

Institute of Actuaries of India

Subject SP1 – Health and Care Principles

December 2022 Examination

INDICATIVE SOLUTION

Introduction

The indicative solution has been written by the Examiners with the aim of helping candidates. The solutions given are only indicative. It is realized that there could be other points as valid answers and examiner have given credit for any alternative approach or interpretation which they consider to be reasonable.

Solution 1:

- i) Possible reasons as below:
- 1) To make the health insurance policies more inclusive and comprehensive by reducing the number of exclusions in the policy and standardizing waiting periods
 - 2) With healthcare sector being dynamic and rapidly evolving, inclusion of more ailments such as mental illness, genetic disorders and advanced treatments
 - 3) To ensure that a uniform approach is undertaken by all insurance companies in the healthcare sector. With the increase in insurers, each insurer has various product offerings with its own list of inclusions and exclusions
 - 4) To make it easy to understand for the policyholders to rationalize and improve service standards of the health insurance industry to bring in transparency [0.5 marks for each logical point, **Max 2**]
- ii) Modern treatment methods is a way of treating certain current ailments with more advanced technologies that have been approved with advancement in medical science.
- 1) Therefore, the assumptions on both morbidity and severity should only include the incremental impact of using these modern treatment methods for treating ailments / procedures.
 - 2) Given that this inclusion will now be available for both new as well as existing policyholders, it could be more appropriate to use prevalence rates instead of incidence rates.
 - 3) The relation between the incidence rate of the underlying ailment and the proportion of impacted policyholders undergoing the treatment would change over time. Initially, due to the lack of infrastructure and expertise, a lesser proportion of the impacted policyholders would be able to avail the treatment. However, with insurance companies covering the treatment method, the supply of relevant expertise and infrastructure would also increase.
 - 4) Severity will refer to the average cost of the procedure. The impact on severity will be dependent on the sum insureds and the sub-limits on modern treatments imposed by the insurance companies.
 - 5) If the sublimit of modern treatment method is set to the cost of existing treatment method, there shouldn't be any impact on pricing.
 - 6) The cost of treatment of the most modern treatment method is expected to reduce over a period of time. With an increasing number of patients undergoing the treatment, the fixed expenses of the hospitals (which include equipment and medical expertise) would be amortized over a larger number of patients.
 - 7) Information available in the public domain and insurance companies' internal experience should be considered to arrive at the incidence rates.
 - 8) Since the regulator is implementing it for all insurers, there will be no competitive advantage or disadvantage. [0.5 marks for each logical point, **Max 4**]
- iii) Data Sources
- 1) There are various sources of data that the insurance company might get these, but all of these have some weaknesses. For example, the insurance company's own data could be of limited use given many of the inclusions were earlier exclusions and only rejected data may be recorded. [1]
 - 2) The company might be able to use industry data or data from the reinsurers.
 - 3) These would have to be treated with caution- any of these data might also be of poor quality in themselves e.g., Inaccurate/out-of-date data
 - 4) The company would also use its own data as a basis for its expense assumptions However, these may be entirely unsuitable for the additional risks assumed.
 - 5) It should be possible to get some information from new markets, but significant judgment will be needed in producing relevant assumptions.
 - 6) A similar problem exists in persistency. Any overseas data may be almost irrelevant to the local market where selling practices and customer behaviour may be quite different.

- 7) Overall, benchmarking the rates with similar products offered by competition in market would help.
- 8) Given the uncertainties, a higher use of reinsurance may be appropriate initially till the company builds its own experience and expertise required for the new product.
- 9) Also, monitor sale volumes and experience closely to timely react.

[0.5 marks for each logical point, **Max 5**]

iv) Analysis of proposal to cover all medically necessary treatments:

- 1) Such a policy to cover all medically necessary treatments will have very limited basic exclusions
- 2) The policy will be easy to understand with simplified terms and conditions in the policy wordings
- 3) Rejected claims are expected to decrease
- 4) Reduced process costs due to simplified administration process
- 5) Shorter claims processing time since coverage is all risks related to health
- 6) Offers umbrella protection with a comprehensive coverage making it very policyholder friendly
- 7) Will lead to increase in sales volume due to the ease of understanding of the policy, and claims process thereby reducing per policy expense
- 8) Underwriting norms will become stricter given all risks covered and after sales is seamless
- 9) The overall impact on costs will be defined by the cost savings due to ease of administration and increase due to stricter underwriting
- 10) Covering all medically necessary treatments would increase the premium given an increase in the risks covered
- 11) Making the premium less attractive to standard lives and hence worsening of the morbidity experience and thereby further increasing the premiums
- 12) Need to monitor experience frequently and take suitable actions

[0.5 marks for each logical point, **Max 5**]

v) Risks

- 1) Anti-selection is the key risk given the product has only basic limited exclusions
- 2) The risk that the premium charged may be inadequate for the additional risk assumed
- 3) Coverage for all medically necessary treatments from Day 1 will increase the costs significantly since claims that were expected to come in after 2-4 years of waiting period, would come in from day 1.
- 4) The underwriting costs is likely to be higher resulting in higher premium and lower sales volume
- 5) Greater data recording might lead to operational risk pertaining to the operations and IT systems
- 6) This might lead to need for greater margin resulting in high premium and finally in lower-than-expected sales volume
- 7) Lower than expected sales might result in high per policy expense loading making it difficult to achieve economies of scale
- 8) Conversely, greater than expected sales volume might result in higher-than-expected new business strain disturbing the business plan of the company
- 9) The existing sales channels may not be prepared to sell the products
- 10) Launch of similar product by other insurers might threaten the expected sales volume and profitability under the product

Mitigation measures

- 1) Company might launch the product on a pilot basis before scaling up to understand customer's reaction and claims experience under the product
- 2) Alternatively, the company may sell it only through select channels for e.g., broking channel where the waiting periods are already waived off and policies are more comprehensive in terms of coverage
- 3) Exclusion of pre-existing conditions to be kept as is for retail policies

- 4) Introduction of a co-pay arrangement where the customer needs to pay a certain percentage of the claim. The co-pay percentage may be made to increase after the attainment of specific ages
- 5) Limit on the benefit available under the product such as overall sum assured limit, number of days of hospitalization, number of claims in a year
- 6) Non-guaranteed rates i.e., rate reviewable at the time of renewal of policy based on claims history
- 7) No claims discount to encourage the policyholders to avoid claiming for treatment of small amount
- 8) Registration into a wellness program as a pre-condition and incentives such as premium discounts based on the level of overall activity in the wellness program. This can help improving the health of the customers and thereby reducing the portfolio incidence rate
- 9) The company may try to get more data on the level and incidence of additional exclusions to be made inclusions and adequately price for the product. Such a data may be received from reinsurers, consultants, hospital records, internal claims experience etc.
- 10) Company may use reinsurance to transfer the risk as well as to get assistance on pricing, product design and underwriting. [0.5 marks for each logical point, **Max 5**]

vi) Riders that can offered along with this product are as below:

- 1) Consumables Cover – coverage towards non-medical or non-payable expenses that are generally excluded from the insurance claims payout
- 2) OPD Insurance Cover – coverage towards outpatient expenses such as medical consultations, diagnostics, vaccination to be covered
- 3) Worldwide Coverage – Option to include worldwide hospitalization coverage both on emergency as well as planned hospitalization basis outside of India
- 4) Wellness initiatives / Care Management Programs – Wellness related services to incentivize and promote good health in line with the regulator’s push to insurers to provide discounts on services and renewal premiums [1 mark for each logical point, **Max 4**]

[25 Marks]

Solution 2:

i) Need for OPD Insurance Product

- 1) Over 60% of overall healthcare expenditure for an individual is out-of-pocket in nature thereby leading to lower financial protection
- 2) Generally, the first port of call for individuals and hence it is important for OPD to be insured given primary care is currently not covered
- 3) OPD incidents are more frequent for all age groups and for different specialties
- 4) Having an OPD coverage from early on helps the insured persons to take preventive measures for staying healthy [0.5 mark for each logical point, **Max 2**]

ii) Policyholder

Advantages

- OPD Insurance Policy will cover day to day medical expenses on doctor consults, lab tests and medicines thus reducing out of pocket expenses for policyholders
- Vaccinations included in the policy will be a good preventive care mechanism for certain health conditions
- Diagnostics covered in the policy would lead to early detection of diseases thereby getting the disease treated at an earlier stage that can help prevent or reduce downstream hospitalisation costs

Disadvantages

- If the OPD Insurance is in a closed network only, the flexibility of consulting a doctor of your choice may be limited if your preferred doctor is not in the network
- This holds true for other benefits as well if the model is completely on a cashless basis.

Insurer

Advantages

- OPD Insurance will add to the overall product offering for the insurance company
- Being a first mover in the market, this policy can add significantly to the top line of the company i.e., premium
- With large volumes of primary healthcare data, predictive data analytics on possible hospitalization and health risk can be computed
- With early diagnosis, diseases can be treated early with lower severity levels and thus better claims experience in the medical hospitalization insurance policy with reduced costs

Disadvantages

- If the OPD Insurance is in an open model, the policy may not be sustainable in the medium to long-term
- Being a high frequency product, the current IT systems will have to be upgraded to handle large volumes of claims compared to private medical insurance
- This product could incur significant losses thereby increasing the capital requirement of the company impacting the solvency margin [0.5 mark for each logical point, **Max 5**]

[7 Marks]

Solution 3:

i) Given this is a recent development, the risks faced are as below:

- 1) While the life insurers will have certain internal data on long-term products, general and health insurers will have very limited to negligible data.
- 2) Life insurers too, will mostly have data pertaining to protection and investment products and long-term healthcare products would be a different product range to explore
- 3) There will be stricter medical underwriting that is likely to be higher resulting in higher premium and lower sales volume.
- 4) The reserving assumptions would vary considerably from those used for existing products given the period and type of product. This could result in incorrect reserving with lesser reserves kept aside.
- 5) This could influence future financial and liquidity considerations because of incorrect asset liability management.
- 6) Greater data recording for a longer time frame might lead to operational risk pertaining to the operations and IT systems.
- 7) This might lead to need for greater margin resulting in high premium and finally in lower-than-expected sales volume.
- 8) Lower than expected sales might result in high per policy expense loading making it difficult to achieve economies of scale.
- 9) Conversely, greater than expected sales volume might result in higher-than-expected new business strain affecting the business plan of the company.
- 10) The existing sales channels may not be prepared to sell the products given lack of experience.
- 11) Launch of similar product by other insurers might threaten the expected sales volume and profitability under the product. [0.5 mark for each logical point, **Max 5**]

ii) Types of long-term health insurance products:

- 1) Pre-funded health care plans that are bought by relatively healthy individuals to protect them against the risk of future disability.

- a. The claim payout is based on the individual not being able to perform a specified number of activities of daily living
- b. Claims can be on an indemnity basis, or subject to maximum cash payments in each period, or fixed cash amounts specified in the policy
- 2) Immediate needs plans that are bought by long-term care claimants to protect them against the uncertain survival duration.
 - a. These can be looked at as an impaired annuity solution. Generally, provide cash benefits
- 3) Critical Illness Product – Long-Term Critical illness product paying a lump sum benefit on first diagnosis of any of the listed critical illness
- 4) Pension Solutions – This can be a prefunded plan using part of the lump sum from a pension or by paying a premium out of the regular pension annuity. Payments to be made can increase subject to age or an impairment trigger.
- 5) Health Savings Account / Investment Product – This will be a pre-funded plan wherein regular premium payments can be done over a fixed period to use it for medical needs, renewal premium of health insurance, non-medical expenses basis activities done over the year demonstrating good health outcomes [1 mark for each logical point, **Max 5**]

iii) Risk Control

- 1) To limit the exposure to risk under the product as the company does not have any experience in this product category.
- 2) To avoid large single losses and ensure claims payments can be made without detrimental impact on business results and solvency.
- 3) To achieve diversification by sharing of risk.
- 4) To enable the company to write large risks with greater profit potential

Financial Assistance

- 1) Reduction of new business strain as the margin for adverse deviation may be higher for the new product
- 2) A capital gearing arrangement to provide capital to the company.
- 3) This may also help the company to meet the required level of statutory solvency.
- 4) Smoothing of profits.

Technical Assistance

- 1) Data on the level and incidence of the long-term product and the claims experience from the existing and overseas market.
- 2) Assistance with other aspects of the product launch such as:
 - a. Customer segmentation
 - b. Product design and pricing
 - c. Underwriting
 - d. Claims Management
 - e. Reserving

[0.5 mark for each logical point, **Max 5**]

iv) Reinsurance structure:

- 1) Since the company does not have any experience with this product, a quota share arrangement that cedes a specified percentage of each risk may be helpful.
- 2) Quota share can help to reduce insurer's exposure to losses due to possible mispricing or uncertainties related to claims experience.
- 3) The quota share percentage can be ascertained based on the comparison between the cost of reinsurance and cost of reserve for the retained portion of risk.
- 4) In addition to above, the company may go for an excess of loss cover to shield itself from the risk of higher-than-expected overall loss. [1 mark for each logical point, **Max 3**]

[18 Marks]

Solution 4:**i) General points**

- 1) IBNR reserves for PMI would be expected to be small. [½]
- 2) This is because most (valid) claims are notified early in the course of treatment (and often *before* treatment) to obtain authorisation. [½]
- 3) A relatively simple method is desirable to avoid excessive costs and all the methods adhere to this to some extent. [½]
- 4) As the calculation is for statutory purposes, the method should result in a reasonable but prudent estimate of IBNR reserves. [½]
- 5) None of the methods given has an implicit allowance for prudence, and so the methods and/or assumptions should allow for this explicitly, for example by building in margins into the assumptions. [1]
- 6) The method should not be open to manipulation and should allow comparisons to be made between companies and over time. [½]
- 7) None of the methods shown has any restrictions or guidance on usage, so their usage will need to be monitored carefully by the regulators to avoid manipulation. [½]
- 8) The method should consider any statutory constraints or guidance. [½]

Method 1:

- 1) If the past reporting patterns of claims can be expected to be appropriate in the future, then this method should be reasonable. However, this assumption may be invalidated by,

for example:

 - changes in the claims handling process or reporting behaviour
 - the mix of business and variations in the types of claims over time. [1]
- 2) An estimate of the average claim size will be readily available from past data... although suitability will be affected by how many years are included in the calculation of the average. [½]
- 3) However, again, this may not be entirely appropriate for the future, particularly due to claims inflation. [½]
- 4) In any case, the average PMI claim size may not represent the average PMI claim size for IBNR claims alone.

for example, it may be that minor ailments are reported less quickly than serious ones, in which case IBNR claim sizes would be smaller than average. [1]

Method 2

- 1) This method will only work if an appropriate claims cohort is used.

For example, if claims are grouped according to when they are reported, irrespective of when they happened, the method would not project IBNR automatically and would therefore be inappropriate. [1]
- 2) The exercise could be distorted by all the usual factors that can distort triangulation exercises, for example, changes in development patterns, the mix of business or claims handling procedures. [1]
- 3) Changes in past and future inflation are also important. [½]
- 4) Care needs to be taken over IBNER. The triangulation may or may not include IBNER estimates depending on the data tabulated within it.

For example, if IBNER is already shown in the data, then the triangulation will automatically include IBNER in the projection. If the intention is that IBNER is *not* included in the reported IBNR, then this will need adjustment. [1]

Method 3

- 1) This method is the simplest of the three and can be calculated as soon as the outstanding reported claims reserves for the prior year have been set.. Given its simplicity and the small size of IBNR, this method may therefore be the most appropriate. [1]
- 2) The method is still reasonably accurate since unreported claims reserves should be some resemblance to a proportion of reported claims reserves. [½]
- 3) The complication is in deciding a suitable “proportion”. This should be based on historical data, which could be inappropriate. [½]
- 4) Claims reported in the previous year may not be directly relevant to unreported claims in the current year, since they represent a different risk period. [½]

[Max 11]

ii) Data issues:

- 1) Longer reporting delays as reinsurers need to incorporate the insurers’ delay in receiving information. [½]
- 2) Greater tendency for claims to develop upwards for non-proportional business. Longer reporting delays for larger claims gives more time for economic and social factors to increase the claim. [1]
- 3) Issues related to heterogeneity:
 - Greater level of heterogeneity as reinsurers accept business from many insurers each possibly selling a diverse range of insurance products.
 - Reduced applicability of industry benchmarks due to heterogeneity of exposures.
 - Data grouping for reserving can be challenging given heterogeneity of experience. [2]
- 4) Data and systems, reporting of aggregate information especially for proportional business means less detail is available to the reinsurer [½]
- 5) Sparse data particularly for high excess non-proportional reinsurance, as the reinsurer is only notified of claims close to the excess points which are rare. [½]
- 6) Case estimates may not be consistently calculated i.e. the methodology is likely to be different for different insurers and so incurred claims data can produce distorted results. [½]
- 7) Data may be out of date and so not as relevant due to longer reporting delays. [½]
- 8) Errors in data may not be easily picked up given that the reinsurer does not have access to the same level of detail as the insurer. [½]
- 9) Data quality may vary and depends on the quality of the data received by all insurers. [½]
- 10) Definitions used and format of data are likely to differ between reinsurers which may complicate the analyses. [½]
- 11) Data may not be recorded consistently between insurers, and with the same insurer over time. [½]

[Max 6]

iii)

- 1) Analysis of emerging experience: Investigate how expected experience as at the last valuation compares to actual experience. [½]

- 2) Breakdown total movement into:
 - Difference between actual and expected movement in paid claims.
 - Change in paid development pattern.
 - Change in prior loss ratio.
 - Change in methodology and or assumptions [2]
- 3) Use different methodologies to calculate the IBNR: Only the chain ladder using say paid claims data is used to project to ultimate by the company, other methodologies which could be used are Chain ladder using incurred data, Average cost per claim method or Bornhuetter-Ferguson. [2]
- 4) The results of other methodologies should be compared to the chain ladder on paid claims data. [½]
- 5) Data:
 - Ensure that the data used in the valuation reconciles to other sources e.g. Financial statement/ Public disclosures
 - Understand movements in the data from the previous valuation
 - May need to identify and separately analyse large or catastrophic claims Investigate [1]
- 6) Development Pattern Diagnostics:
 - Compare assumed future development patterns with past development patterns
 - Check for distortions across calendar year and as compared to prior years
 - Check for very high or low development factors and investigate sensitivity of results to the inclusion or exclusion of these factors and compare the results [2]
- 7) Compare paid development pattern to:
 - Other classes of business for the same company.
 - Other clients as you are from a consultancy. [1]
- 8) Can compare specific diagnostics ratios
e.g., IBNR/Premium to industry benchmarks, other classes, or previous accident years. [½]
- 9) Other areas:
 - Check for any change in claims adjudication methodology
 - Consider reinsurance arrangement, reinstatements and any potential profit or sliding scale commissions which may need to be allowed for.
 - Understand differences, if any, in the pricing loss ratio and the ultimate loss ratios used for reserving in the latest accident year
 - Court precedents & recent court rulings which could affect the number and size of claims. [2]
- 10) Analyse changes in reinsurance arrangement and policy terms and conditions which could affect the size of the IBNR reserve. [½]
- 11) Adjust for economic cycle e.g., recession could lead to an increased propensity to claim for claims that have been incurred, and lead to a higher IBNR reserve. [½]
- 12) Sensitivity testing to key assumptions e.g., loss ratio, maybe use pricing loss ratio, assumed could be varied or different inflation assumptions could be used in basic chain ladder. [1]
- 13) Qualitative assessments, discussions with claims and underwriting. [½]
- 14) Understand and quantify uncertainty in IBNR reserve estimates and Check utilization of IBNR [½]
- 15) Analyse change in mix of claim types, business mix (i.e. change in insurer mix) within particular insurance class [½]
- 16) Adjustment for latent claims that have not be included in the IBNR reserve. [½]
- 17) Allowing for trends that may perhaps not be fully allowed for in the reserving methodology. [½]

[Max 13]

[30 Marks]

Solution 5:**Risks:**

- **Liquidity risk:** The Insurer will need to make large payments for claims emerging from these two events. There will be significant pressure on liquid assets and may result in illiquid assets needing to be sold on unfavourable terms to meet the cost of claims. [1]
- **Reserve risk:** There is likely to be greater uncertainty about the amount of liability claims emerging from the two events due to the longer tail of these claims and the influence of court decisions. There will therefore be greater risk that reserves set up to cover claims for these events turn out to be insufficient to meet the eventual cost. [1]
- **Aggregation of risk:** There is a risk that there are more events leading to large claims in the near future. This would put further pressure on company's capital and possibly threaten the solvency of the company. [1]
- **Increased uncertainty about future large claims:** The insurer may not have realised the potential for such large losses to happen so close together, which may result in the company becoming more concerned about future large losses. [1]

[Max 3]

Mitigations:

Liquidity Risk:

- Initiate process to sell some illiquid assets in anticipation of high claims.
- Reduce share of insurer/ retention limit in the reinsurance treaty
- Arrange for financial reinsurance to receive some capital support or try alternate risk transfer [1]

Reserve Risk:

- Request reserving assistance and data from reinsurers.
- Include a margin for uncertainty in reserves. [1/2]

Aggregation of Risk:

- Increase Aggregate XL cover.
- Increase proportional reinsurance cover for small amount of cover [1/2]

Increased uncertainty about future large claims

- Reduce maximum cover limit
- Run Catastrophe model to assess maximum possible loss under single and multiple catastrophe events in a year
- Achieve diversification through sourcing from different locations and segments
- Restrict maximum number of lives can travel together
- Avoid covering riskier nature of activities under personal accident insurance [2]

[Max 3]

[6 Marks]

Solution 6:**i) Case estimation vs statistical estimation**

Case estimation is more suitable than statistical estimation when there is:

- 1) sufficient qualitative data available for each individual claim ...
- 2) ... and an experienced team of claims assessors
- 3) insufficient historic data for statistical methods
- 4) relatively heterogeneous types of claims
- 5) a new class of business
- 6) high variance in the claim amount

- 7) no appropriate statistical model. [1/2 mark for each point, **Max 3**]

ii) Factors to consider when estimating the ultimate claims cost

- 1) Type of claim – Medical management or Surgical
- 2) Procedure type
- 3) Hospital (medical centre) to be used
- 4) Name of surgeon, consultant/treating doctor
- 5) policy coverage (Available sum insured, deductible, co-payment, sub-limit for any illness or condition, recuperation benefit *etc*)
- 6) Policy terms & conditions
- 7) Claims is incurred within policy period, age, gender and past claims history of claimant
- 8) current levels of medical inflation [1/2 mark for each point, **Max 3**]

iii) Risk mitigations:

- 1) The insurer can implement a stricter pre-authorisation process to identify claims that do not require in-patient hospitalization. [1]
- 2) The insurer can approach hospitals to explain this situation and work with only those hospitals which agree to refuse unnecessary admissions for minor ailments. [1]
- 3) Networks could also allow for an alternative reimbursement structure where hospitals are incentivized to only treat conditions that really require admission [1]
- 4) The insurer can modify the product design:
 - include OPD benefit to cover minor ailments so that hospitalization is not necessary. However, Premium will increase on inclusion of OPD cover in the product.
 - apply a co-payment or deductible fo specific treatments
 - exclude treatment for common ailments which do not require hospitalization. [2]
- 5) The insurer could implement case management for cases where the insurer suspects patients are admitted unnecessarily to ensure that they are immediately discharged once identified.[1]
- 6) The insurer can target policyholders who are healthier and have lesser chances for these minor ailments. [1]
- 7) The insurer can also implement wellness programs, annual health check-ups and preventative treatment methods to ensure that policyholders do not fall sick where possible. [1]
- 8) The insurer can increase premium basis recent trend if it appears to be an industry wide problem. [1]

[Max 8]

[14 Marks]
