

Spotlight on Cancer Incidence Trends

Pricing Critical Illness insurance (CI) necessitates a view of the future, informed by trends in past disease incidence rates.

One of the main CI conditions is cancer. We show, with examples from across Asia, how population incidence rates for some of the most prevalent cancers have notably improved in recent years, and that not incorporating recent short- to medium-term experience can lead to a sizeable over-estimation of future claim costs. We also consider the factors that could determine how trends are likely to change going forward.

Key findings

When deriving CI trend assumptions, the data and research presented in this report indicate:

Consider using more recent year data for short- to medium-term trending.

Deriving trends for CI cancer incidence rates in Asian countries, where data is available, should be guided (but not dictated) by relevant, recent historic experience. This should then be blended into a long-term trend assumption that the pricing actuary considers reasonable.

It's important to get a good grip on the long term as the trend assumption can have a significant impact on future claims cost. For example for South Korea, for all male cancers, an assumed arbitrary worsening trend of 1.5%, instead of an improving trend of -2.6%, for 10 years, potentially overstates the current value of claims by 18%¹. A book of business/treaty last priced in 2011 could have been overpriced by 18%.

It's not just about data. There is a need to understand potential medical developments, lifestyle changes and expansions to screening programs. This requires the combined expert judgement of actuaries and medical professionals when determining trends.



We regularly help our clients to analyze incidence rate trends and estimate future risk using a combination of actuarial, analytical and medical expertise.”

Jerome Matrundola
CEO Life & Health, Asia Pacific

1 Assuming Korea Insurance Development Institute (Kidi) - <https://www.kidi.or.kr/eng/> - mortality and morbidity, 1% discount rates, 10% lapses in all years, no expenses and no capital for a representative portfolio.

Changing trends

The examples given below have been chosen to highlight the trends and potential impact on the pricing of CI business. Similar observations are noted in the respective female populations.

Example: Most prevalent male cancers, South Korea

Figure 1 and table 1 show that the age-standardized population^{2,3} incidence rates for many of the most prevalent male cancers in South Korea improved, or continued to improve, after 2011; improvement from this time is most notable for colon and stomach cancer. Incidence trends based on data from 1999 to 2011 would notably be more pessimistic than those calculated on data from 2011 to 2016. For example, colon cancer incidence deteriorated at a rate of 5.9% for more than 10 years, but then improved at a trend of -5.0% since 2011.



The age-standardized population incidence rates for many of the most prevalent male cancers in South Korea improved, or continued to improve, after 2011.”

Translating this into an impact on the future claims cost

Taking the example of a male non-smoker aged 45, figure 2 shows how the incidence trends based on data from the two time periods in table 1 translate into different present values of future claims for the two most prevalent cancers in South Korea: stomach and colon cancer. In this example, the incidence trends based on 1999-2011 data potentially overestimate the present

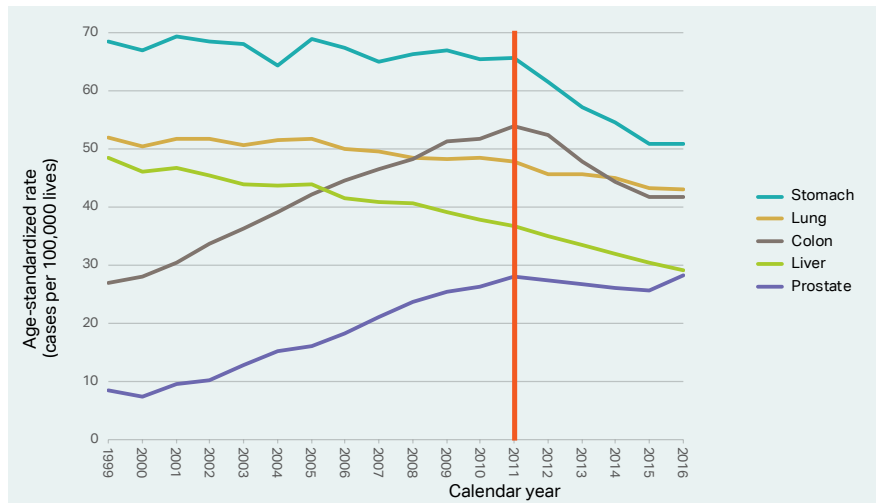


Figure 1: Age-standardized³ population incidence rates for the most prevalent male cancers 1999-2016, South Korea. Trends notably improved after 2011. Source: IACR⁴.

Cancer site	1999 - 2011	2011 - 2016
Stomach	-0.3%	-5.0%
Lung	-0.7%	-2.1%
Colon	5.9%	-5.0%
Liver	-2.3%	-4.5%
Prostate	10.5%	0.1%
All Cancers	1.5%	-2.6%

Table 1: Empirically calculated incidence trends for the most prevalent male cancers, South Korea, using 1999-2011 and 2011-2016 population data. The two periods lead to distinctly different trend rates on which to price future CI business, adding complexity to deriving long-term incidence trends. Source: IACR⁴.

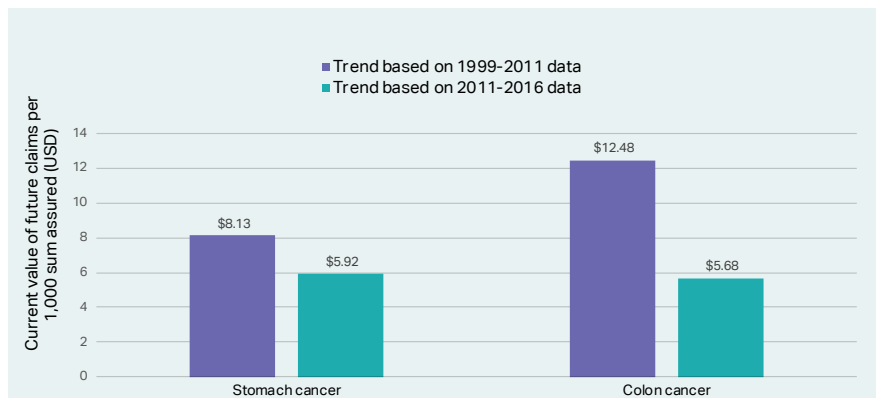


Figure 2: Present value of future claims⁵ (pure risk) for a male non-smoker aged 45 over the next 20 years, per USD 1,000 sum assured, South Korea. Source: IACR⁴, PartnerRe.

2 Cancer prevalence in the insured population differs from the general population; for example, compared to the general population, the insured population tends to have a higher proportion of female breast cancer and lower proportions of male smokers.
 3 Different population estimates were applied to standardize the incidence rates for South Korea and Japan, and so the absolute incidence rates are not comparable between the countries, simply the trends, i.e. annual percentage change.
 4 Ministry of Health & Welfare, Division of Disease Control Policy/Korea Central Cancer Registry, Annual Report of Cancer Statistics in Korea, 2016.
 5 Ignoring expenses and capital with a 1% discount rate and 10% lapses in all years.

value of claims by 37% for stomach cancer and 120% for colon cancer. This in turn impacts CI pricing.

Example: Most prevalent male cancers, Japan

Figure 3 also shows a shift in incidence rates in Japan in 2011, indicating that incidence trends across other Asian countries may also need to be re-assessed.



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What's driving the observed changes?

The risk factors are complex and multi-faceted, with different lags between cause and effect for different diseases exemplifying the complexity of predicting future trends. The positive and negative factors at play for stomach and colon cancer are summarized in table 2.

And will the trend continue?

Despite the observed improvements in stomach and colon cancer in more recent years, 2016 (the most recent year) data indicates a flattening. Although this is only a single year, can flattening be expected to continue?

The following factors indicate that improvement will continue in the short to medium term (next 5 to 10 years), but is likely to flatten in the longer term:

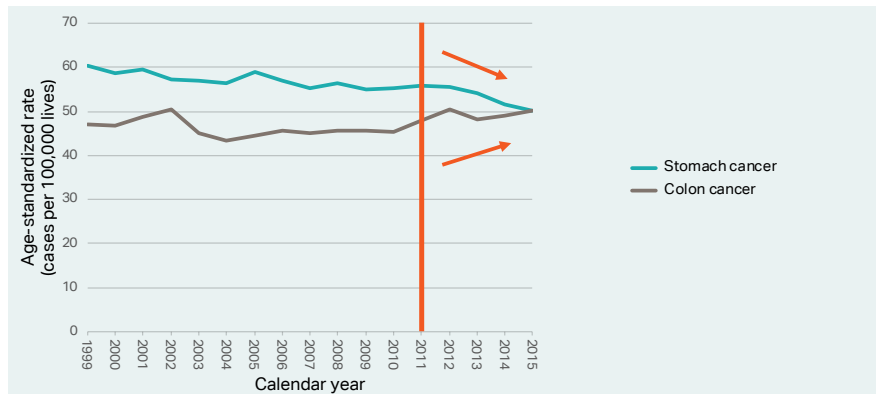


Figure 3: Stomach and colon cancers, Japan. Age-standardized⁹ male population incidence rates for the period 1999-2015. The graph shows a change in trend after 2011, as also observed in South Korea. Source: Cancer Information Service⁶.

	Increasing incidence	Decreasing incidence
Stomach	<ul style="list-style-type: none"> • Earlier/better screening 	<ul style="list-style-type: none"> • Reduction in <i>Helicobacter pylori</i> infection⁷ • Use of refrigeration to preserve food rather than using salt⁸ • Reduced smoking • Diets lower in salt
Colon	<ul style="list-style-type: none"> • Increased physical inactivity and obesity • Increased meat consumption • Diets higher in fat • Earlier/better screening 	<ul style="list-style-type: none"> • Increased biopsies of precancerous lesions (polyps) • Reduced smoking and alcohol consumption

Table 2: Summary of risk factors for stomach and colon cancer, South Korea. Source: Compiled by PartnerRe.

- The prevalence of *Helicobacter pylori* in Korean adults has fallen constantly by 1.5% per year since 1998⁹. If this trend continues at the same rate, it would take another 20 years to reach western levels of 35%¹⁰.
- Smoking rates are likely to continue to decline¹¹, suggesting a continued improvement, at least in the short term.
- If eligibility for screening and removal of pre-cancerous colon polyps widens, as is likely, and given lags of up to 10 years for polyps to become cancerous,

improvements can be expected for years to come (see text box on next page, 'Why screening is reducing the incidence of colon cancer').

- The increasing discovery of early-stage male stomach cancers is an indication of earlier screening¹². However, given that 72.4%¹³ of those eligible are already being screened, this risk factor is likely to flatten future incidence rates.
- Increasing sedentary lifestyles and dietary changes are likely to counteract any ongoing improving trends.

6 Japan's national Center for Cancer Control and Information Services. ganjoho.jp
 7 E.g. <http://www.hnews.kr/news/View.php?no=47104>
 8 <https://www.wcrf.org/sites/default/files/Stomach-cancer-report.pdf>
 9 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5900911/>
 10 <https://www.jwatch.org/na44107/2017/05/15/global-prevalence-helicobacter-pylori>
 11 WHO global report on trends in prevalence of tobacco smoking 2000-2025, second edition. Geneva: World Health Organization; 2018. <https://www.who.int/tobacco/publications/surveillance/trends-tobacco-smoking-second-edition/en/>
 12 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4453643/>
 13 <https://www.e-crt.org/journal/view.php?number=2450>

Why screening is reducing the incidence of colon cancer

Earlier screening usually means higher incidence rates, as in the case of stomach cancer. In the case of colon cancer, however, earlier screening of colon polyps¹⁴ (precursor lesions, adenomas and non-adenomatous polyps that typically take 5 to 10 years to become cancerous) has had a positive impact on incidence.

Polyps have historically been on the increase in Korea due to westernized dietary habits, increased meat

intake and reduced vegetable intake. Because most colorectal cancers are known to occur in adenomas, diagnosis and removal of asymptomatic precancerous adenomas is an effective way to prevent colorectal cancer. In fact, colonoscopy is associated with a 61% reduction in incidence¹⁵.

The Korean government launched public mass screening for colorectal cancer in 2004 for asymptomatic adults over 50 years of age. Tissue biopsy is recommended during colonoscopy in patients with

suspicious lesions. The process is carried out free of charge or at very little expense, according to the patient's status. The number of colonoscopies increased rapidly from 200,000 in 2004 to nearly 2 million in 2013¹⁶. There is still scope for the proportion of those eligible for colon cancer screening to continue to increase. Given lags of approximately 10 years, improvement in colon cancer incidence rates could be sustained for some time to come.

Importance of regularly updating trend assumptions for all cancers

The given examples highlight the importance of regularly monitoring cancer incidence trends, understanding evolving risk factors

and updating trend assumptions. Across all cancers, improving trends in some may offset worsening trends in others. In Singapore, for

example, worsening incidence trends in females for breast cancer are offsetting improving incidence trends in colon and lung cancer¹⁷.

Contact us

PartnerRe has expertise in the risk assessment and underwriting of CI business across global markets. Please contact us if you'd like to discuss this topic. We look forward to hearing from you!



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14 Abnormalities of the mucous membranes that grow into the large intestine.
 15 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4820666/> and <https://insights.ovid.com/crossref?an=00000434-201603000-00021>
 16 <https://hineca.kr/1607>
 17 Page 24 of <https://www.nrdo.gov.sg/publications/cancer>