



**Critical Illness
and Supplemental
Insurance Conference**

Looking Ahead: An Actuarial Perspective on Long-Term Critical Illness Trends

The Impact of the COVID-19 Pandemic





Looking Ahead: An Actuarial Perspective on Long-Term Critical Illness Trends

Moderator



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Agenda

- 01** Post Covid Mortality and Morbidity
- 02** Impacts of Cancer Screening
- 03** Impacts on Non-covid-19 Healthcare
- 04** Future Healthcare Strain
- 05** Impact on Future CI Incidence Trends



Isn't COVID-19 Effectively "Over"?

Some key themes and concerns that are emerging

1

SARS-CoV-2 will continue to exist

- The virus continues to mutate, so we can expect future variants
- Absent full immunity or a 100% effective treatment, COVID-19 will remain a cause of death for the foreseeable future

2

The effects of the COVID-19 pandemic will reverberate for years

- COVID-19 sequelae¹ and impact on mortality & morbidity of survivors
- Accelerated deaths, delayed screenings and treatments, unfilled prescriptions, stresses on the healthcare system, etc.

3

We see persistent non-COVID excess mortality

- Statistically significant in almost all countries and regions
- Deaths due to COVID-19 and its sequelae do not fully explain and account for excess deaths relative to pre-pandemic expectations

4

How should the industry think about mortality longer term?

- Ensure we are making better use of 2020 – 2022 experience data²
- How to tackle data where cause of death is unknown?

> 5

Pre-pandemic experience might not be the best predictor

- Things are changing quicker and more unpredictably
- There are significant systemic trends at work that may never return exactly to the glide path we expected "pre-pandemic"
- Will mortality "gains" (improvement) be harder to achieve?
- How much of what we are seeing is acceleration?

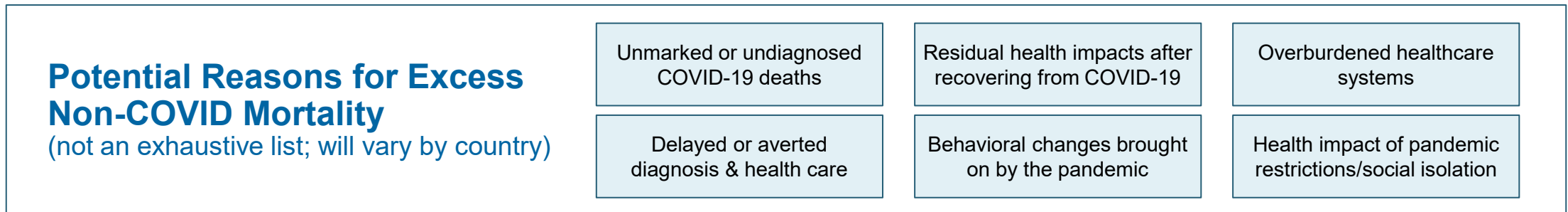
1. COVID-19 infection can have a significant longer-term mortality impact on those populations with co-morbidities such as cardiovascular disease, diabetes, respiratory problems, etc.

2. These should not be considered "lost data" years. Nevertheless, it is a challenge to use these data more *directly* to inform ("construct") a starting basis for mortality (or morbidity).

A Logical Framework for Understanding and Quantifying the Non-COVID Excess Mortality (or Morbidity)



- 1 Calculate Actual vs. Expected Total Experience Deviations**
 - Can use general population or insured data, depending on metric (count or amount)
 - Need to examine pre-pandemic data to establish baseline variation and trend (if any)
- 2 Identify the Non-COVID Deviation ("Excess")**
 - Non-COVID Excess = Total – COVID
 - Excess can be positive or negative (or >1 and <1 if using ratios)
 - Determine if variations are correlated with COVID deaths or claims – could signal under-reporting or some functional relationship
- 3 Propose Component Risk Drivers for the Non-COVID Excess**
 - Examine published (mostly qualitative) material on this subject to put forward hypotheses
 - A given driver (component) can be positive or negative
 - Some drivers may be global in nature (e.g., impact of mRNA vaccines)
- 4 Gather Data & Research to Estimate Parameters**
 - Data may be hard or impossible to obtain
 - Even simplified guesses can be instructive and offer insight
 - Need to “calibrate” so that the combined impact of the components matches observed (e.g., 2021 – 2022) experience



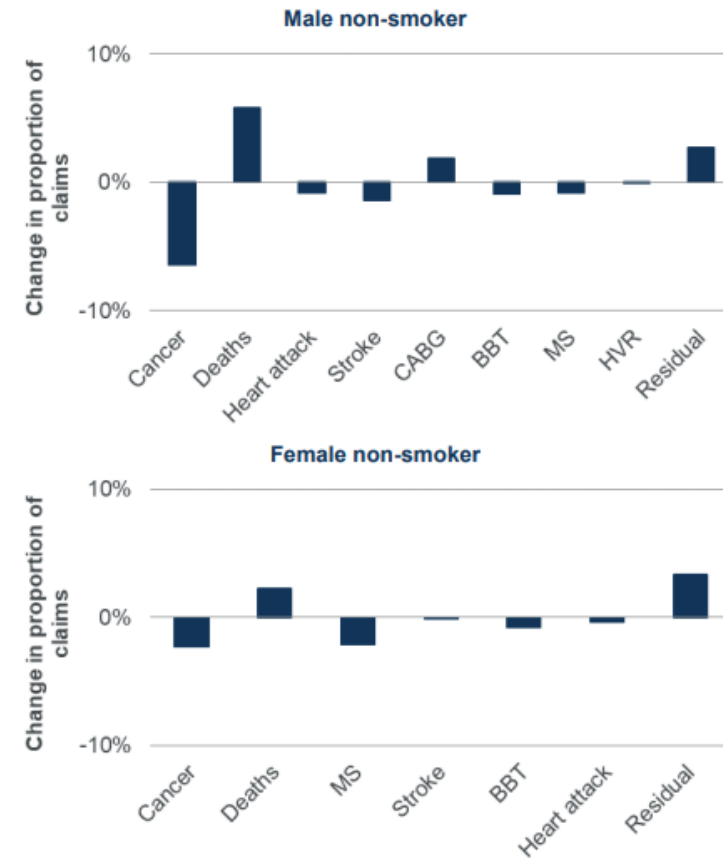
How Has Critical Illness Performed During the Pandemic?

UK Critical Illness

Table 3.1: 100 x Actual / Expected values in the CoC dataset and the WP162 dataset

Dataset	Male non-smoker	Male smoker	Female non-smoker	Female smoker	All
2017-2019 CoC	100	97	101	98	100
2016-2019 WP162	101	99	100	99	100
2020 CoC	85	83	89	88	87
2020 WP162	84	81	89	86	86

Chart 4B: Change in proportions of claims by cause, 2020 vs 2017-2019



- Experience in 2020 is 13-14% better than pre pandemic years (by number)
- Biggest change in claims for cancer with small reductions in MS, AMI and Stroke
- Experience in 2021 looks to be returning closer to expected. 2022 as expected or slightly higher.
- Not all countries have seen this pattern

Source: CMI Working Paper 167



The impact of Covid-19 on CI Trends



Post Covid Morbidity Critical Illness

Covid Survivors Morbidity

- Covid survivors have been shown to have elevated risk for CVD, Respiratory Disease, Diabetes, Kidney Disease and Dementia
- The level of risk correlates with the severity of the infection
 - ICU vs Hospital vs Non-hospital
- The severity of infection correlates with pre-existing comorbidities
- Relative Risk reduces with time since infection
- Difference between insured lives and general population
 - Prevalence of comorbidities so therefore lower risk of severe infection
 - Behaviour differences e.g., vaccination and exposure to virus

Post-Acute Morbidity COVID Survivors

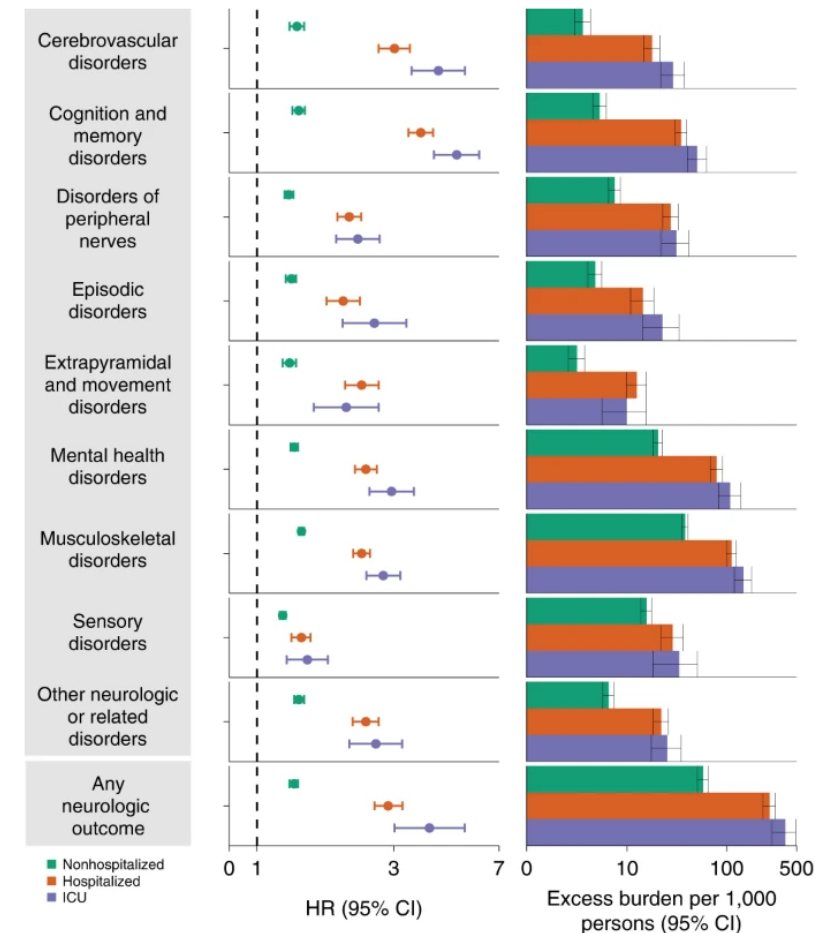
- 47,780 hospitalized patients
 - Jan. 1-Aug. 31, 2020
 - Discharged alive
- Matched controls – general population
- 29.4% were readmitted
 - 3.5x rate of matched controls
- Multiorgan dysfunction – post discharge
 - New onset / all events
 - 27x / 6x respiratory disease
 - 5x / 3x major cardiovascular events
 - 4.0x / 2.9x chronic liver disease
 - 3.5x / 1.5x diabetes
 - 2.0x / 1.9x chronic kidney disease
 - Rate ratios higher <70 vs 70+
- Baseline characteristics
 - Mean age 64.5 years
 - Male 55%
 - Lower socioeconomic status
- Pre-existing co-morbidities
 - Hospitalized vs. unmatched general pop
 - Obese (BMI >30): 32% vs. 17%
 - Hypertension: 52% vs. 18%
 - Respiratory disease: 41% vs. 16%
 - Diabetes: 24% vs. 7%
 - Cardiovascular disease: 22% vs. 3%
 - Cancer: 21% vs. 9%
 - Dementia: 11% vs. 1%
- Readmission rates in general
 - 10-20% at 30 and 60 days post discharge

Source: Post-COVID syndrome in individuals admitted to hospital with COVID-19: retrospective cohort study BMJ 2021;372:n693

Long-term Neurological Outcomes of Covid-19

- US Study Dept Veterans 109,226 covid infections
- 12-month risk of neurological outcomes for patients surviving 30 days compared to historical and contemporary control groups
- Stroke Risk relative to historical control group
 - 1.21 Non-hospitalised
 - 3.03 Hospitalised
 - 4.1 ICU
- Alzheimer's
 - 1.25 Non-hospitalised
 - 3.33 Hospitalised
 - 4.42 ICU

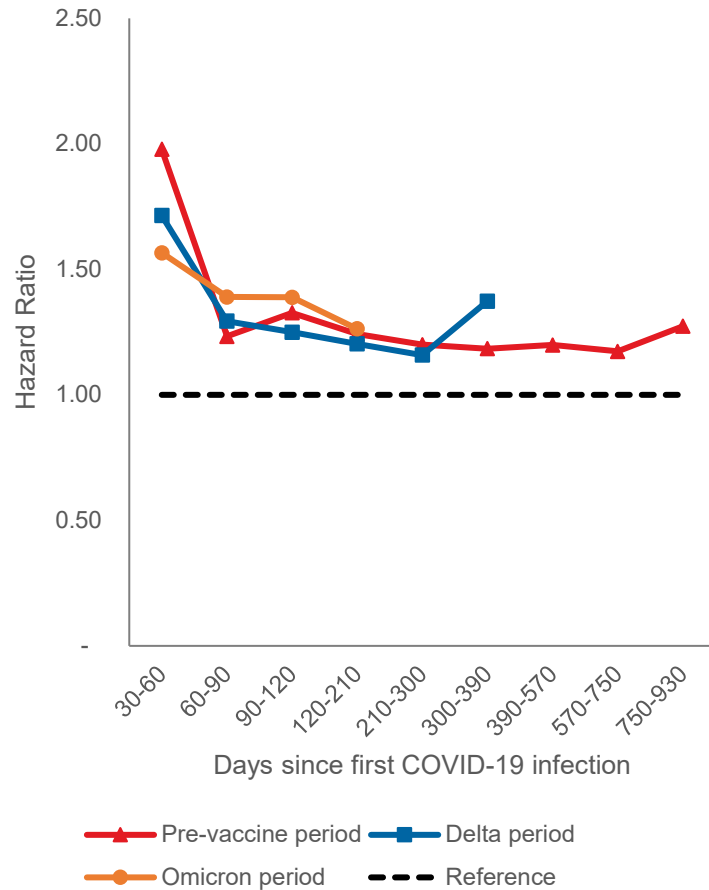
Fig. 6: Risks and 12-month burdens of incident postacute COVID-19 composite neurologic outcomes compared with the contemporary control cohort by care setting of the acute infection.



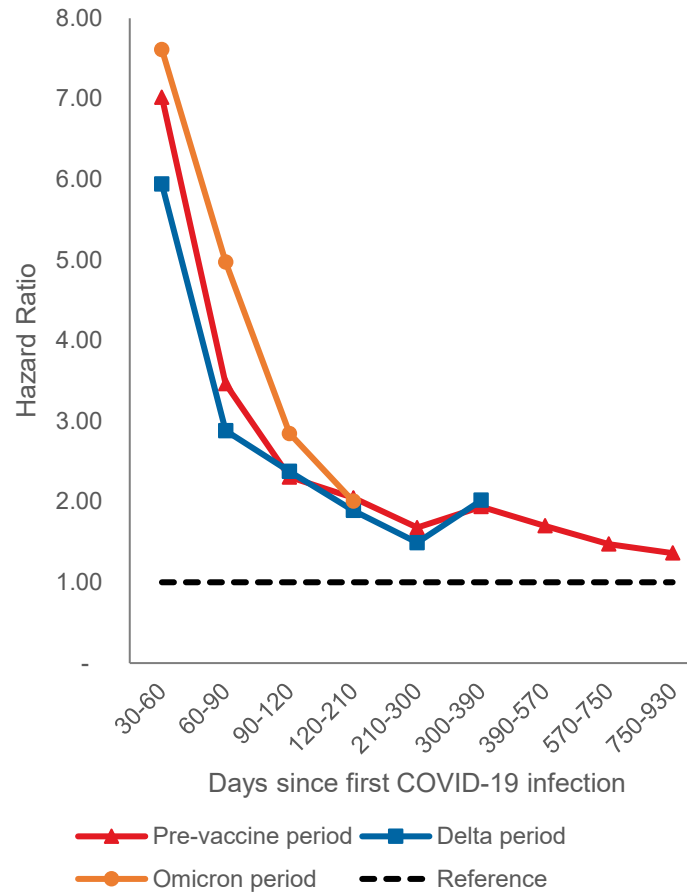
Source: Long-term neurological outcomes of Covid-19 <https://www.nature.com/articles/s41591-022-02001-z>

US Claims Data Relative Risk: MACE¹ Outcomes Ages 45-64

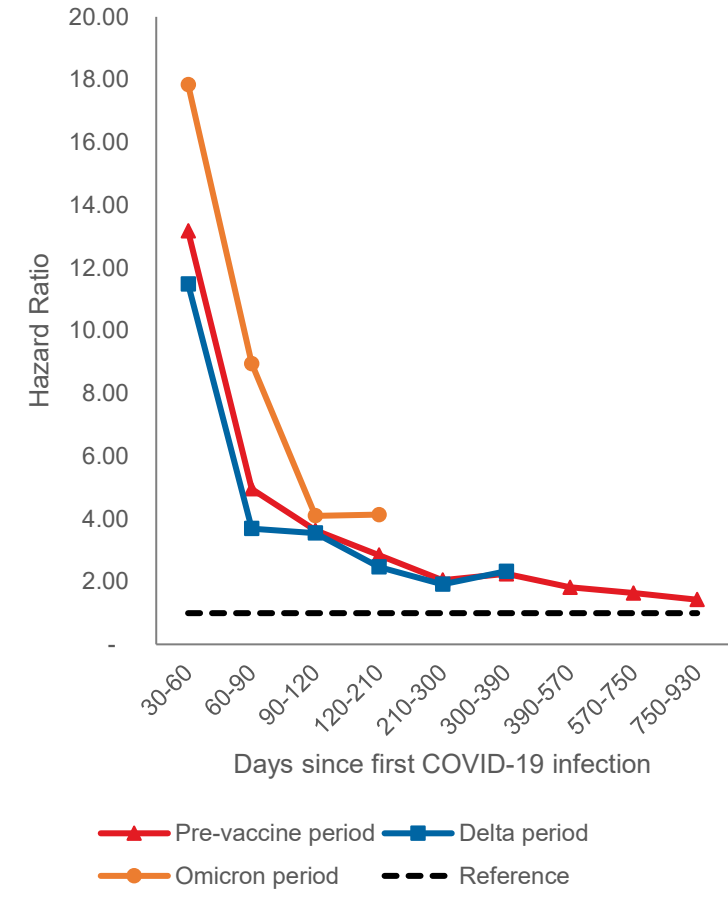
Non-Hospitalised



Hospitalised



ICU



--- Reference = Contemporary Cohort

Source: RGA Analysis Note 1: MACE = Major Adverse Cardiovascular Event.



Omicron vs. Previous Variants – Morbidity

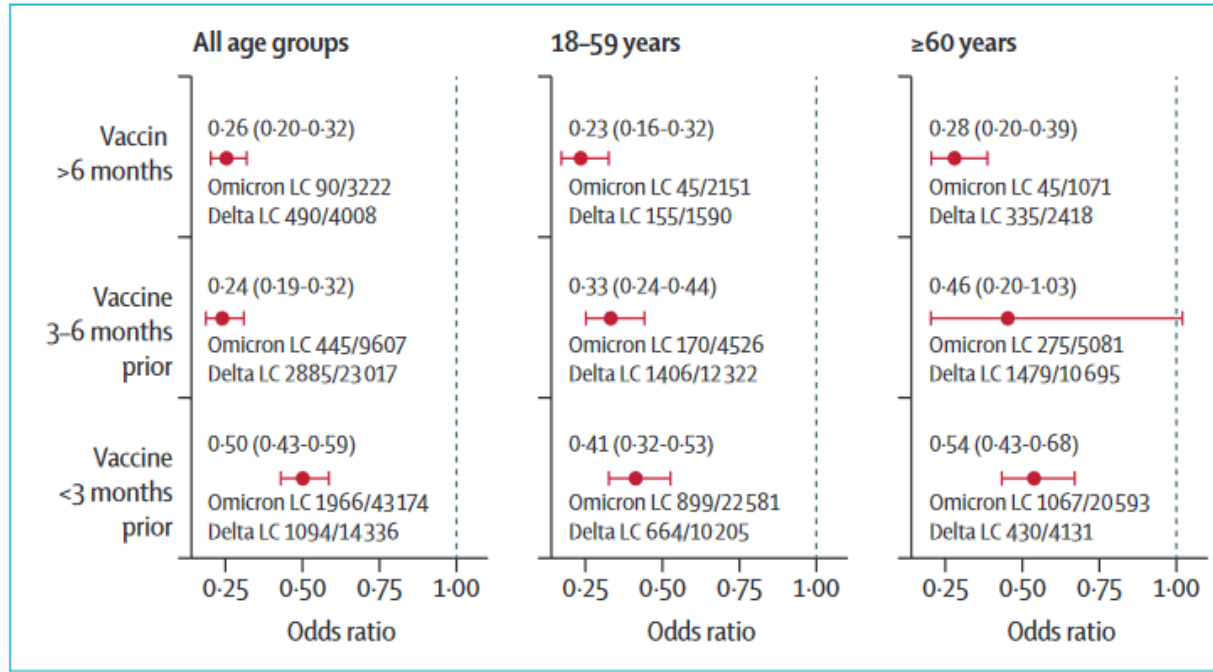
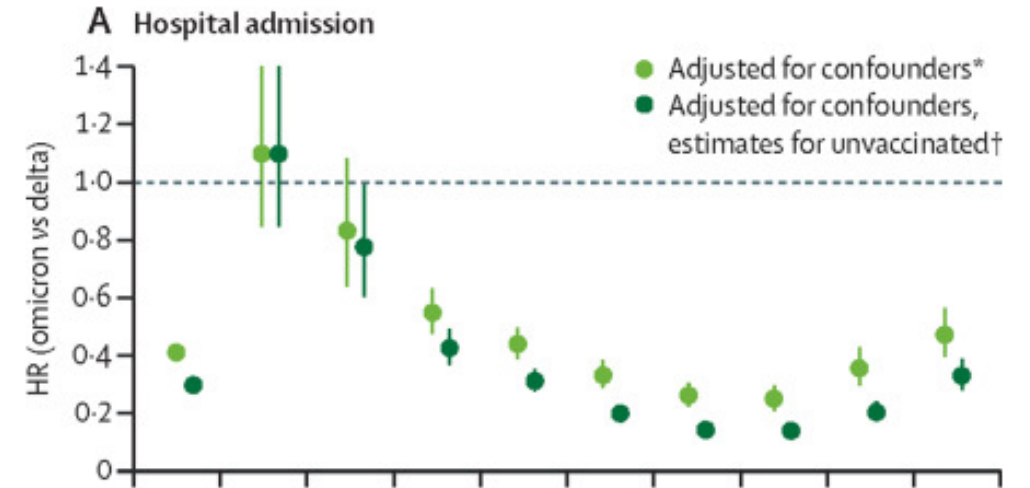


Figure: Odds ratio of long COVID (LC) adjusted by age, sex, body-mass index, Index of Multiple Deprivation, presence of comorbidities, and vaccination status
 Omicron long COVID and delta long COVID indicate, for each stratum, the number of users with long COVID over the total number of users of that stratum.



- Hospital admission significantly reduced for Omicron
- Omicron cases less likely to experience long COVID for all vaccine timings and all ages
 - OR 0.24 (0.19–0.32) to 0.50 (0.43–0.59).

Source: Risk of long COVID associated with delta versus omicron variants of SARS-CoV-2 <https://www.thelancet.com/action/showPdf?pii=S0140-6736%2822%2900941-2>
 Comparative analysis of the risks of hospitalisation and death associated with SARS-CoV-2 omicron (B.1.1.529) and delta (B.1.617.2) variants in England: a cohort study

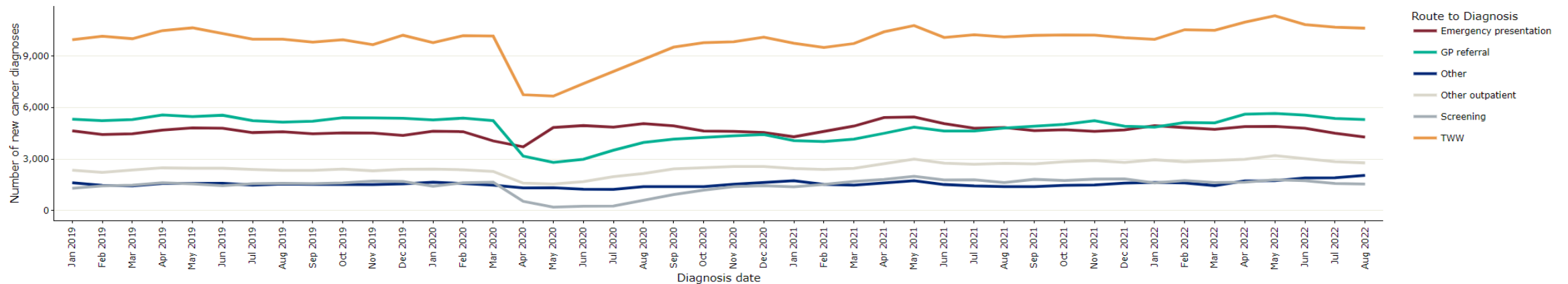


The Impact of the Pandemic on Cancer Diagnosis

England Cancer Diagnosis 2019-2022

New Cancer Diagnoses in England

New cancer diagnoses, England, January 2019 to November 2022
Cancer group: All sites combined



This work has been produced by the National Disease Registration Service.

Cancer Diagnoses relative to 2019	Female	Male
2019	100%	100%
2020	88%	86%
2021	102%	99%
2022 (Grossed up)	103%	105%

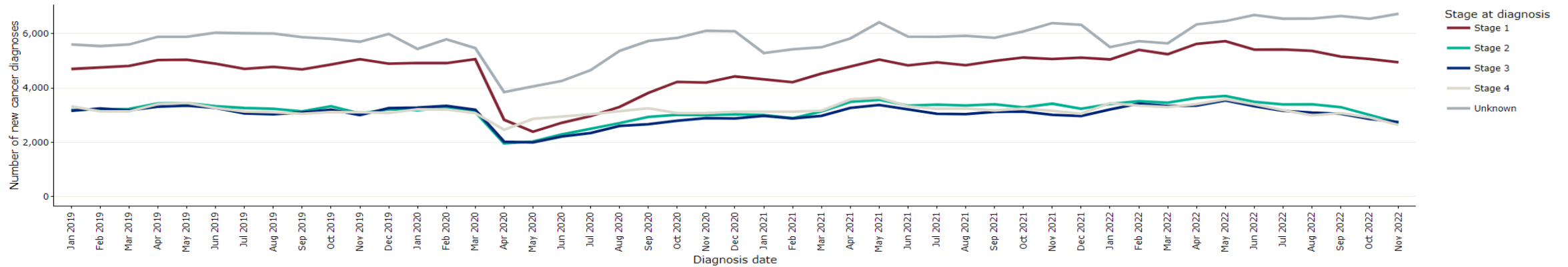
- Significant fall in diagnoses in 2020 across most pathways including GP, TWW and Screening
- Evidence of catchup in 2021 and 2022

Source: National Disease Registration Service NHS

England Cancer Diagnosis 2019-2022

Stage at Diagnosis

New cancer diagnoses, England, January 2019 to November 2022
Cancer group: All sites combined*



This work has been produced by the National Disease Registration Service.

- Biggest reduction in stage 1 in 2022 (21% lower in 2020) vs stage 4 (5% lower)

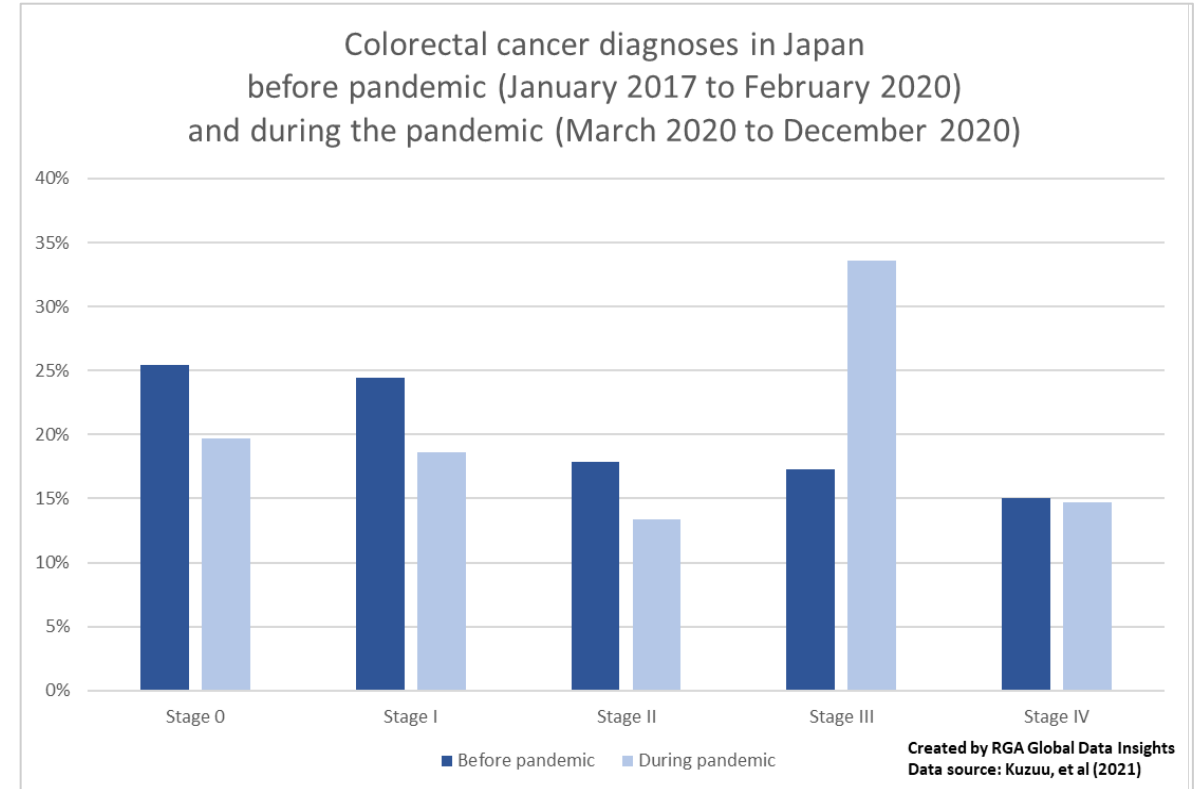
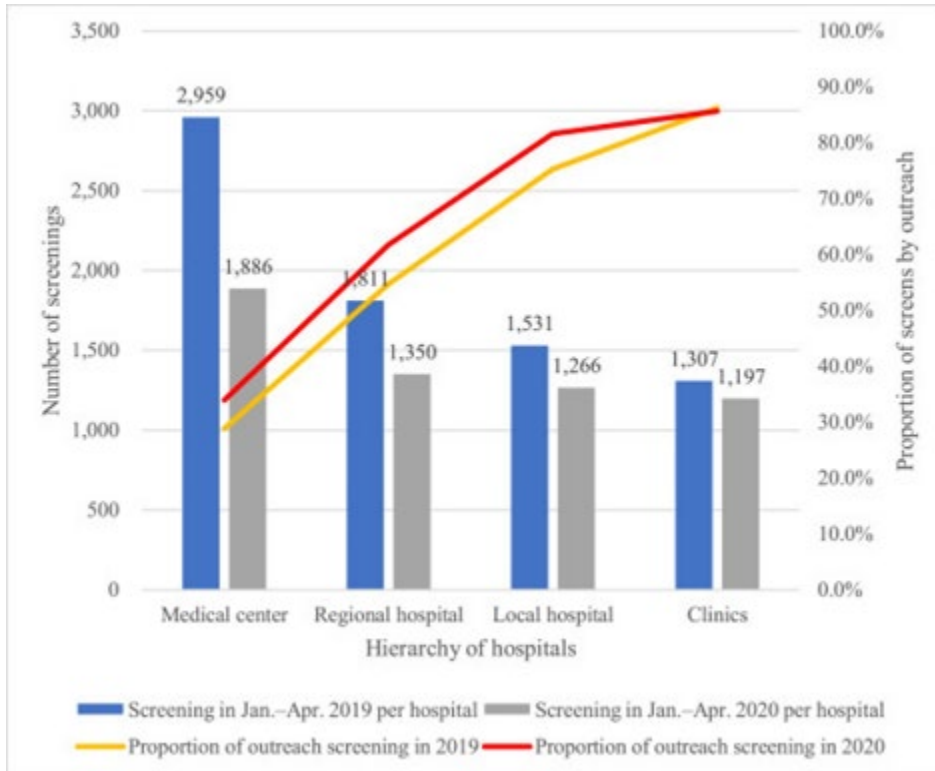
Cancer by site

- Biggest impacts on Breast (18% lower in 2020), Prostate (25% lower in 2020) and Colorectal (10% lower)
- Lowest impacts on Lung (7% lower), Liver (7% lower) and Pancreatic (0% lower)

Source: National Disease Registration Service NHS

Delays in Diagnosis and Treatment of Cancer - Asia

Reductions in screening and the impact on stage at diagnosis



Data source: Tsai Et al, The Breast, December 2020. Available at <https://www.sciencedirect.com/science/article/pii/S0960977620301673>

Kuzuu, et al (2021), Gastrointestinal Cancer Stage at Diagnosis Before and During the COVID-19 Pandemic in Japan, available at <https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2784394> under CC-BY (<https://jamanetwork.com/pages/cc-by-license-permissions>)

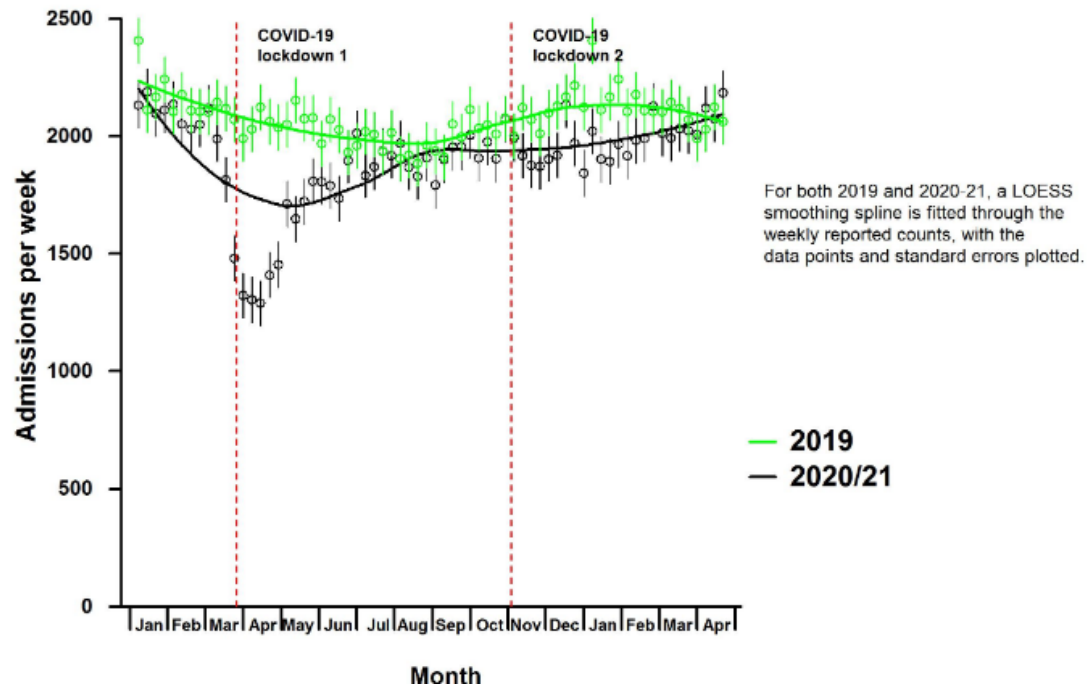


The Impact of the Pandemic on Non-covid Healthcare

Emergency Department Admissions England Heart Attack

University of Oxford and NHS Digital

Weekly numbers of admissions to acute NHS hospital trusts for heart attack (based on admissions up to 25 April 2021)

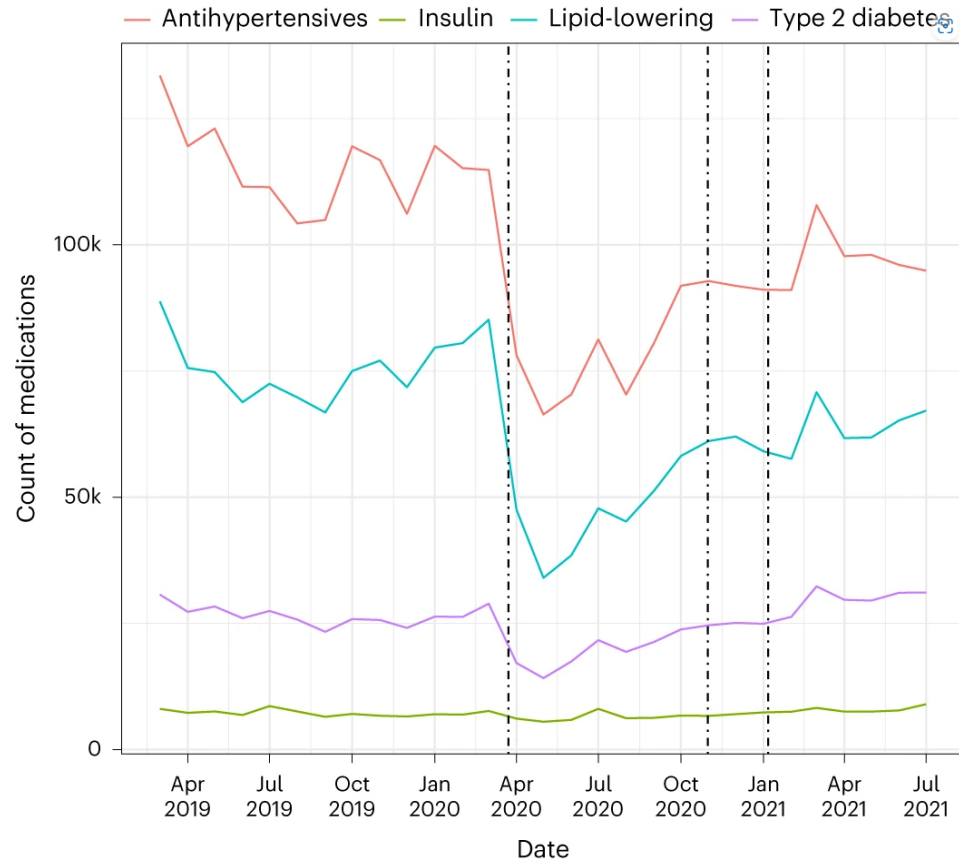


- Weekly admissions for Heart Attack fell by one third between mid February 2020 and end March 2020 before returning to usual levels by August 2020
- Further small falls during 2nd lockdown
- Analysis of NHS total emergency admissions show overall fall approx. 15% in 2020 and 4% in 2021
- A proportion of these likely died during this period however some of these Heart Attacks should be expected to be diagnosed later
- Likely also an issue for strokes

Source <https://www.ctsu.ox.ac.uk/research/covid-19-acute-coronary-syndromes>

Preventative Treatment Delays – England, Scotland and Wales

Reduction in first time prescription medication to manage risk factors - increase future rates of AMI and Stroke



- During April 2020-July 2021 nearly 500,000 fewer individuals initiated antihypertensive treatment
- Estimate 13,662 additional CVD events over their lifetime if they never started treatment
 - Equates to additional 2,281 MI's and 3,474 Strokes from hypertensive medication alone
- If these individuals can be identified within 5 years, then a significant portion of these “unnecessary” events could be averted (i.e., ~1,554 MIs and ~3,014 Strokes avoided)

Additional implied incidence rate over next few years

- AMI 0.2% to 0.8% per annum
- Stroke 0.2% to 1.7% per annum

Source: [The impact of the COVID-19 pandemic on cardiovascular disease prevention and management | Nature Medicine](#) by Dale et al



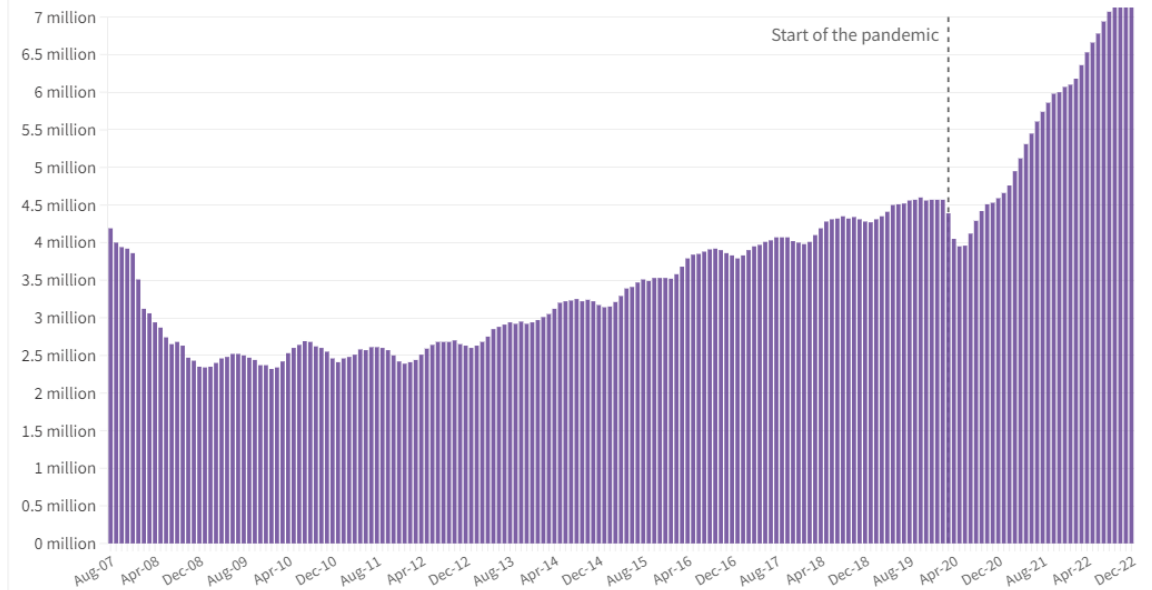
Future Healthcare Strain

Future Healthcare Strain

- Very dependent on healthcare capacity in each country
- In some countries evidence of big increase in waiting lists for elective care, delays in starting cancer treatment and wait times in emergency care
- Dealing with these issues will take significant time and resources from governments
- Have risk factors for CI events deteriorated due to the pandemic e.g. obesity, smoking, alcohol consumption, physical exercise? Impacts on mental health?
- Have people become more reluctant seeking medical help?

Number of people on NHS waiting lists for consultant-led elective care

September 2015 to December 2022



Source: BMA analysis of NHS England Consultant-led Referral to Treatment Waiting Times statistics • The data includes estimates for missing data.





Impacts on Future Critical Illness Incidence Trends

Impacts on Future CI Incidence Trends – Key Takeaways

- Impact of survivors on AMI and Stroke in particular, but in some markets Dementia. Biggest impact on males more than 5% p.a. in next few years.
- Significant increases in Dementia 2-3% p.a. in oldest ages (some of this likely acceleration)
- Increases in Diabetes 2-3% p.a. (some acceleration)
- Insured experience much better on these survival elements. These impacts will trend down over several years.
- Impact on NB less with underwriting for severe infections and complications
- Cancer diagnosis delays in particular for Breast, Prostate and Colorectal in some markets. Driven by length of lockdowns and impact on screening in 2020 and 2021. Expect this to emerge in next few years. Bigger impact female population
- Preventative Treatment for delays for key CVD risk factors
 - AMI and Stroke could be more than 0.2% p.a.
- Future healthcare strain impacts unknown at present but likely to persist for some time
 - Severity and time dependent on country though and healthcare system



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