Impact of the Reduction in Hospital Coverage between 2014 - 2019

Annotations of Figures

Extended figures + calculations and details can be found on the Jupyter Notebook

(1)

- **The overall coverage over time grouped by both state and age.** The shaded red region represents the time period not considered for this analysis, but used for smoothing, removing seasonal effects + numerical stability in calculating gradients.
- While not shown here (see supplementary), the coverage over time graph trend persists across states.
- There are **two** primary variables that could influence this trend, **1) the evolution of the proportion of insured** and **2) the evolution in population demographics**

(2)

- In this followup figure. We demonstrate that the declining growth in coverage fraction is driven by **the evolution in the proportion of the insured.** The relative impact is of the order ~O(10) times compared to the change in population demographics, which can be found in the supplementary notebook.
- We see here that all <75 age groups exhibit **negative growth** in their probability of purchasing PHI. This corresponds to **continued declining fraction of insured persons over time**, as long as this trend persists.
- The 75+ age group is the only group to be **more likely to purchase insurance over time**.
- We speculate that the origin of the decreasing uptake may be to do with the **changes in the MLS threshold**, increasing by $2000 once in 2012 and again in 2013. **This reduces the incentive of the employable group (<75) of purchasing PHI**.

(3)

- It follows that the Episodes would be **proportional to the number of insured persons under a given age group** (as an episode here is defined as a person with PHI being admitted).
- Since the number of insured is a function of the changing population as well as the probability of a person acquiring PHI, we look at how the distribution of Episodes evolve over time. The centre percentage is the 2019 proportion at an age group, and the colored percentage change represents the difference in percentage from 2015.
- Naturally, this change **closely follows that of the change of coverage over time** and the **evolution of probability of being insured** (Fig 2). The largest benefactors are the 75+ age group experiencing an increased share of **+3.1%,** and the greatest reduction in share was with the 25-50 group with **-2.1%**
- This tells us the **probability of an insured person having an episode** is **relatively constant over time**.

(4)

- The overall benefits (defined here as the benefits from Other Hospital Treatment Benefits + Medical Benefits), is an i**nterplay between many variables**, such as the number of episodes, the age bracket (e.g. distribution of treatment types) and time.
- We see here that the age group to provide the largest magnitude of benefits is the 50-75 age group. This is due to the ideal combination of its population size, and advanced age, providing **~$1.5b** in benefits by Jun 2019
- Even though the 75+ age group is the smallest, it was the second largest contributor to benefits with just under **$1b** by Jun 2019, largely due to predisposition of this age group to utilise PH services.

(5)

- We can calculate the relative growth in benefits of each age group.
- We take the derivative of Fig 4, and find that the 50-75 age group gives has a growth of ~$**15.3m/qtr**, closely followed by the 75+ age group with a growth of ~$**15.1m/qtr.**
- The remaining two groups has a significantly smaller rate of growth, yielding an **increase** of ~**$1.7m/qtr** and ~**$2.7m/qtr** for the age groups 0-25 and 25-50 respectively.

(6)

- We can finally evaluate the impact of the reduction of hospital coverage 2014-2019. To do this, **we ask ourselves how many potential episodes has the reduction in coverage led to**?
- Given the number of potential episodes in each age group, **we can estimate the potential loss in benefits**.
- We assume that the growth in the evolution of the probability of purchasing PHI (Fig 2) is **fixed at Jun 2015 levels**. We look at groups of the two most significant reductions in this evolution, the 25-50 and 50-75 age groups, both experiencing drops of **~3-4%** in probability of acquiring insurance (see supplementary P(Insured) vs t). We make the assumption that the distribution of treatments types do not change over time in these age brackets as well as the probability of an insured having an episode.
- We find a **31k** loss in potential episodes, equating to a **~$90m** of benefits lost.
- This is relatively mild with a **difference of +18.5% vs +18.0%** in benefits between 2015-2019
- The impact of the **25-50 group is mild** compared to the changes of the 50-75 group **(14k vs 17k episodes/$41m vs $49m benefits)** especially when considering the population difference **(**25-50 group is **~26% larger)** in mind**.**