Institute and Faculty of Actuaries

COVID-19 Report

COVID-19 Scenario Modelling: Healthcare Sector Scenarios

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Some of the parameters that can be used for pandemic scenario creation have been listed below. However, modelling might require time dependent variables for some of the scenarios. This paper proposes 5 possible stress scenarios using following parameters.

I. Parameters to Model:

1. **Regulatory intervention:**
   This variable may include scenarios where regulatory intervention caps claim costs during a disease outbreak. For example, in India, GI council proposed a cap on maximum pay-out under non-ICU and ICU COVID-19 cases, based on geographical location.
   Such intervention will reduce claim severity and therefore intensity of intervention can be built reflected via possible reduction in claims cost.
   Parameters will include two values - yes or no for regulatory intervention. If yes, then the question would be the expected percentage of severity reduction. Further allowance should be made for the timing of such intervention i.e. during the peak of a particular wave.

2. **Underreporting of COVID cases:**
   Reporting of COVID-19 cases is not independent of political considerations. COVID-19 prevalence within a particular state is seen as weakness of the state government to impose necessary precautionary measures. Hence, the reported data may be modified. For example, during election time, a sudden dip in reported infected cases may be observed.
   As all the insurers take these reported numbers as proxy for various analyses in their liability estimates, the magnitude of underreporting will impact the true nature of the potential risk exposure.
   We can consider various underreporting scenarios can in modelling for example an optimistic scenario of 10% underreporting and a pessimistic case of up to 90% underreporting.
   The underreporting parameter should also vary by geography and over time.

3. **Vaccine effectiveness**
   Vaccines are being successfully distributed, 11-12%-6% of the global population has already administered the first dose, which includes roughly 6% fully vaccinated population. However, virus is continuously evolving with new strains being identified every now and then. It is too soon to say that vaccine will help us get rid of this virus any time soon. A few possible scenarios on vaccine effectiveness are given below:
   - Failure resulting into secondary cost:
     Frequency might continue to increase at base rate with possible increase in severity due to the secondary cost resulting from possible side effects emerging over time. Optimistic to pessimistic scenario might include from no secondary cost to 50-60% increase in claims severity.
   - Immediate success:
     Curvature of declining disease spread needs to be analysed in depth for example, by what percentage spread will the prevalence decline in the future? Will it be a constant

decline in disease spread or will the rate of decline increase over time due to the impact of improved vaccines in near future?
Also, if the vaccination is only protecting against fatality and not the infection, COVID-19 related claim cost will continue to appear in health insurer's book. However, the resultant severity might reduce e.g. a person without vaccination could be severely infected but with vaccination his/her symptoms might reduce to mild.

- Success in future trials:
  Until an effective version of vaccine is identified, the disease spread is expected to follow the usual pattern of infection of any given wave of a disease. Once the effective vaccine is identified, we need to think about the pattern in which frequency will start declining (constant or time dependent decline).

  This might impact both frequency or severity. We can assume that vaccine might reduce the infection rate as well as the intensity of the infection, resulting in a lower treatment cost.

4. **Political and social factors**
   Effectiveness of various preventive measures adopted to control the disease, which might include future lockdowns, continuation of work from home, availability of required sanitization.

5. **Possible future harmful mutations and their timings**
   Multiple mutated variants of this virus have been identified so far. Infection, symptoms and fatality rate of each variant varies significantly. Different scenarios can be built to allow for such expected mutations during the valuation period.
   - Optimistic scenario – no further harmful mutation resulting into big infection waves
   - Pessimistic scenario – future multiple harmful mutations resulting into several leptokurtic infection waves. Scenario should consider possible increase in infection rate as well as in resultant claim severity. Timing of such expected mutations should also be considered. Until then frequency would remain at the base infection rate.

As proposed scenarios are designed keeping in mind healthcare sector alone, mortality has not been considered as a shock parameter. Unlike a life/pension insurance provider, where payout is linked to mortality/survival, a healthcare provider incurs a cost on hospitalization irrespective of survival status.

II. 5 Proposed Scenarios Using Parameters:

Possible scenarios will vary by country as each country is at a different stage of pandemic. Pessimistic scenario for one country might be best estimate of another depending on assessment period.

- Highly Optimistic Scenario: Considering best of above parameters
- Highly Pessimistic Scenario: Considering worst of the above parameters
- Best estimate: Closer to the existing view of the disease spread
- Optimistic Scenario: little better compared to the best estimate
- Pessimistic Scenario: little worse compared to the best estimate

Scenarios can be modified based on the view of the portfolio under review:

Highly Optimistic	Regulatory intervention to cap the claims outgo, with settlement/claim ratio decreasing by 35%
	Low underreporting i.e. 70% cases are reported
	Immediate vaccine successes with high take up rate (vaccine take-up rate should be factored or can be built through possible curvature of declining frequency)
	Strict control until vaccine is successfully circulated
	No further harmful mutation resulting into further infection waves
Highly Pessimistic	Regulatory intervention to settle all the COVID-19 claims in full (without co-pay or deductibles)
	High underreporting i.e. only 10% cases are reported
	No vaccine success during assessment period with potential secondary cost resulting from the trial vaccine take-up.
	No lockdown restriction to protect the economy from slowdown
	4-5 infection waves during the assessment period resulting from harmful mutations
Best estimate	Current insurance claims severity will continue with respect to COVID-19 Claims
	50% underreporting (parameter can be decided based on the difference between overall national vs insurance industry observed frequency estimate)
	Vaccine success to be visible from one/two quarters from administration
	Current political and social intervention to continue during the assessment period
	At least one or two more additional waves resulting in a disease spike
Optimistic Scenario	Regulatory intervention to cap claims, resulting in a settlement/claim ratio decrease of 20%
	Low underreporting i.e. only 60-75% cases are reported
	Immediate Vaccine success with low take-up rate (vaccine take-up rate should be factored or can be built through possible curvature of declining frequency)
	Current political and social intervention to continue for the assessment year
	At least one more additional wave resulting in~~to~~ a disease spike during the year
Pessimistic Scenario	Actual insurance claims severity without any regulatory intervention
	High underreporting i.e. only 25% cases are reported
	Vaccine success to be visible from third quarter from administration or residual risks start appearing by the end of the valuation period
	No government restriction to protect the economy from slowdown
	One possible harmful mutation during the year with higher spread rate