon

MUMBAI: As insurers, patients and governments across the world debate over the rising cost of healthcare, Swiss pharmaceutical major Roche has boldly launched two new drugs for late-stage breast cancer, pricing them higher than any other cancer medicine in the Indian market.
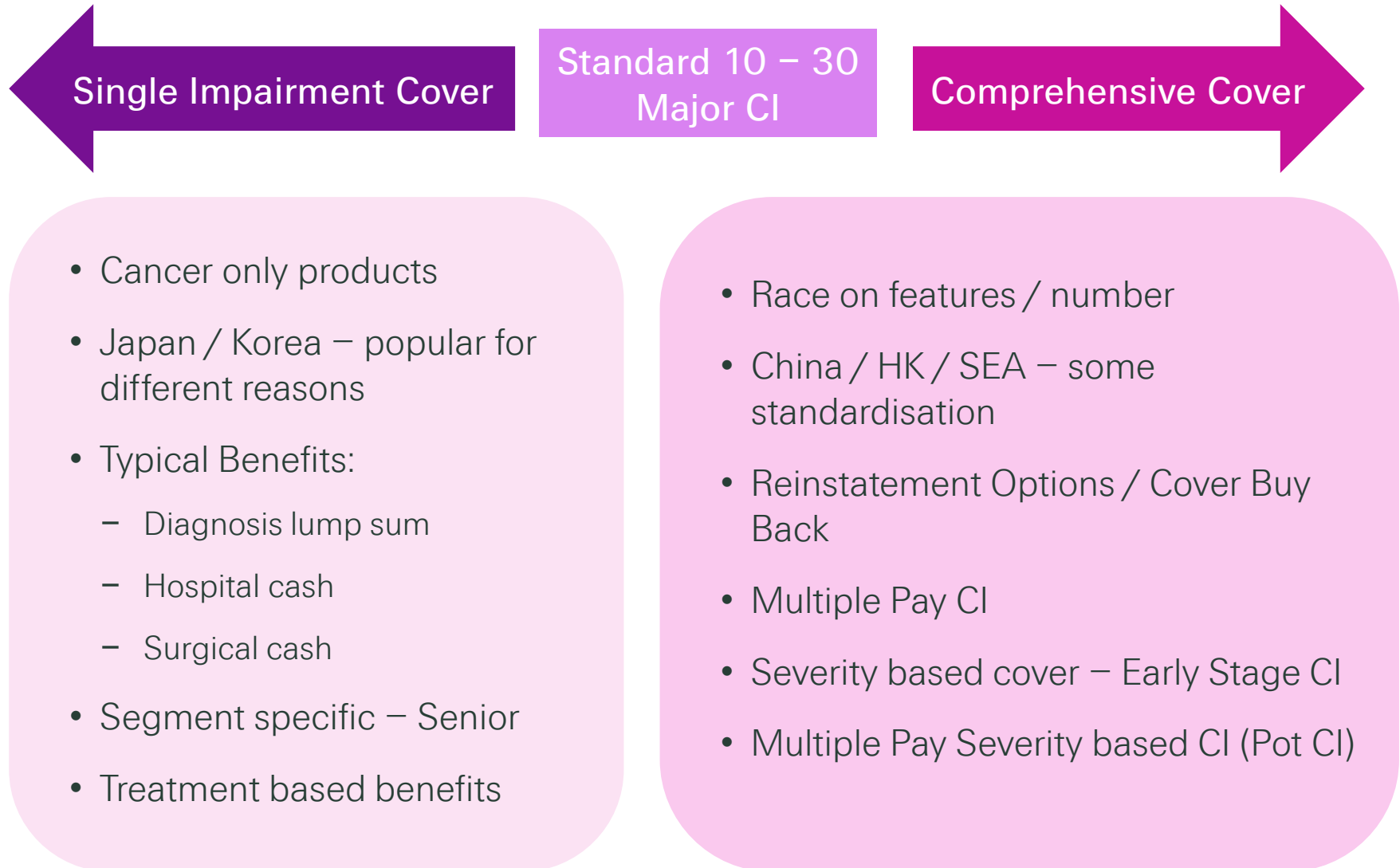
Kadcyla and Perjeta, the new class of drugs launched in India in October, cost Rs 2,10,000 (200 ml) and Rs 2,49,000 for a dosage, respectively. ET verified the price with several chemists and doctors, who said the maximum discount that was available was in the range of Rs 10,000-15,000. Roche said it gives the drugs free of cost after an initial stage of treatment.

ET SPECIAL: Love visual aspect of news? Enjoy this exclusive slideshows treat!

These drugs are given when the cancer becomes metastatic, or in simple terms when the tumour spreads to other parts of the body where the chances of cure are negligible. They are recommended when patients fail to respond to Herceptin (trastuzumab), the most commonly prescribed treatment for breast cancer.

The cost of the drugs over a nine-month period hovers around Rs 12 lakh for Kadcyla and Rs 30 lakh for Perjeta. In India, Roche collaborated with Pune-based Emcure Pharmaceuticals to sell Herceptin under a local brand name, Herclon, which costs about Rs 65,000 a vial.
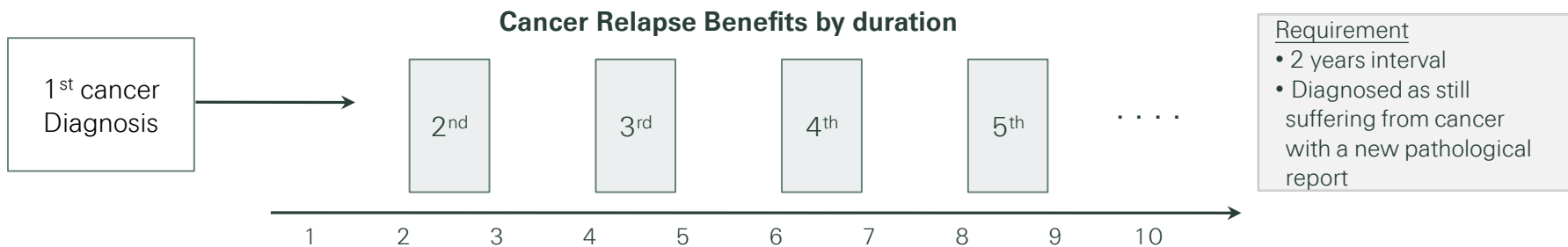
Critical Illness evolution across different Asian markets

Single Impairment Cover ← | **Standard 10 – 30 Major CI** | **Comprehensive Cover** →

- Cancer only products
- Japan / Korea – popular for different reasons
- Typical Benefits:
  - Diagnosis lump sum
  - Hospital cash
  - Surgical cash
- Segment specific – Senior
- Treatment based benefits

- Race on features / number
- China / HK / SEA – some standardisation
- Reinstatement Options / Cover Buy Back
- Multiple Pay CI
- Severity based cover – Early Stage CI
- Multiple Pay Severity based CI (Pot CI)

Cancer Relapse Cover

Cancer relapse benefit pays a additional benefits as long as there are residual cancer cells within the body every 2 years.
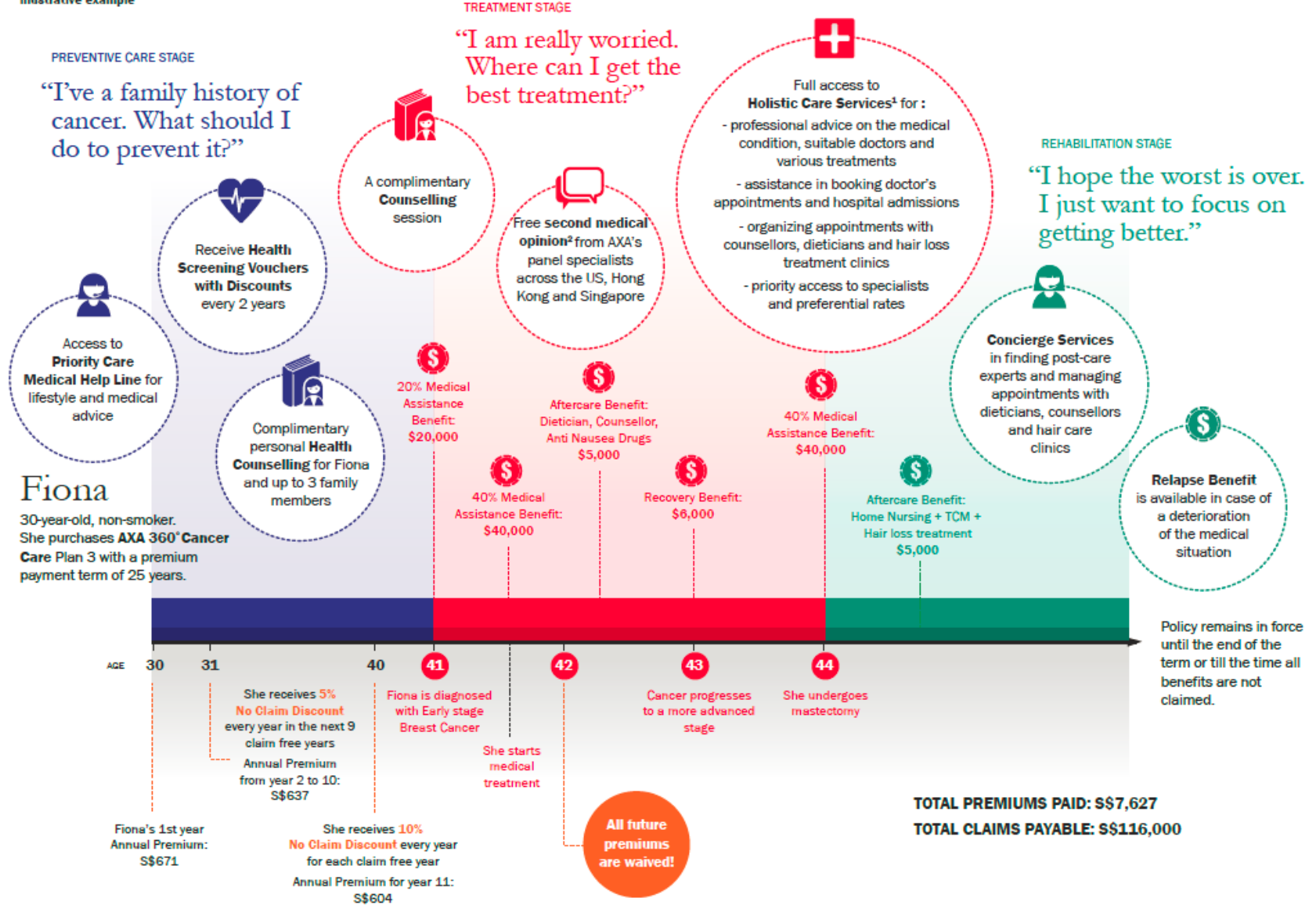
Cancer Relapse Benefits by duration

| 1st cancer Diagnosis | → | 2nd | 3rd | 4th | 5th | . . . . |

1   2   3   4   5   6   7   8   9   10

Requirement
• 2 years interval
• Diagnosed as still suffering from cancer with a new pathological report

The cancer re-diagnosed benefit pays 50% S.A. as long as there are residual cancer cells for all major cancer within the body every 2 years, maximum 2 payouts per life (including the first diagnosis):

✓ First primary cancer persists to more than 2 years since first diagnosis

✓ Metastasis cancer of the first cancer organ to other parts of the body

✓ Though recovered temporarily, the same cancer recurred at the same organ as the first cancer
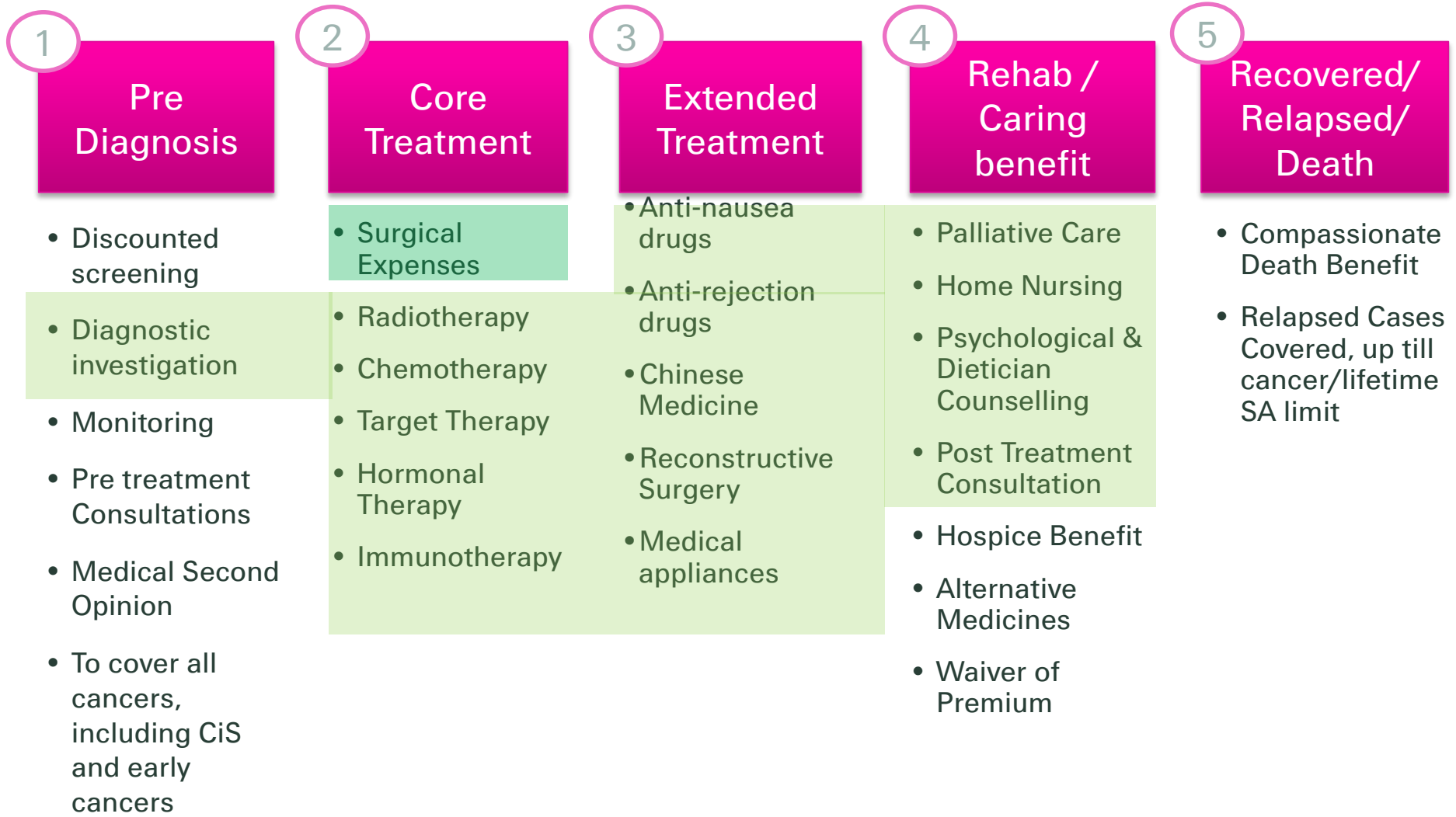
✓ New primary cancer unrelated to the first

Only this item covered in current market's multiple pay cover

AXA SG − Cancer 360

illustrative example

PREVENTIVE CARE STAGE

"I've a family history of cancer. What should I do to prevent it?"

TREATMENT STAGE

"I am really worried. Where can I get the best treatment?"

REHABILITATION STAGE

"I hope the worst is over. I just want to focus on getting better."

Receive **Health Screening Vouchers with Discounts** every 2 years

A complimentary **Counselling** session

Free second medical opinion[2] from AXA's panel specialists across the US, Hong Kong and Singapore

Full access to **Holistic Care Services**[1] for :
- professional advice on the medical condition, suitable doctors and various treatments
- assistance in booking doctor's appointments and hospital admissions
- organizing appointments with counsellors, dieticians and hair loss treatment clinics
- priority access to specialists and preferential rates

Access to **Priority Care Medical Help Line** for lifestyle and medical advice

Complimentary personal **Health Counselling** for Fiona and up to 3 family members

Concierge Services in finding post-care experts and managing appointments with dieticians, counsellors and hair care clinics

20% Medical Assistance Benefit: $20,000

40% Medical Assistance Benefit: $40,000

Aftercare Benefit: Dietician, Counsellor, Anti Nausea Drugs $5,000

Recovery Benefit: $6,000

40% Medical Assistance Benefit: $40,000

Aftercare Benefit: Home Nursing + TCM + Hair loss treatment $5,000

Relapse Benefit is available in case of a deterioration of the medical situation

Fiona

30-year-old, non-smoker. She purchases **AXA 360° Cancer Care** Plan 3 with a premium payment term of 25 years.

Policy remains in force until the end of the term or till the time all benefits are not claimed.

AGE 30 31 40 **41** **42** **43** **44**

She receives 5% **No Claim Discount** every year in the next 9 claim free years

Fiona is diagnosed with Early stage Breast Cancer

Cancer progresses to a more advanced stage

She undergoes mastectomy

Annual Premium from year 2 to 10: S$637

She starts medical treatment

Fiona's 1st year Annual Premium: S$671

She receives 10% **No Claim Discount** every year for each claim free year

Annual Premium for year 11: S$604

All future premiums are waived!

TOTAL PREMIUMS PAID: S$7,627
TOTAL CLAIMS PAYABLE: S$116,000

What about Cancer <u>Reimbursement</u> version?

1	**2**	**3**	**4**	**5**
Pre Diagnosis	**Core Treatment**	**Extended Treatment**	**Rehab / Caring benefit**	**Recovered/ Relapsed/ Death**

1 — Pre Diagnosis
- Discounted screening
- Diagnostic investigation
- Monitoring
- Pre treatment Consultations
- Medical Second Opinion
- To cover all cancers, including CiS and early cancers

2 — Core Treatment
- Surgical Expenses
- Radiotherapy
- Chemotherapy
- Target Therapy
- Hormonal Therapy
- Immunotherapy

3 — Extended Treatment
- Anti-nausea drugs
- Anti-rejection drugs
- Chinese Medicine
- Reconstructive Surgery
- Medical appliances

4 — Rehab / Caring benefit
- Palliative Care
- Home Nursing
- Psychological & Dietician Counselling
- Post Treatment Consultation
- Hospice Benefit
- Alternative Medicines
- Waiver of Premium

5 — Recovered/ Relapsed/ Death
- Compassionate Death Benefit
- Relapsed Cases Covered, up till cancer/lifetime SA limit

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Can Actuaries Foresee the Future?

Retrospective projection

- Derive a trend mainly from the numeric incidence rates in the past; and

- Apply this trend for the future for a period of time with/without a cap.

Pros and Cons	
Simple & easy to explain	✓
Better than nothing?	✓
Requires credible, relevant data	✗
Projection period/ultimate cap are subjective	✗
Relevance of past to future?	✗
Sensitive to data period used	✗

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Trend Approaches

Past data can give a very different answer, depending on the period considered
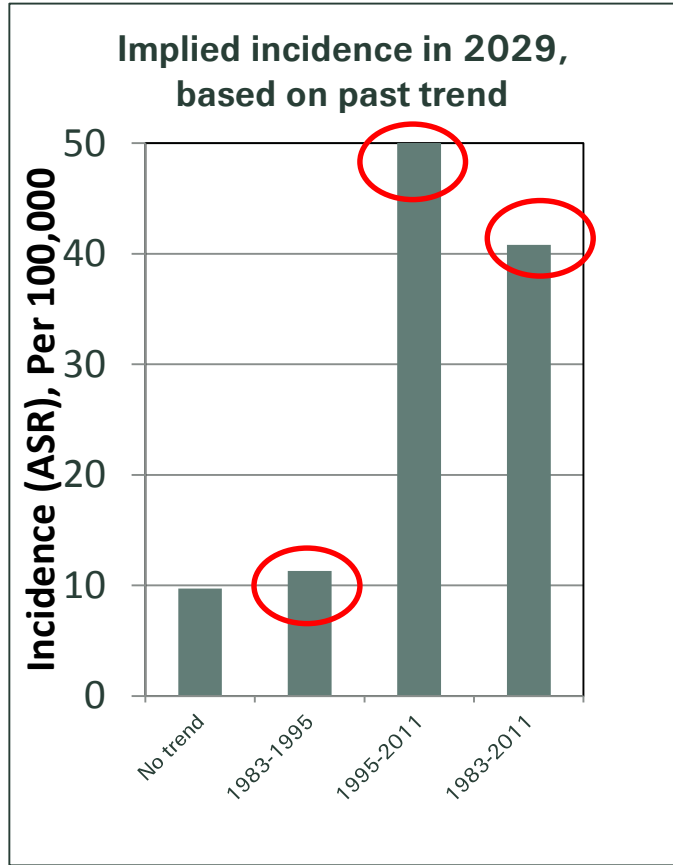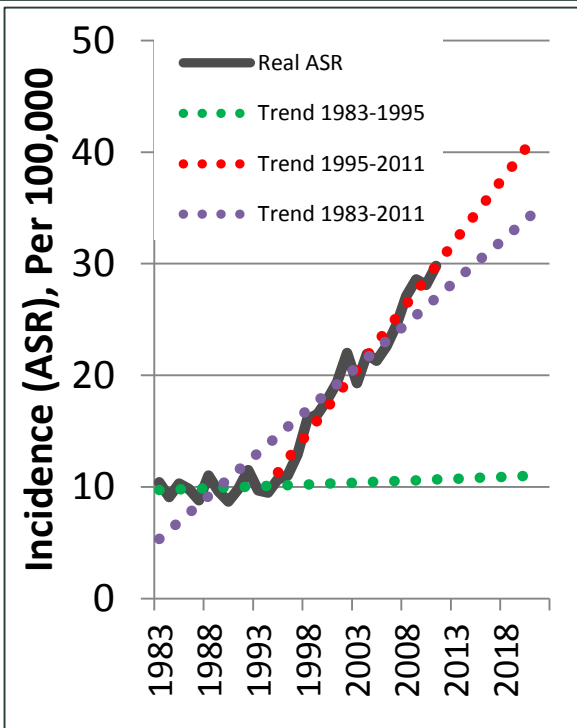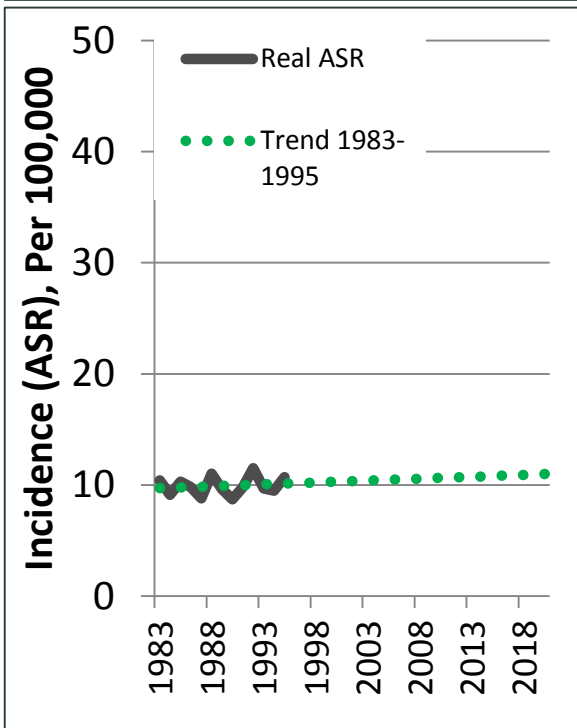
Source:
Hong Kong cancer registry online query system

Drilling deeper

- Before making assumptions for the future, it is necessary to understand the circumstances that drove current and past experience
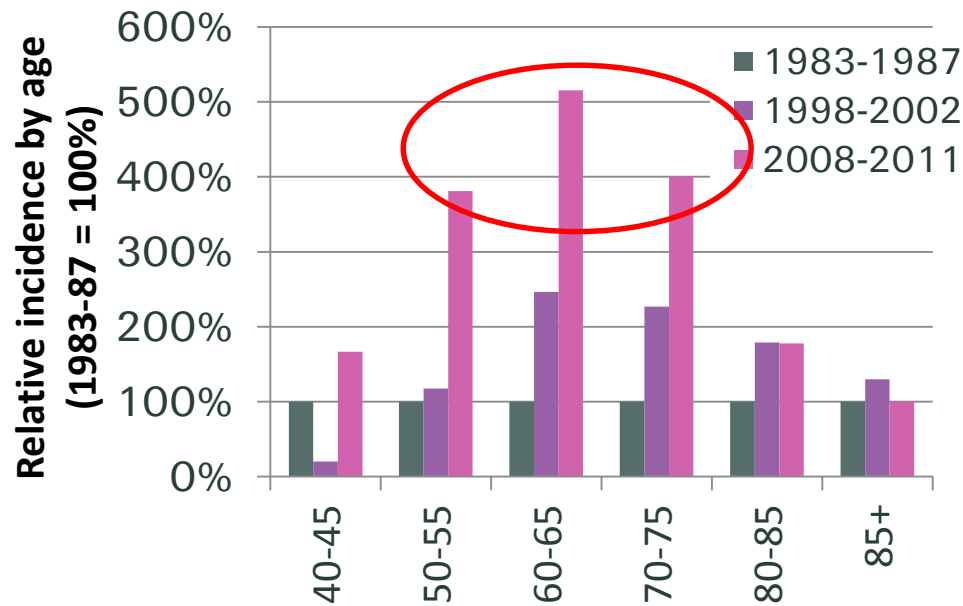
Spike in ASR is driven by specific ages and coincides with the key screening age group

Retrospective method does not allow for this

Breast cancer

Breast Cancer Incidence Rate in Shanghai (Age Adjusted)
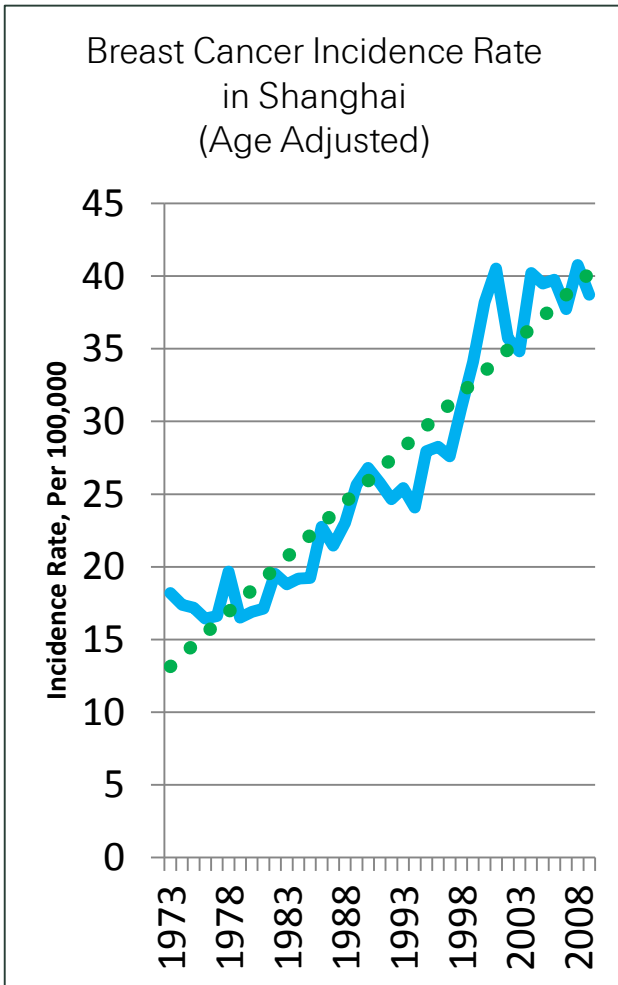
- How to project forward breast cancer incidence rates in Shanghai?

  - extrapolation?

  - external benchmarks? which one?
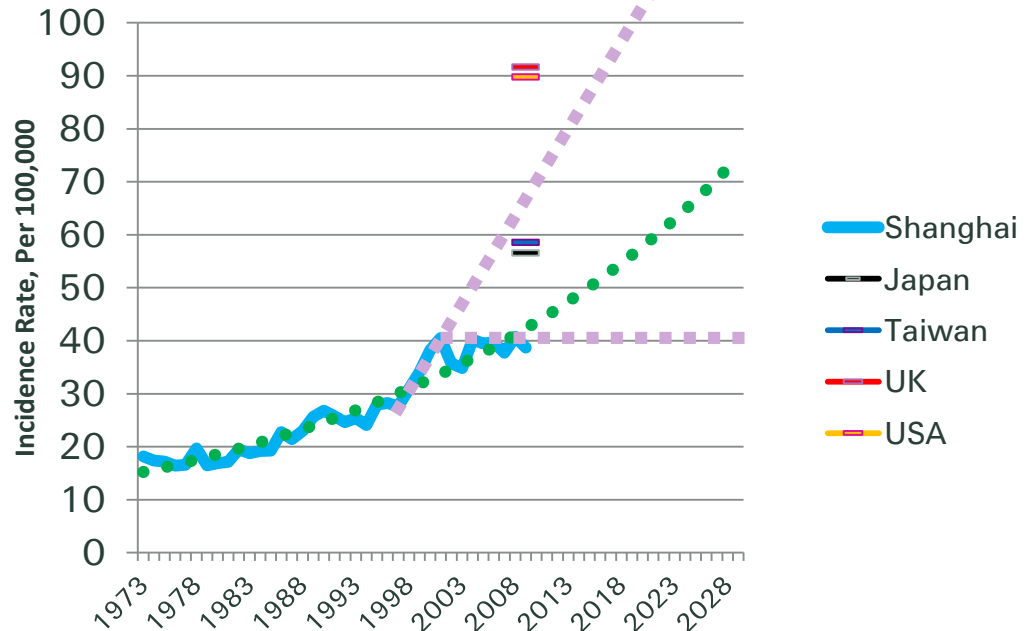
Fertility rate & breast cancer

Breast Cancer Incidence Rate in Shanghai (ASR)
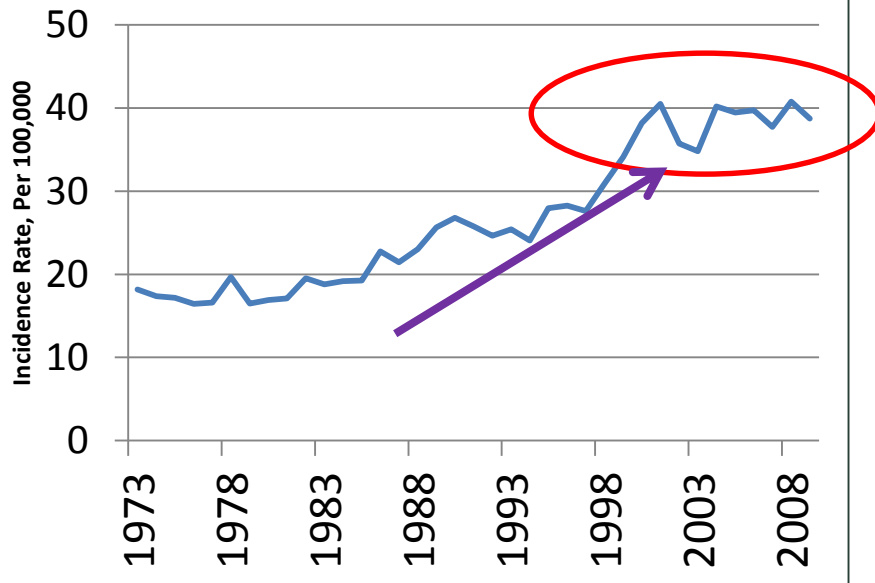
Total fertility rate in Shanghai
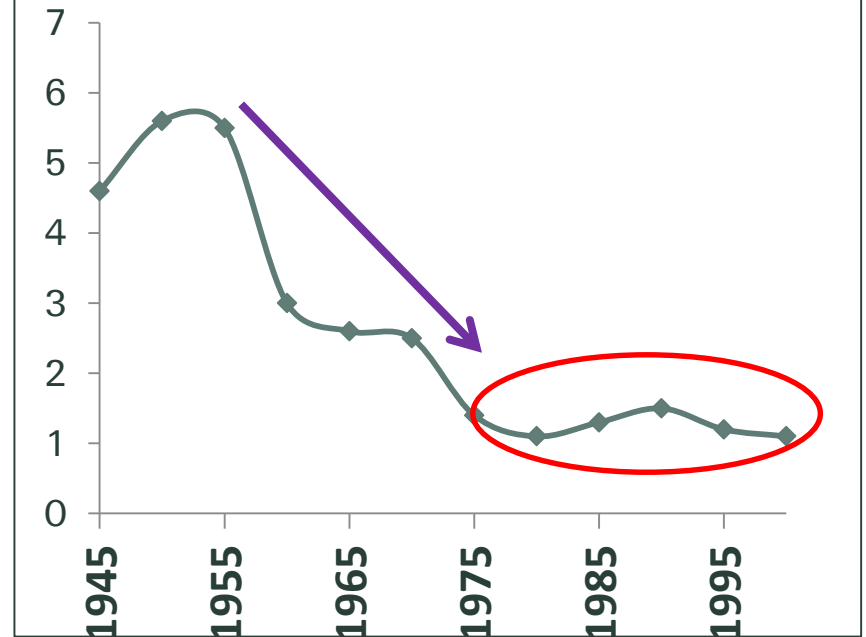
- Link between breast cancer risk and hormone status during reproductive ages
  - Did we have a 20-30 year advance notice?

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Fertility rate & breast cancer

FIGURE 4 – IRRs of breast cancer diagnosed 1968–1997 by birth cohort, with the 1928 birth cohort as reference group. Estimates derived from age-cohort models fitted to younger (< 45) and older (≥ 45) women. Dotted lines, premenopausal women; solid lines, post-menopausal women.

FIGURE 5 – Total fertility rates (age 15–44) for Sweden and Singapore from 1964 to 1997. Source: Registrar-General of Births and Deaths, Republic of Singapore (1978–1997). Total Population Register, Statistics Sweden (1964–1997).

- Similar patterns observed in other countries

What else do we know?

To estimate future cancer incidence, it is necessary to estimate the changes in the underlying causal factors

- Breast cancer (c30%)
  - Obesity, alcohol intake, hormones, occupation, diet, ...

- Lung Cancer (c90%)
  - Smoking, Occupational hazards, Low fruit & veg, Radiation, ...

- Stomach cancer (c80%)
  - Low fruit & veg, infection, salt intake, tobacco, ...

- Bowel cancer (c60%)
  - Red meat, obesity, low fibre, alcohol, tobacco, infection, inactivity, ...

- Malignant melanoma (>90%)
  - sunlight/sunbeds, ...

Source: cancer research, UK

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Prospective projection

- Emphasis of understanding of risk factors, with focus on key and modifiable ones

- Evaluate the relative importance (e.g. attributable fraction) of risk factors

- Project the change of these risk factors and measure the impact on cancer incidence rate

Pros and Cons	
Less reliance on past experience data	✓
Allows for known changes	✓
Theoretically more sound	✓
More complex	✗
Intensive research required	✗
Not all risk factors have been identified	✗

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Case Study: Liver Cancer
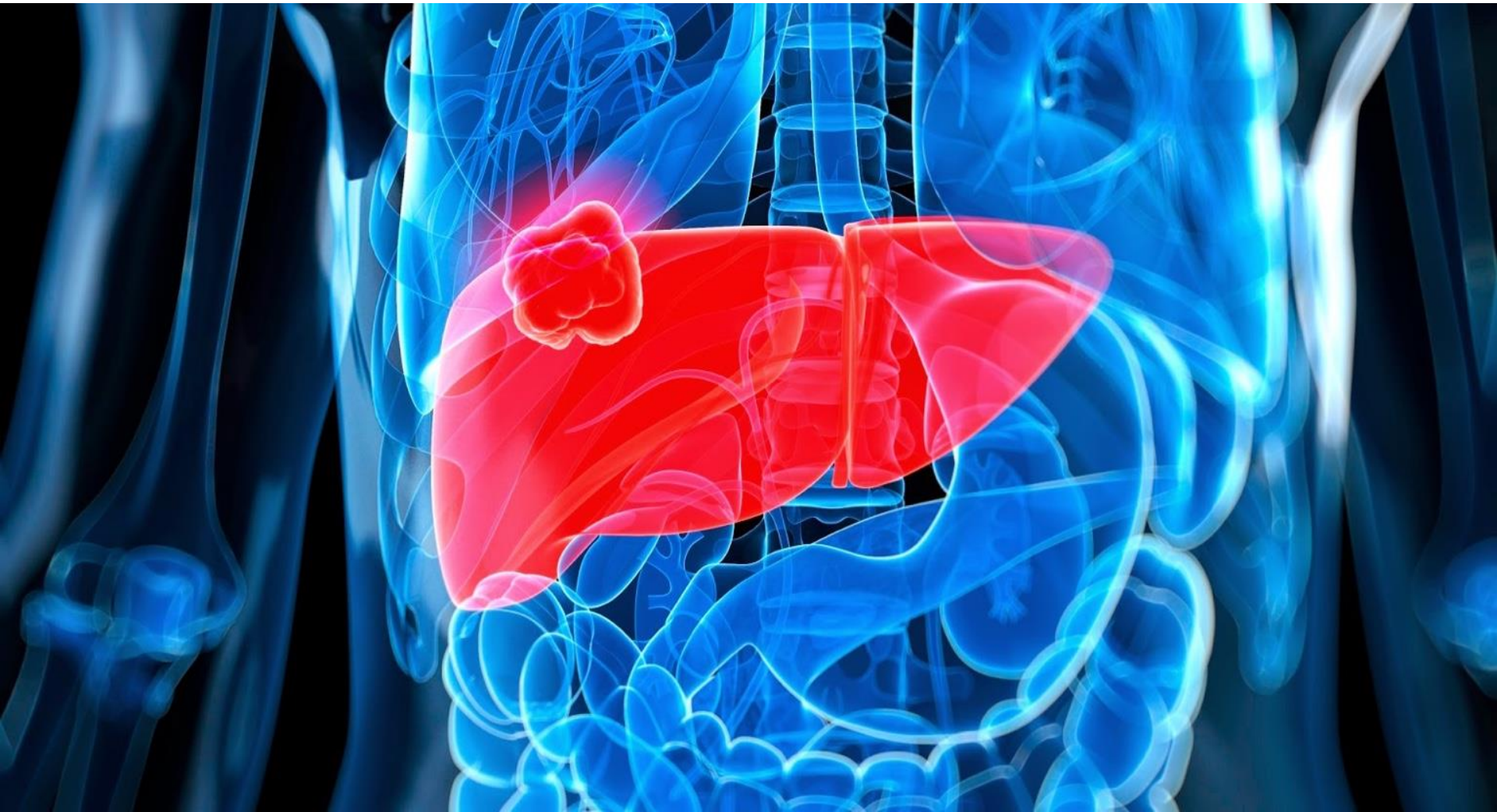
Current liver cancer trends in Asia

- Incidence has generally reduced over last 30 years

Liver cancer incidence (male)

Legend:
- China (Shanghai)
- Hong Kong
- Japan
- Korea
- Singapore

Y-axis: Incidence rate (per 100,000 person years) — 0 to 50

X-axis: Year — 1979, 1984, 1989, 1994, 1999, 2004, 2009
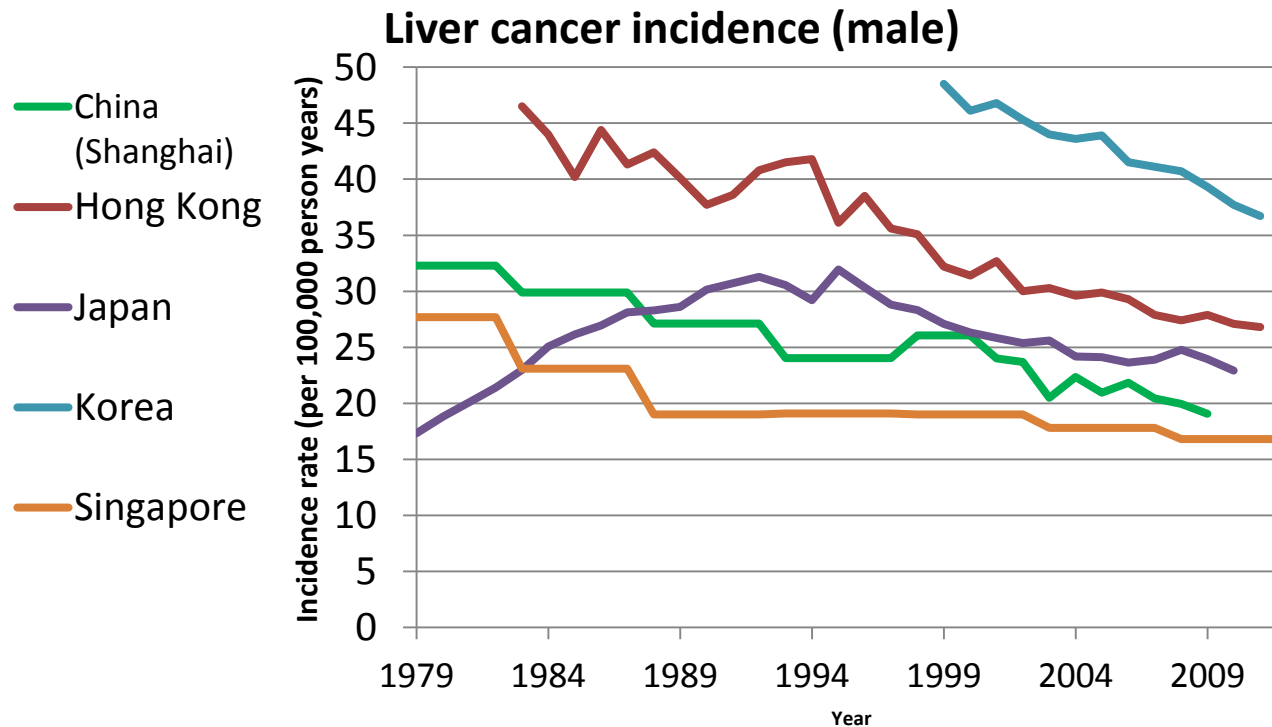
- Why a reduction, and will it continue? How long?
- Why is Japanese shape so different?

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Risk factors

	Risk (95% CI)
Hepatitis B Virus (HBV)	- Pooled RR: 11.6 (8.3-16.3) - Higher in HBV genotype C
Hepatitis C Virus (HCV)	- Pooled RR: 7.4 (4.3-12.8) - Higher in HCV genotype 1b
Aflatoxin B1	- Pooled OR: 6.4 (3.7-10.9) - Higher in HCV genotype 1b

- Hepatitis prevalence has been reducing

	HBV prevalence rate	Change	Notes
CN	9.8% in 1992, 7.2% in 2006	**-27%**	National serosurvey of HBV, age 1−59
HK	11.3% in 1990, 7.4% in 2011	**-35%**	Hepatitis surveillance, antenatal women
TW	14.3% in 1995, 1.1% in 2009	**-92%**	University freshmen
JP	1.1%	**n/a**	National health screening for HbsAg, age 40+
KR	4.5% in 1998, 3.7% in 2005	**-18%**	National health & nutrition survey in Korea, 10+
SG	4.0% in 1999, 2.8% in 2005	**-30%**	National health survey, age 18−69

Results of intervention

- Aflatoxin has improved in the past and now generally under control.
- Transmission of HBV/HCV via blood products well reduced in most countries
- Treatment becoming more effective:
  - Control of HBV (although not a cure) can reduce liver cancer risk by 40-50%.
- Success in treatment for HCV may compensate for lack of vaccination,
- Vaccination for HBV well established in many countries over last 10-30 years
  - Reduction in prevalence will be observed as vaccinated population ages

A quantitative approach (China, 40 – 49)

Risk factor prevalence (y-axis) vs. years 1992–2077 (x-axis)

Risk factor (& odds ratio)

— HBV (14.7)
— HCV (8.3)
— Diabetes (1.8)
— Smoking (1.4)
— Alcohol (1.9)
— Aflatoxin (6.4)

A quantitative approach (China, 40 – 49)

Legend: implied Liver cancer incidence (per 100,000)

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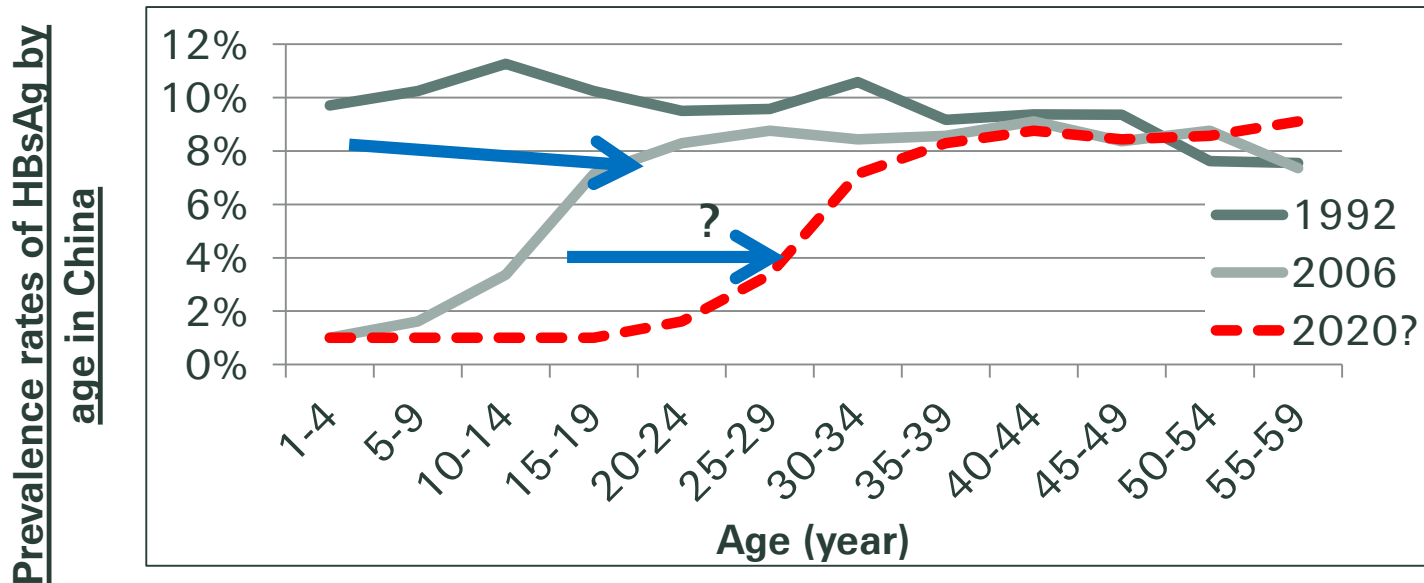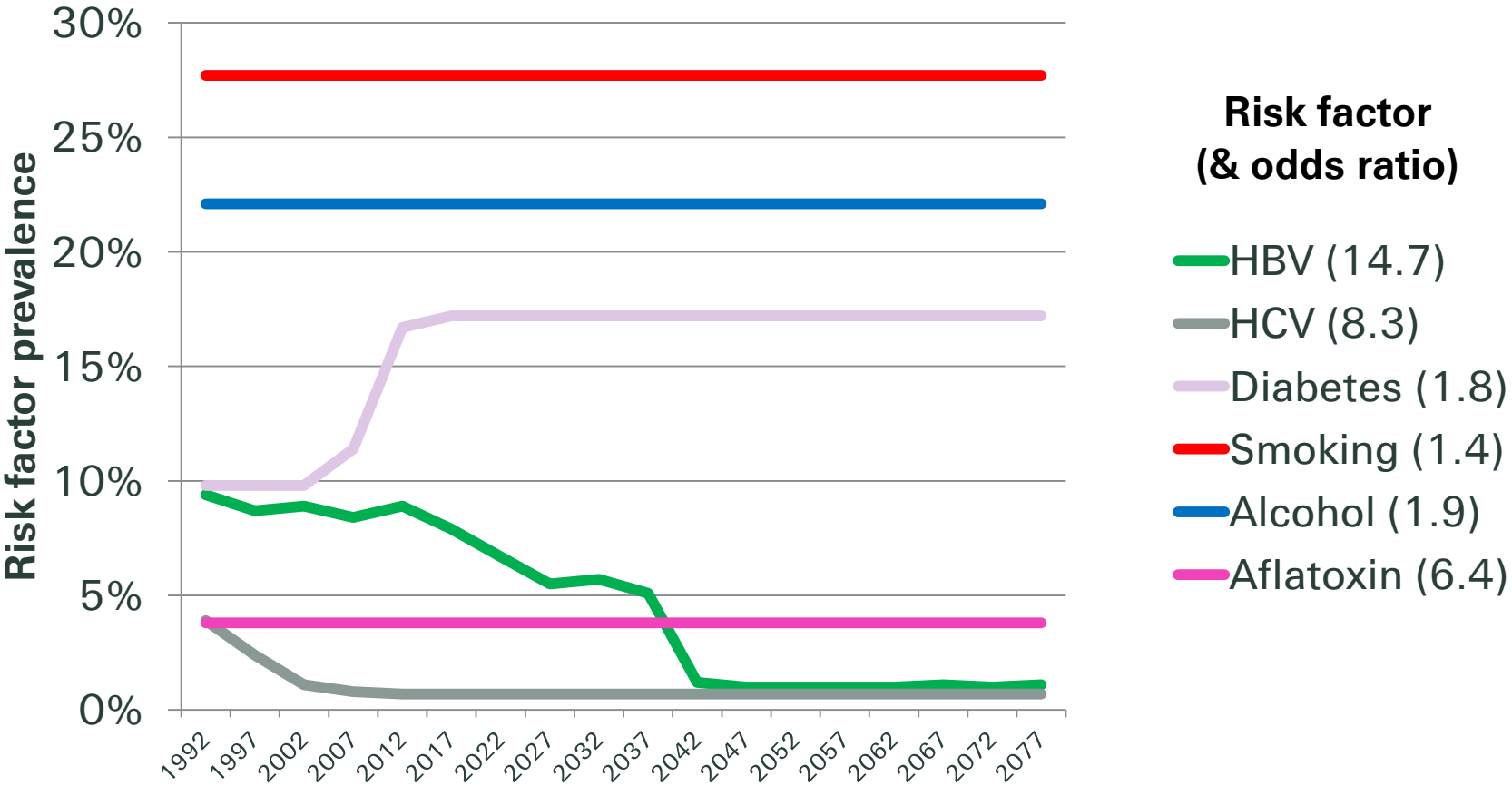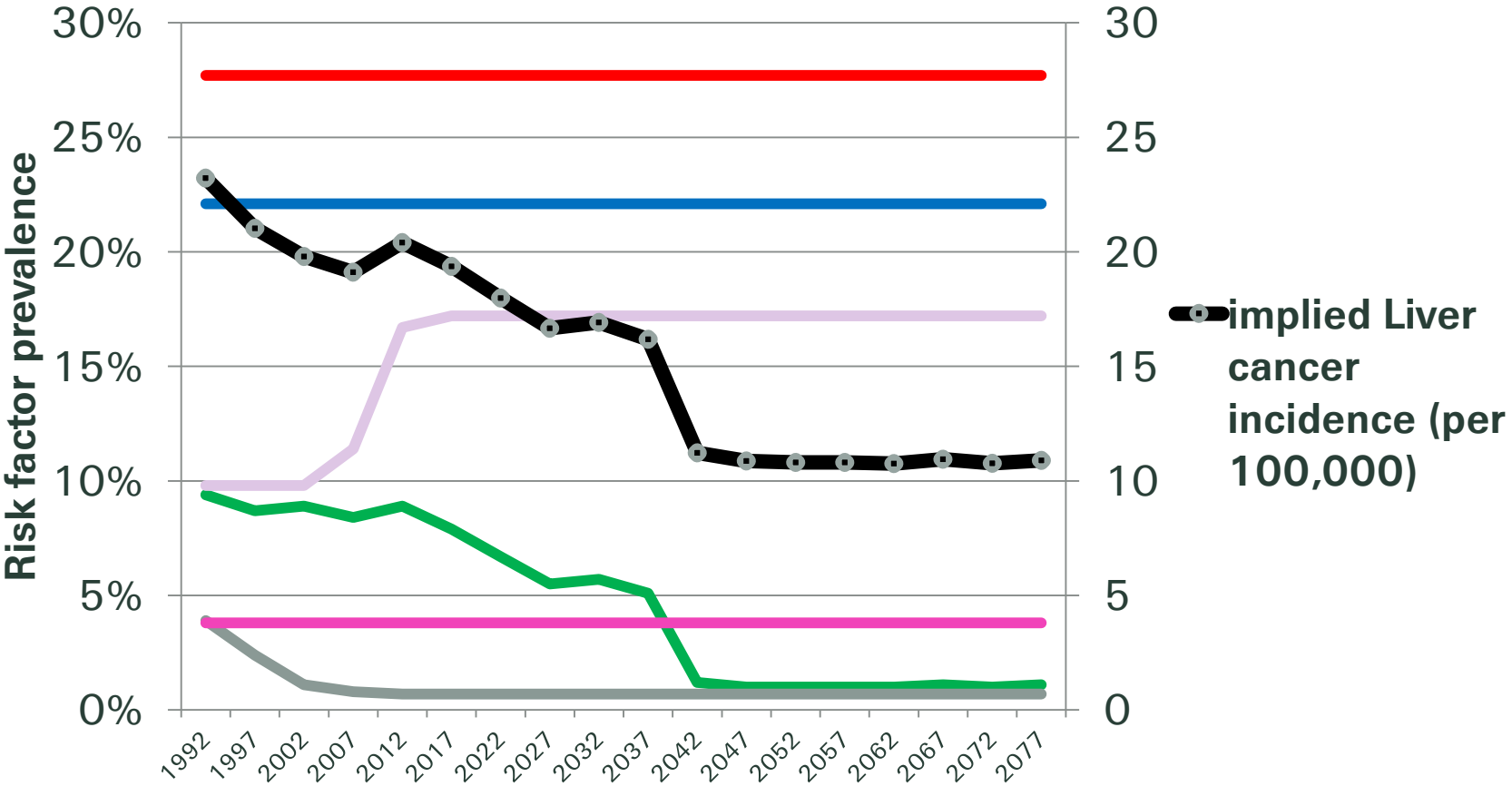
Case Study: Thyroid Cancer

An increasing risk

Female Cancers - Beijing
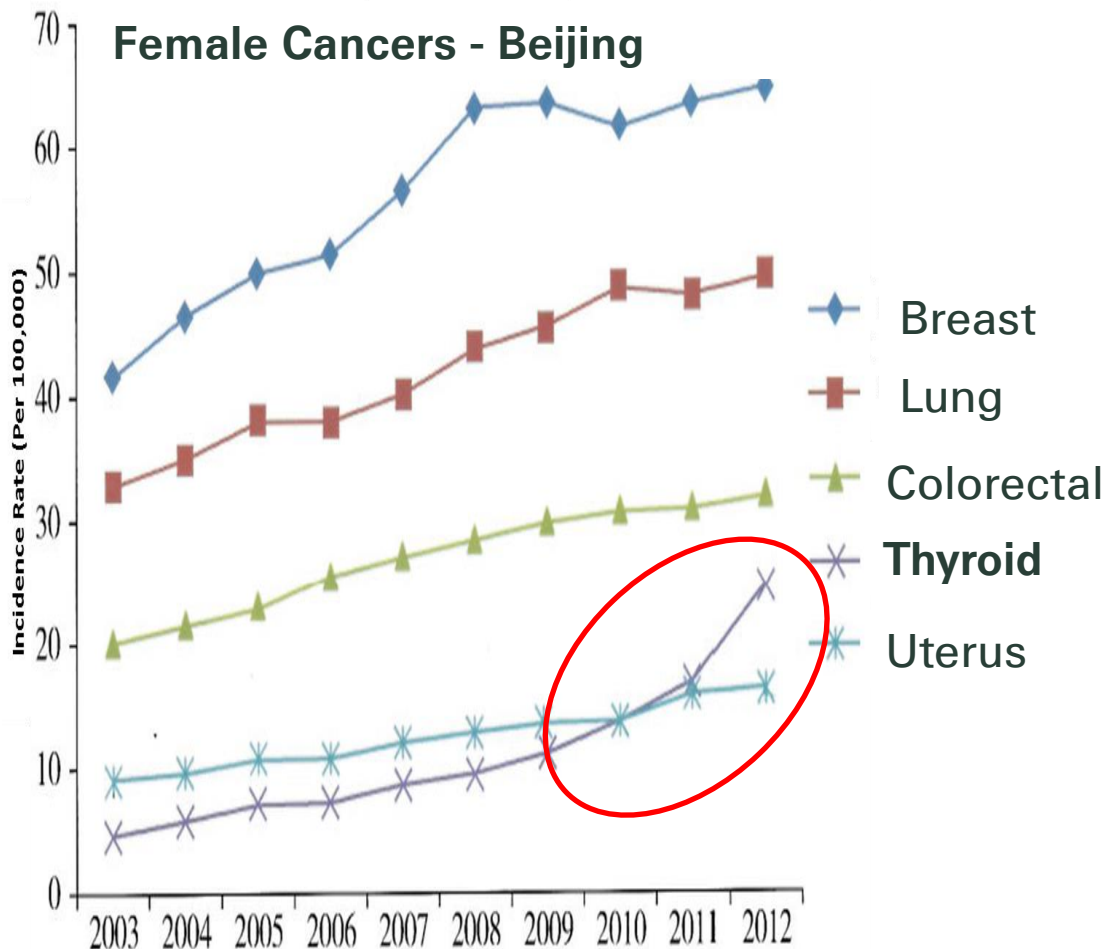
According to a 2014 report:

- In 2012, it increased by about 40% compared to 2011 - ranked No. 4. female cancer
- Similar findings also observable in Shenzhen, Shanghai etc.
- Some insurance companies have reported alarming trend of thyroid cancer claims, especially in eastern provinces/cities.

It is not a potential risk anymore but a realistic one.

Similar pattern in Korea

Trends of Age-standardized Incidence Rates of Major Cancers : Female
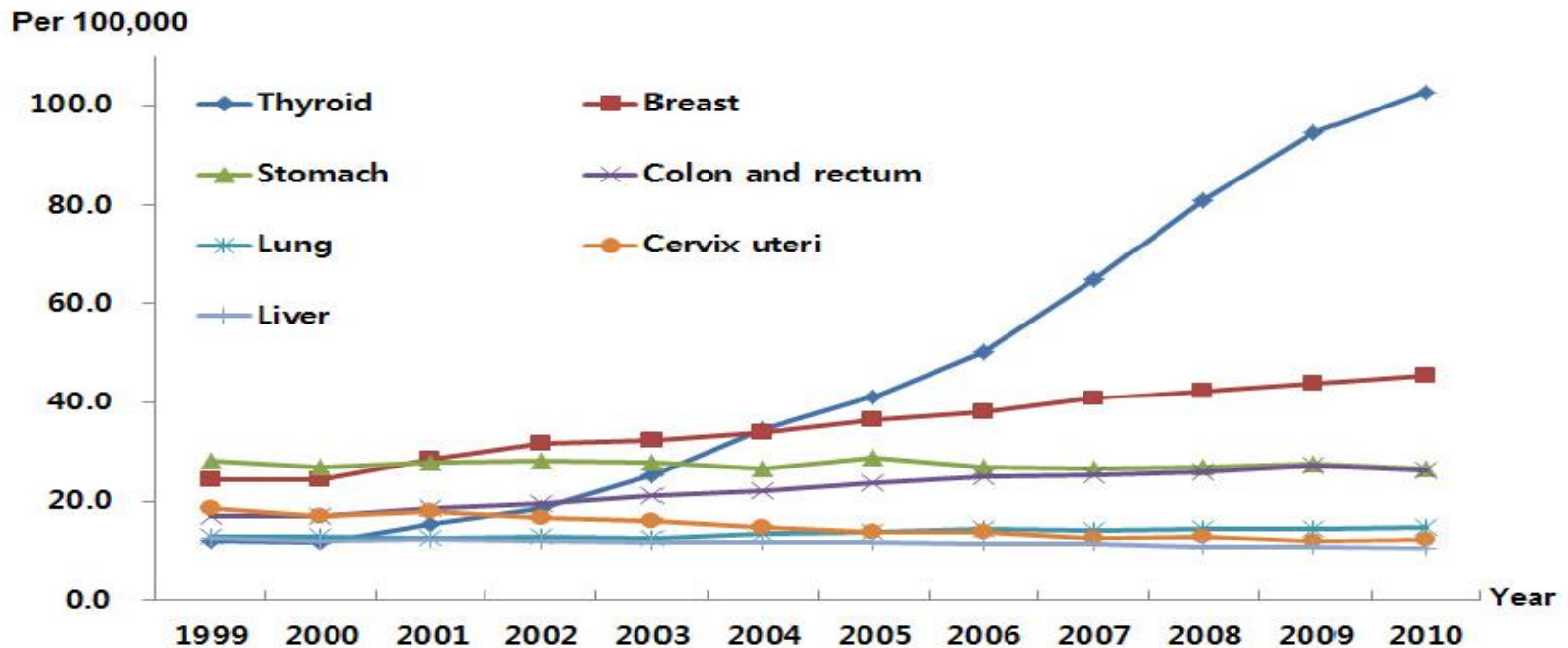
Source) Ministry of Health & Welfare, Korea Central Cancer Registry, 2012
Note) ASR (Age-standardized rate) standard population: Korean mid-year population in 2010

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Projection for Beijing

Incidence is sensitive to assumed detection rate, but shows how rapidly rates could increase should screening prevalence increase

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How high can it go?

- "Natural" incidence
  - up to 0.01%

- Screening detection rate
  - 0.3%-2.6% (varies by study)
  - c100x natural rate

- Autopsy prevalence rate
  - 10-20% in Asian countries
  - Claims rate could increase as diagnostic methods

Population

No thyroid cancer

detected in screening?

additional detected at autopsy

natural rate

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Swiss Re
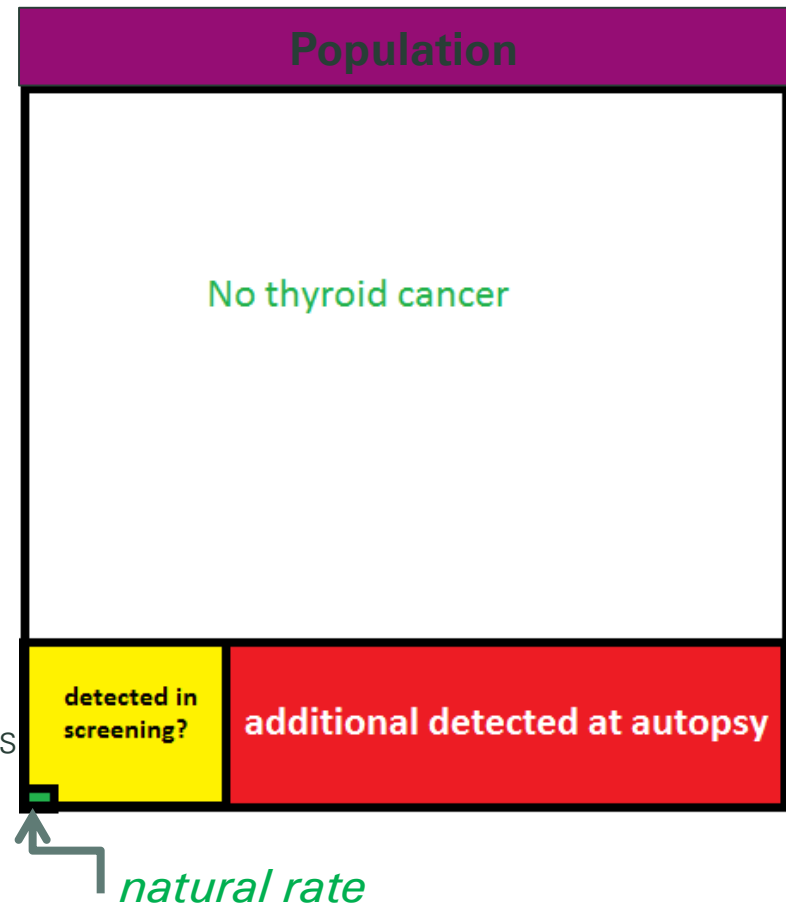
Risk Management Tools

- Mandatory exclusion as part of policy conditions ex-survival period, waiting period etc.

- Limiting maximum payout or excluding lower severity cancers

- Tight policy wording on definitions of cancers and medically necessary treatments (for reimbursement feature)

- Periodic experience monitoring – good quality data is key!

  - Early warning signals to detect issues in advance

  - Ability to react quickly and effectively

- Scenario testing

Key Takeaways

- Cancer plans evolution needs to consider the following:

  - Adequate coverage to consumers

  - Simple to understand for agents/consumers

  - Operational infrastructure to support (claims/uw, VAS, etc.)

- To estimate future cancer incidences, given the interaction of numerous moving parts, extrapolating past experience is insufficient

- Considering underlying drivers can help, but

  - each cancer has numerous risk factors, that are not fully understood

  - detailed analysis is informative, but risk remains

- Long term guarantees mean future incidence rates require significant thought

Thank you

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