The Actuary India

Magazine of the Institute of Actuaries of India

April 2025

Net Replacement Ratio

Retirement Income - Are We Sufficiently Covered?

Disability insurance, Income protection

Income Protection: Understanding Disability Insurance



Number Search Puzzle

Number Search

Humour

Humour Flashcards

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Editorial



Dear readers,

I'm sure you have been busy working on the closure of books during the last month immediately following the financial year end. I do hope you find some time to relax, read and glance through some of our e-publications during the month of April.

To sum it up, we had two main features – one described a very useful pensions concept and the other covered disability insurance penetration in India. For a change of communication from our President, we uploaded a podcast interview with her covering several personal and professional topics, including some insights on leadership and growing opportunities for actuaries.

We thank the volunteers who have covered the reportages for the IAI flagship event, Global Conference of Actuaries. We have started to put up the event reportages for those who may have missed some of the sessions. These will continue to get published through the next couple of months.

I'd like to highlight a very fun humour short poem that was put together by the Editorial Board – 'Private Insurers'. We hope you enjoy it as much as we enjoyed writing it.

Thank you for being supporters of TAI. We invite the actuarial community to share their views, whether technical, opinion-based, or purely for fun – we have a section for each of these on the magazine website. Another easy portion to contribute to is the culture section – where you can share a short story/write-up to help us actuaries reflect on something beyond our routine work, numbers and presentations!

We look forward to hearing from you!

Ekta Mehta
Editor, The Actuary India
Magazine of the Institute of Actuaries of India

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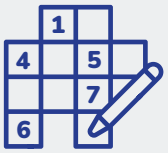
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Features

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Net Replacement Ratio

Retirement income - are we sufficiently covered?



Post retirement income becomes the key to survival once we stop working. How do we assess if we're sufficiently covered given our spending needs and current income? This article by Arpaan Begdai explains the concept of net replacement ratio and why it's an important indicator of financial security in our golden years.

Introduction

Net Replacement Ratio (NRR) is an important metric in retirement economics. It is expressed as a percentage of the pre-retirement income that is payable as pension post-retirement.
This paper examines the intricacies of the NRR and explores the implications of changing income and expenditure patterns before and after retirement. It also examines how an individual's consumption behaviour changes with increasing age, often decreasing in real terms.
The paper also investigates the variation in the net replacement ratio across different income groups (high earners and low earners) and nations (developed and developing). Such differences are influenced by various factors, including income and expenditure patterns, country's social security systems, economic structure and outlook and demographic trends. Lastly, the paper also illustrates the expected NRR that an individual can attain depending upon when they start contributing towards their retirement savings.
The paper, thus, aims to provide a comprehensive overview of the net replacement ratio and its broader economic and social implications. The paper assumes an individual earns a stable income and ignores pre-retirement income volatility.

What is Net Replacement Ratio (NRR)?

Net Replacement Ratio (NRR) is defined as the net income after tax earned in the year after retirement divided by net income after tax in the year before retirement. The ratio provides an understanding of the extent to which an individual's post-retirement income, i.e. pension, may replace their pre-retirement income, i.e. salary. For example, an individual with a last drawn salary of INR 100,000 will have 60% NRR if the projected pension income in the year after retirement is INR 60,000. NRR provides an indication of the appropriateness and adequacy of the post-retirement income compared with the pre-retirement income. The higher the NRR, the higher the post-retirement disposable income and vice-versa.
The level of post-retirement income earned will determine the living standard that the retired individuals may attain. Some individuals can maintain a similar living standard pre-retirement and post-retirement despite having a lower NRR, but some individuals may require a much higher NRR to mirror their pre-retirement living standard (much of this is explained in the sections below). Along with the changing income and expenditure pattern before and after retirement, the appropriateness of the NRR also depends upon the following:

- High earner v/s low earners, i.e. size of income before retirement,
- Developing v/s developed economy, i.e. nature of economy

Varying income and expenditure patterns

The principal concept underlying the NRR is the changing income and expenditure pattern before and after retirement. Understanding these trends is essential for effective financial planning.

Before retirement, the majority of individuals may have a stable income (salary and/or self-employment). The income will support their lifestyle then, and depending upon the income size, individuals may also be able to invest, save and contribute towards retirement saving funds. Expenses then may include home/university loan repayments, children's education costs, taking care of old/dependent parents, other lifestyle-related expenses and contributions to retirement saving products.

At or after retirement, there is a shift from salary to pension. It is also common for some retirees to downsize their investments, such as partially selling the home or reducing living costs, to meet the increasing expenses.

Further, individuals may also get access to various accumulation funds, such as Provident Fund accounts in India. They may also be entitled to several subsidies in retirement, such as food, travel. Expenses may or may not remain similar to their pre-retirement levels. Some individuals may take advantage of free time to go on vacations, pursue hobbies, and indulge in other leisure activities. Whereas some individuals may continue to meet house rent payments and/or loan repayments. As the individual ages further, there may be a steep increase in expenditure towards more essential spending, such as healthcare, nursing care needs.

The transition from pre-retirement to post-retirement requires an individual to make several key decisions, such as how much retirement fund to withdraw year on year, how and where to invest the accumulated fund, and what type of annuity to purchase. The transition can decrease the regular income, thus highlighting a need for careful budgeting. It involves careful monitoring of both retirement income and expenses to ensure that savings last throughout life.

The NRR assumes that individuals require less income as they age due to reduced expenses. However, another important theory, usually considered as a part of retirement planning, is the life-cycle hypothesis. It suggests that individuals aim to maintain a consistent consumption level throughout their lives, implying a need for a higher income replacement ratio as they age. It challenges the notion that spending naturally declines in one's later years. These contrasting views highlight the complexity of retirement planning and the importance of personalized strategies to meet individual financial goals.

Variance between high-income earners and low-income earners

The appropriateness of NRR can be subjective. There are arguments suggesting a higher NRR for low-income earners. Doing so ensures a minimum living standard and avoids poverty traps in later years. Further, a higher NRR also ensures that the retirees will have enough income to meet the rental costs and the increasing health care costs. On the contrary, high-income earners may be able to sustain a similar living standard even with a lower NRR. These individuals may no longer have rent repayments and/or outstanding mortgages at retirement and may have access to adequate insurance. Further, any contribution to retirement saving products will cease post-retirement. Thus, a lower NRR can be justified.

According to the Organisation for Economic Co-operation and Development (OECD), "Pensions at a Glance 2023" report:

"For low earners (defined as having half of average worker earnings), the average NRR across OECD countries is 73.2%, while it is 52.8% for high earners (who earn 200% of the average worker's earnings)". These statistics have witnessed a southward trend when compared with a similar report published in 2021.

Particulars	Trends observed in 2021 report	Trends observed in 2023 report
Low earners	74.4%	73.2%
High earners	54.9%	52.8%

The average NRR for high earners has reduced by over 2%, whereas it has reduced by about only 1% for low earners. One of the primary reasons could be a higher tax charge on high earners to counter the increasing COVID crisis (during that time). Other possible reasons could be:

- Reforms in the pension benefit provision over the year
- Change in the economic conditions over the year
- Shift in the country's demographic profile

The NRR for high-income earners is significantly lower than that of low-income earners. The disparity possibly reflects the progressive taxation systems, i.e. where high earners pay a greater portion of their income in taxes, still leaving themselves with adequate disposable income for repayment of home loans and retirement benefit contributions compared to lower earners. As the individual approaches retirement, a lot of these expenses, such as taxes, contribution payments, and home loans, are reduced or completely eliminated. On the contrary, because of lower disposable income, many of the low-income earners may not have enough retirement savings and may also continue to pay house rent even after retirement. Plus, the basic cost of living expenditure, such as food, clothing, and shelter, remains unchanged in real terms. Thus, a relatively higher NRR is required for low-income earners as compared with high-income earners to sustain a similar living standard.

Nature of economy

Similar to how the income size influences the NRR adequacy, the nature of the economy, i.e. developed or developing, can also play an important role.

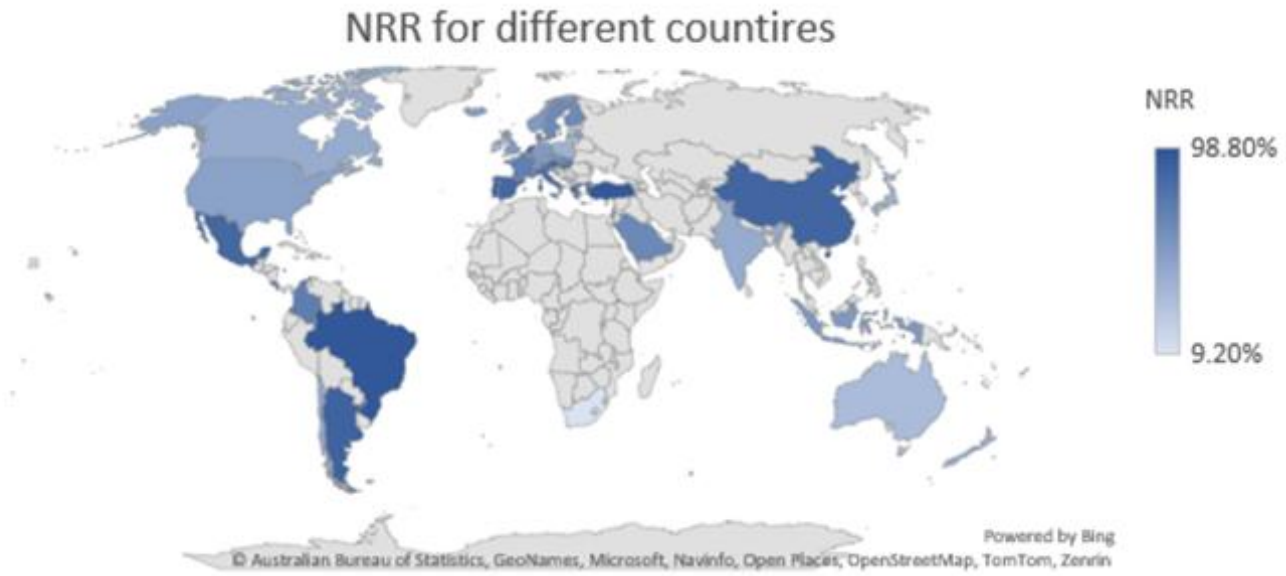
A developed economy will usually offer more comprehensive and structured retirement saving products. The pension contribution may come from the employers, employees and government (though indirect), resulting in a higher retirement fund accumulation. These economies may also adopt a progressive taxation system, and hence, the retirement pension may be taxed at a lower tax rate, comparatively. Thus, a higher NRR may be achieved.

At the same time, retirees may have access to some indirect form of benefits and/or subsidies. It allows them to maintain a similar living standard with a lower income. Thus, a lower NRR, if attained, may be justified to maintain a similar living standard.
On the contrary, a developing economy will usually have a limited formal retirement saving structure, and the majority of individuals may fail to access the benefit. It may so happen because of a lack of awareness, and/or several individuals may not have bank accounts.
Other potential reasons for low NRR in developing economies are:

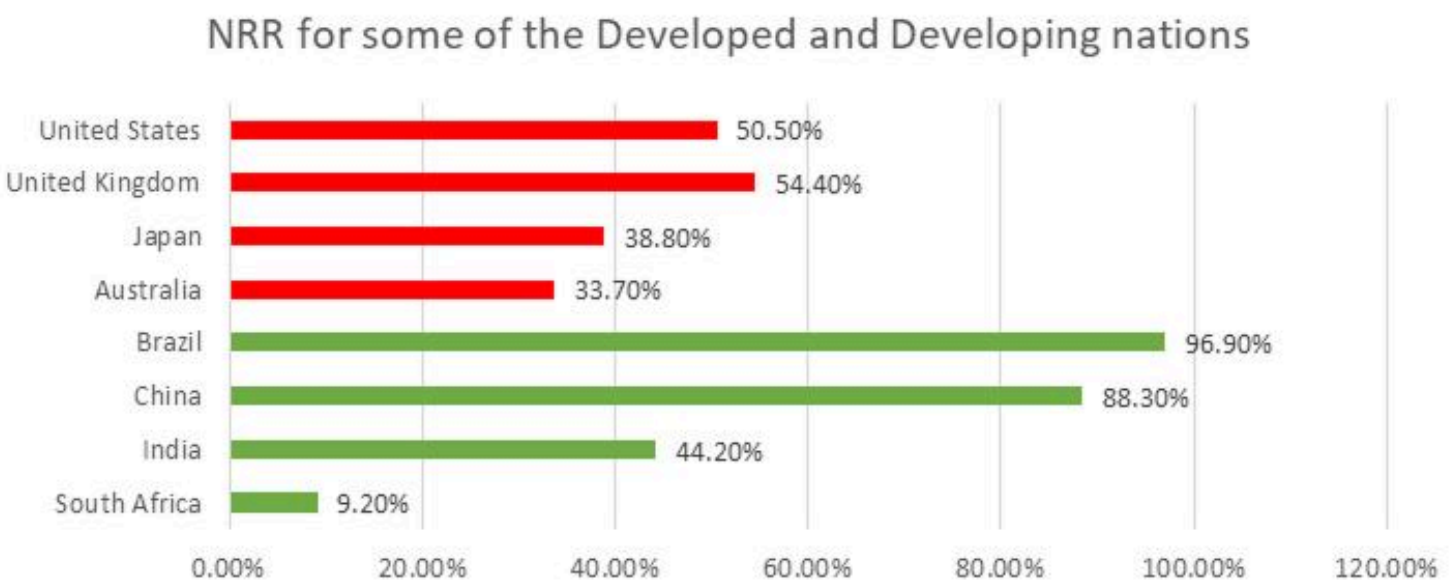
- The Government's inability to fund the retirement due to increasing public debt,
- Economic conditions in the developing economies, such as high inflation and/or poor investment return, and higher volatility, can result in a lower NRR.

A lower NRR attained may not sustain a similar living standard. However, it is also interesting to note that a lot of developing economies may have a joint family system. Such a system allows an individual to sustain a similar living standard even with a much lower NRR. For example, a lot of families in India have a joint family system. Parents in their older ages (after retirement) live with their children. Such a structure means that a lower NRR will be sustainable because a reduced post-retirement income will be offset by the expenditures taken care of by their children.

Depending on the objectives, the policymakers may design the pension scheme to target a certain NRR on retirement. Doing so ensures an adequate balance between the working and retiree population. For example, a lower NRR on normal retirement may encourage some individuals to work longer (beyond normal retirement) and hence, improve the overall productivity of the economy. Whether the policymakers introduce a cautious or a generous retirement income system will also determine the size of the NRR achieved. For example, according to the Organisation for Economic Co-operation and Development (OECD), "Pensions at a Glance 2023" report:



The world map shows how the NRR varies across different nations, including developed and developing countries. The NRR for an average earner is 61.4% across OECD countries. The ratio has ranged between 98.8% and 9.2% in Portugal and South Africa, respectively. The NRR for some of the developing and developed nations is presented below:



The research report suggests that developed countries have lower NRR compared to developing countries. This trend can be attributed to various factors listed above, including the different pension structures and variable levels of economic development. In the case of India, the NRR is notably lower, which probably reflects its socio-economic culture, such as the prevalence of joint family systems, where family support substitutes for pension benefits. Plus, additional income from the informal sector might not be fully accounted for in official pension schemes. Additionally, the tax and social security contribution systems play a significant role in determining the disposable income of retirees, which can lead to variations in NRR across different countries. Understanding these nuances is critical for policymakers to design pension systems that are both sustainable and adequate for the aging population.

Sample NRR Projection

In continuation with the above, the section below demonstrates various NRR projection scenarios. It considers the following two scenarios:

- Expected NRR that can be achieved for individuals starting at different ages,
- Contribution rate required (as a percentage of salary) to achieve a 50% NRR (Targeted NRR).

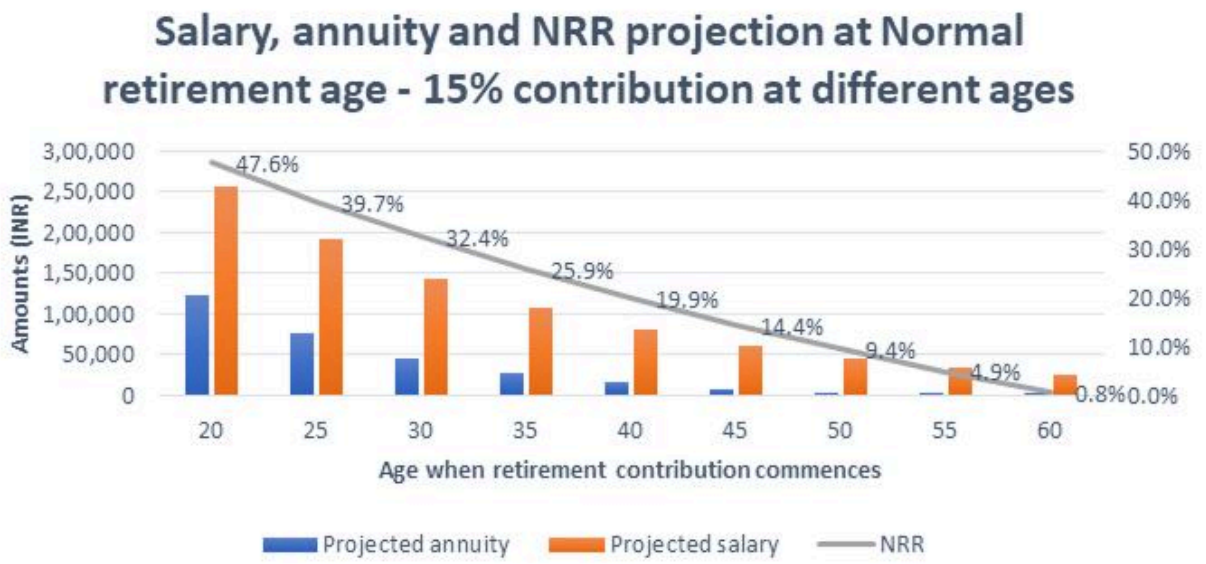
Some of the key factors considered in making the estimations are:

- Age when the individual starts building provision
- Expected retirement age
- Expected investment return during the term to retirement
- Expected salary growth rate
- Annuity rate at NRA
- Percentage of salary contributed towards the pension scheme

The calculation assumes the following:

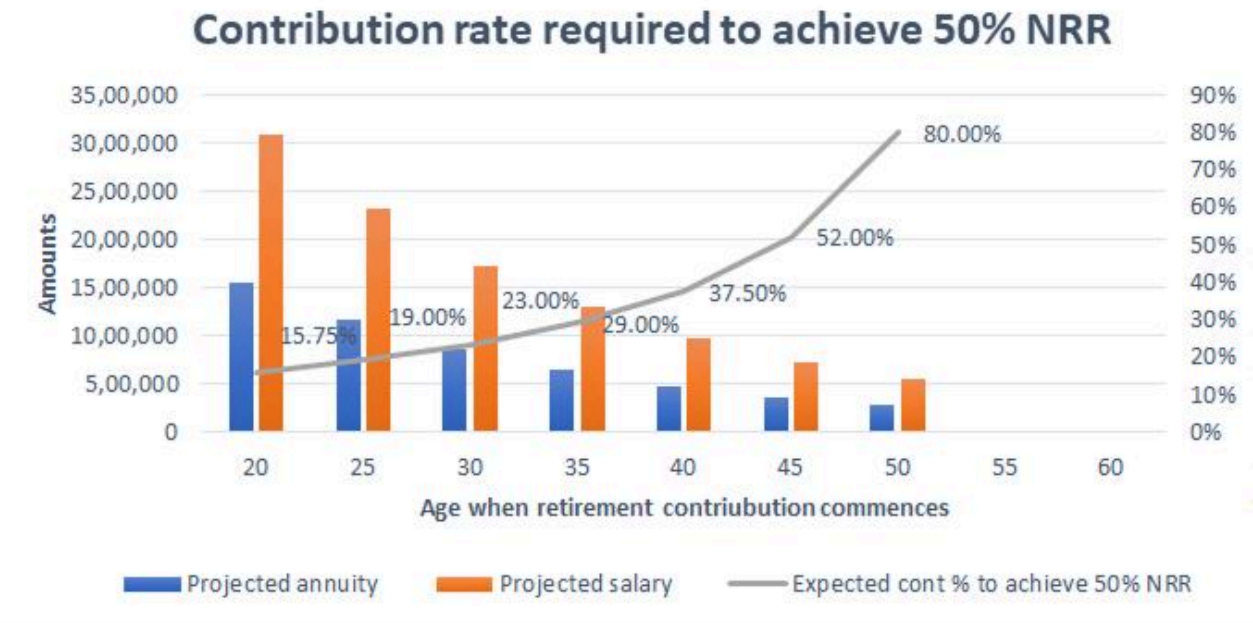
- Normal retirement age - 60,
- Expected investment return - 8% p.a.
- Expected salary growth rate - 6% p.a.
- Monthly starting salary - 25,000
- Annuity rate at NRA - 20
- Contribution happens in the middle of the year,
- No decrements between the starting date and retirement age.

The chart below shows the expected NRR that can be achieved, assuming the individual starts contributing to a pension at different ages.



The graph suggests, starting as early as possible with retirement contributions is a strategic move that can significantly improve an individual's financial security in retirement. Early contributions allow the individual's retirement fund accumulation to benefit from the power of compounding. Even small amounts invested regularly can grow exponentially over time. For example, an individual who starts contributing at age 20 is expected to achieve an NRR of 48% by the age of 60, whereas an individual starting at age 40 is expected to achieve an NRR of about 20% only, which is 2.4 times lower. Further, starting early can also allow an individual to take advantage of a life styling investment strategy and thus earn a higher investment return.

Another analysis was performed to determine the contribution rate as a percentage of salary to achieve an NRR of 50% at retirement. The results are presented in the chart below:



Similar to the conclusion derived in the above scenario, starting earlier resulted in a lower contribution rate. Conversely, starting at an older age typically requires a higher salary percentage to be contributed to meet the same net replacement target. The lowest contribution of 15.75% was required at age 20, whereas, contribution as high as 80% is required to achieve the target at age 50. Practically, achieving the target looks unreasonable for an individual starting after 50. Thus, starting early is the key to ensuring an adequate retirement fund.

Conclusion

The net retirement ratio (NRR) is a critical metric in assessing the adequacy of retirement income, reflecting the percentage of pre-retirement earnings that are replaced by retirement benefits. This rate can significantly vary based on income levels; higher earners often have a lower replacement rate, while lower earners may receive a higher percentage of their working income as retirement benefits. The disparity in net retirement rates between developed and developing countries can be attributed to differences in social security systems, economic structures, and demographic trends. Developed countries typically have more comprehensive social security systems, which can provide higher retirement benefits relative to earnings. Conversely, developing countries may have less developed systems, resulting in lower replacement rates.
Starting early in retirement planning is paramount for several reasons. It allows individuals to take advantage of compound interest, potentially leading to a larger retirement fund over time. Early planning also provides more flexibility in investment choices, enabling individuals to take on more risk earlier in their careers when they have more time to recover from potential market downturns. Moreover, starting early can mean lower necessary contributions to reach the same retirement goals, as the investments have more time to grow. This proactive approach is especially beneficial in countries with less robust pension systems, where personal savings play a crucial role in ensuring financial security in retirement. Overall, the net retirement ratio is a nuanced indicator that requires consideration of various factors, including income levels and the economic context of the country, while early retirement planning stands as a universally beneficial strategy.

Initiating retirement savings early is not just about accumulating wealth; it's about securing a future that offers peace of mind and the freedom to enjoy one's golden years to the fullest.

About the author(s)



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Arpaan G Begdai is a Fellow member of the Institute of Actuaries India and Institute and Faculty of Actuaries. He has over a decade's experience in the Indian employee benefit industry. He has been a part of the team KPAC since its inception. His extensive work experience also includes working in the UK benefit consulting environment and micro-insurance / climate change related research projects. Arpaan thrives in environments that foster innovation and offer strategic planning and leadership opportunities. Outside of his professional life, he enjoys engaging in adventurous activities, always seeking new challenges.

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Disability insurance, income protection

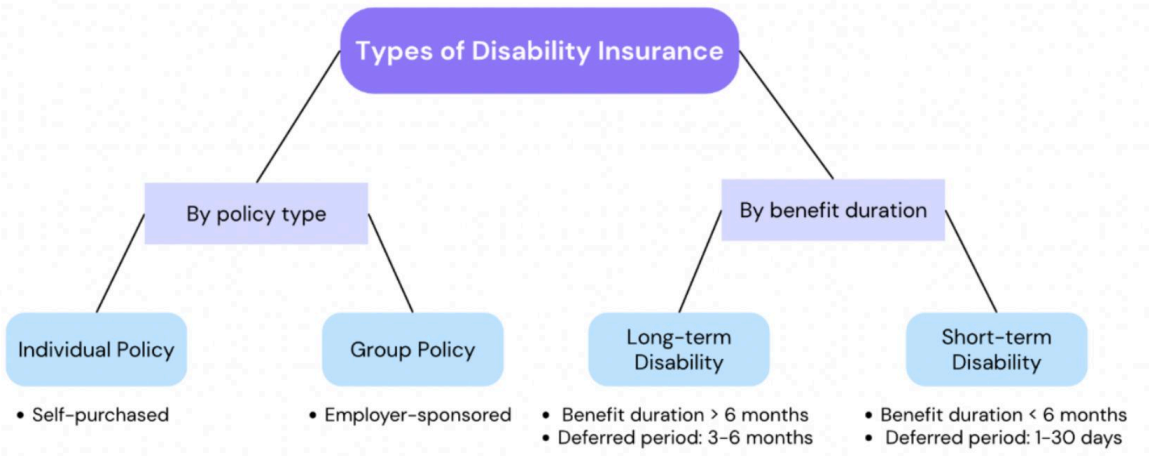
Income Protection: Understanding Disability Insurance



While health insurance penetration has improved in India, there is yet a lack of awareness about disability insurance. there are few companies selling the product and few people buying it, causing a lack of credible data. **Sandhya Kadilaya** and **Kaustubh Marathe** have put together an article exploring disability insurance and the hurdles of its penetration in India.

Definition and importance

Disability Insurance is an income protection product designed to replace a portion of a person's earnings if they are unable to work due to illness or injury. It provides periodic payments when an insured's ability to earn an income is curtailed by a disabling condition. The financial impact of losing earning capacity due to disability can be severe, often worse than death, as expenses continue. There are different types of disability insurance which can be split according to the type of policy and duration of the benefits.



Over 2.2% of the Indian population endures some form of severe mental or physical disability, according to the 2011 Census of India. Yet, disability insurance remains one of the most overlooked products in India. Traditional insurance focuses only on life and health insurance, leaving a protection gap in times of income loss.

From an actuarial perspective, disability insurance presents unique challenges in pricing, underwriting, and claims. These challenges are particularly evident in India, where low awareness, affordability, and a lack of standardized policies limit its adoption. This article explores the reasons behind its limited market presence, the types of coverage available, key actuarial considerations, and how insurers can develop products suited to the Indian market.

Key features of long-term disability insurance

Long-term disability insurance policies vary in coverage, disability definitions, and benefit structures, making it essential to understand key terms and conditions. A well-designed policy ensures financial security while encouraging rehabilitation and return to work. Below is a breakdown of its essential components. These components can be accordingly applied to short-term disability insurance in a similar manner.

Own/Any occupation periods

- Own occupation period: The period during which an employee must be disabled from performing their own occupation to qualify for benefits. Typically lasts for two years.
- Any occupation period: Follows the own occupation period. During this phase, the employee must be unable to perform any job suited to their education, training, and experience.

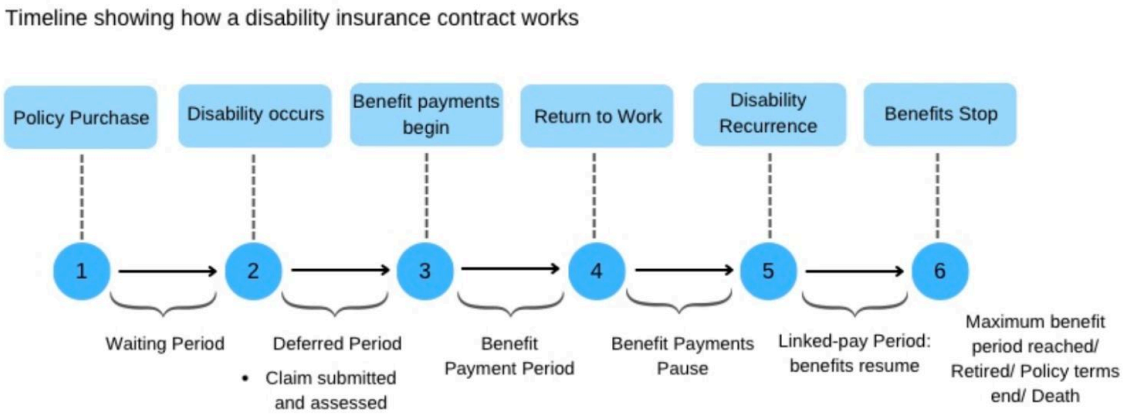
Types of disabilities

Disability definitions can vary, but they generally fall into three categories:

- Total definition: Requires a complete inability to work with a 100% income loss. If an employee returns to work, they lose their disability benefits, which may discourage rehabilitation.
- Partial definition: Requires total disability during the elimination period. After this period, the employee can work part-time while still receiving benefits. This definition encourages a return to work.
- Residual definition: The most common type, covering both total and partial disabilities is one which allows employees to work on a limited basis while still qualifying for benefits, promoting rehabilitation and a return to work.

Key periods

- Waiting period – The initial period when no benefits are paid, preventing people from purchasing insurance only when they anticipate needing it soon.
- Elimination/Deferred period – The time an employee must be disabled before receiving benefits.
- Benefit payment period – Defines how long benefits are paid, starting after the elimination period. Ranges from 2 years to retirement age for LTD.



Key benefit conditions

Disability insurance contracts must define several benefit conditions, including:

- Benefit percent/Replacement ratio – The portion of pre-disability earnings that the policy will replace.
- Integration of benefits – Benefits are often integrated with Social Security, workers' compensation, or other income sources to prevent over insurance.
- Maximum and minimum monthly benefits: A maximum monthly benefit limits the total amount a disabled individual can receive, preventing over insurance. A minimum monthly benefit ensures financial support even if other income sources reduce LTD benefits.
- Escalating benefits – Some policies include benefits adjusted for inflation. When benefits rise, premiums often rise as well.

Group disability insurance pricing factors

1. Group demographics & risk factors

- Industry & Occupation: Higher-risk industries (e.g., construction) have higher premiums than lower-risk sectors like finance and education.
- Age & Gender Distribution: Older groups or high proportion of male population may result in higher premiums.
- Group Size: Larger groups benefit from better risk pooling and lower per-person costs.
- Claims Experience: Groups with past high claims may face premium increases.

2. Policy structure & plan design

- Benefit Percentage: Coverage typically ranges from 50 to 70% of salary, depending on policy design and market norms.
- Benefit Duration: Shorter benefit periods may help control costs.
- Elimination Period: Longer waiting periods before benefits start reduce premiums.

- Own/Any Occupation periods
- Definition of Disability: Plans may define disability as total, partial, residual, with each having different implications for claims and costs.

3. Underwriting & pricing methods

- Experience Rating: Large groups are priced based on historical claims data.
- Manual Rating: Small groups use industry-standard rates.
- Reinsurance & Pooling: Insurers spread risk across multiple employers or use stop-loss coverage for large claims.

4. Market & regulatory influences

- Local Regulations: Some countries may mandate minimum benefits or pricing guidelines.
- Competitive Market Rates: Insurers adjust pricing to attract and retain employer groups.
- Economic Conditions: Inflation and interest rates affect long-term disability costs.

Actuarial considerations in disability coverage

For actuaries, disability insurance is a complex product to design and manage, given the uncertainty and long-term nature of disability risks. Key actuarial considerations include:

- **Limited data and incidence rates:** Estimating disability incidence and recovery rates often relies on morbidity data and multi-state models. Unlike life insurance, the availability of such data for disability – especially in India – is limited. This requires reliance on other countries' experience, adjusted for Indian demographics, until sufficient domestic data emerges.

- **Pricing methodology:** Pricing disability insurance is complex due to claim uncertainties. Premiums are influenced by several factors as we saw in the previous section. Actuaries adjust pricing using waiting periods (longer ones weed out short-term claims) and benefit periods (longer ones increase costs). To avoid disincentivizing recovery, high-income replacement (above 70%) is discouraged. In India, a 50% replacement is recommended initially, rising gradually to 60-70%. Due to limited reliable local data, insurers often rely on international benchmarks, making careful monitoring and a cautious approach essential.

- **Underwriting and anti-selection:** Disability insurance is prone to anti-selection, as higher-risk individuals are more likely to buy coverage. Unlike life insurance, disability is less objectively defined and often requires medical verification. Indian insurers, wary of past losses from broad definitions, may adopt stricter criteria and include margins for behavioural risks in pricing.

- **Claims management and experience analysis**: Regular experience studies is crucial to track claim trends, loss ratios, and recovery rates. Since this is a relatively newer product in India, assumptions may need revision as real data emerges. Past experience from mature markets shows the risk of mispricing, so Indian actuaries are likely to price cautiously and review regularly until the market stabilises.

- **Reserving and capital:** Disability insurance involves long-term payouts, requiring insurers to set aside a Disabled Life Reserve (DLR) for reported claims and an additional reserve for claims that have been incurred but not yet reported (IBNR). Reserving is complex due to medical advancements or uncertainties like COVID. The IRDAI mandates conservative actuarial practices, while reinsurance helps manage risk and supports pricing and claims management.

Hurdles for penetration of disability insurance in India

Several factors have contributed to the limited penetration of disability insurance in India, spanning both regulatory constraints and demand-side issues:

1. **Lack of awareness and demand:** Unlike life and health insurance, disability insurance isn't widely promoted. Many people are unaware of its existence and rely on family support during financial crises, which discourages insurers from offering standalone policies.

2. **Regulatory and product challenges:** Insurance in India is split into life or general categories. Short-term disabilities are classified under health insurance, while long-term disabilities fall under life insurance. This ambiguity limits product innovation.

3. **Socio-economic factors:** With much of India's workforce in the informal sector, irregular or undocumented incomes make it hard for insurers to design reliable income-replacement policies.

4. **Limited distribution and market push:** Distribution remains a key hurdle. Agents prefer selling familiar products like term life or mediclaim. Disability insurance requires customer education and strategic bundling, but insurers have not invested enough in training. Without regulatory incentives or higher commissions, intermediaries may show little interest.

5. **Affordability & underwriting challenges**

From an actuarial perspective, pricing disability insurance in India is complex due to :

- High employment in informal sectors, where verifying income loss is difficult.
- Limited data on disability claims, making actuarial pricing harder.
- High risk of fraudulent claims, leading insurers to impose strict underwriting rules.
- Needs well-designed policy conditions that suit the Indian market.
- Underwriting expertise from a design, implementation and claims management perspective- as it requires initial underwriting, continuous monitoring of claims at different stages of policy and management of add-ons that are commensurate with pricing.

In summary, India's disability insurance market struggles to grow due to low public awareness, limited demand, and insurers' perception of high risk with low returns. The problem isn't strict rules but a lack of institutional support. However, IRDAI has shown interest in making insurance more inclusive. Solving this will require coordinated effort on multiple fronts.

How can the penetration of disability insurance be improved in India?

To strengthen the disability insurance market in India, key stakeholders – insurers, actuaries, regulators, and intermediaries – should focus on:

- **Better risk assessment models :** Using AI and predictive analytics to better evaluate occupation-specific disability risk tables.
- **Product innovation and pilots:** Launch simple, low-cost policies like income riders on life insurance or short-term disability plans (e.g., two-year coverage with brief waiting periods). Begin with limited coverage to manage costs and build trust.

- **Leverage group insurance channels:** Promote disability coverage through employer–sponsored plans, especially in IT, banking, and manufacturing. This enhances employee benefits and aids in talent retention.

- **Awareness and education campaigns:** Greater public awareness is needed by comparing disability insurance to familiar products like health or car insurance. Real-life stories can highlight their value, such as income loss after an accident. Simplified messaging like "Protect your paycheck" or "Income insurance" can be effective.

- **Government schemes and tax incentives:** Expanding schemes like PMSBY to include disability income or introducing subsidised plans for low-income groups can increase protection and awareness. Tax incentives, similar to Section 80D, could encourage uptake among the middle class. Employer participation can also be promoted through tax benefits.

- **Actuarial risk management and reinsurance:** Insurers can reduce risk by partnering with global reinsurers. Another internal strategy is to use adjustable premiums based on claims experience to help avoid long-term underpricing.

Prospects

Overall, while disability insurance in India is currently a largely untapped segment, the coming years offer strong growth potential. The market is likely to evolve from near-zero to a notable contributor in the insurance industry, especially as awareness grows that insurance is not just about life and health, but also about livelihood.
By first leveraging employers, insurers can promote group disability insurance as an accessible entry point in India. This can gradually create awareness and trust, paving the way for growth in individual disability insurance products as well.

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Kaustubh Marathe

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Kaustubh has more than 5 years of experience in the group insurance business of PGS. Kaustubh has overall actuarial experience of more than 15 years in life insurance, group insurance, pensions and retirement solutions and asset modelling. He enjoys playing chess, travelling & exploring new places and listening to music.

About the author(s)



Sandhya Kadiyala

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Sandhya works in the Specialty Benefits domain with practical knowledge on pricing and renewals for products such as long-term and short-term disability insurance, as well as dental and vision coverage. She is pursuing her actuarial qualifications as a student member of the Institute and Faculty of Actuaries. Outside of work, she enjoys reading, photography, exploring new places—and especially loves spending time by the beach.

Events

Events



Events: Webinar
Session #4: Sports Analytics



Reportage by

Vidhi Gogri



Speakers:

- Mr. Mayur Ankolekar
- Prof. Steve Stern

Summary :

Dr. Lewis Stern introduced a new metric called "net runs attributable" to evaluate cricket player performance using data analytics, challenging traditional metrics and validating the approach with IPL data.



Quotable Quotes

"Just because something's hard to calculate doesn't mean it's wrong, and just because something's easy to calculate doesn't mean it's right."



Quotable Quotes

"Understanding the correlation between performance and context is vital."

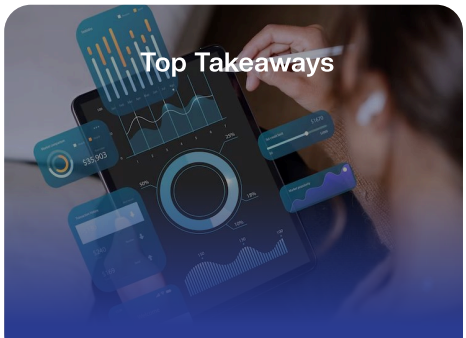


Quotable Quotes

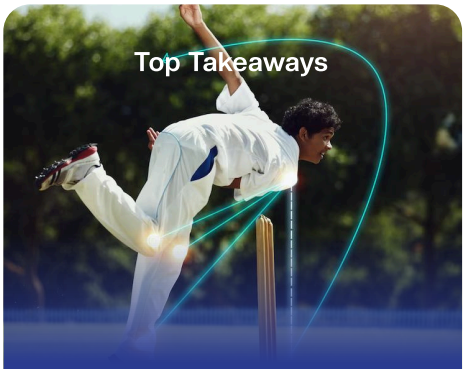
"The auction is not always about winning matches, it's about making profits, getting fans in the seats."



Top Takeaways



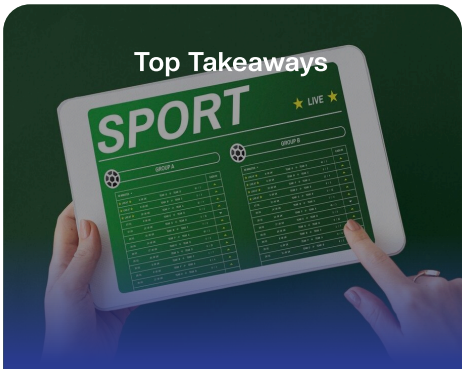
Importance of Measurement: Accurate measurement is crucial in data analytics, requiring careful consideration of bias, precision, and natural variation.



Context Matters: In cricket, the context in which runs are scored or wickets are taken is vital for evaluating player performance.



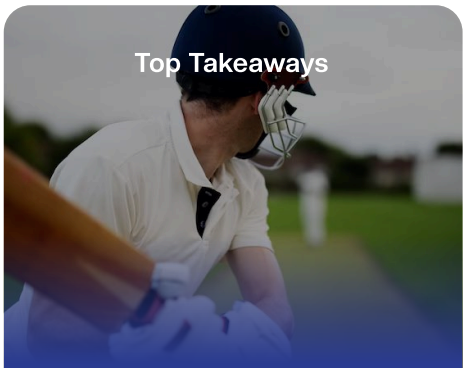
Utilization Concept: Understanding and assigning resources (overs and wickets) to players helps evaluate their performance relative to their resources.



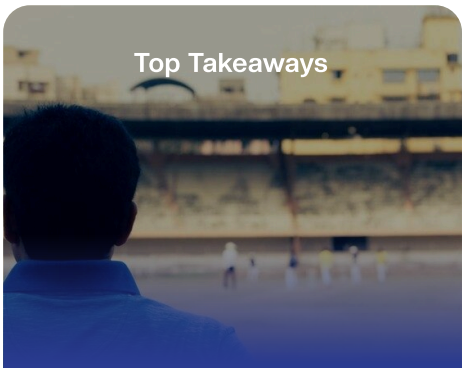
Net Runs Attributable: This new metric offers a more precise evaluation of player performance by comparing actual scores to what an average player would have achieved.



Balancing Quantitative and Perceptual Insights: Effective decision-making requires mathematical analysis and perceptual judgment.



Adjustment for Opponent Quality: Adjusting metrics for the quality of opponents ensures fairness and accuracy.



Fielding's Impact: Fielding is a critical yet often overlooked aspect of cricket that significantly impacts the game's outcome.

Session notes

Session #4 : Sports Analytics Date: 18-Mar-2025

Speakers of the session who have chosen a different path in their respective careers

- Mr. Mayur Ankolekar is the founder and principal of Ankolekar & Co., a consulting firm specializing in actuarial and financial services. He has over two decades of experience in financial management, investments, pensions, and risk management.
- Prof. Steve Stern is a Professor of Data Science at Bond University, known for maintaining and upgrading the Duckworth-Lewis-Stern (DLS) method used in cricket.

How can we determine which player performed the best in a cricket match?

- ·Currently, the player of the match is usually determined by a former player who is now a commentator who uses their experience to evaluate the match and identify the best player. However, this method can introduce bias, especially if the commentator favors batsmen, leading to potential errors in judgment.
- A more systematic approach involves the concept of "utilization." This means understanding each team's resources (overs and wickets) and evaluating player performance relative to these resources.
- To measure player performance more accurately, we use the metric "net runs attributable." This compares a player's actual performance to what an average player would have achieved in the same circumstances. This metric is adjusted for factors such as the quality of the opponents faced, providing a more contextual and fair assessment of a player's contribution to the match.

Different methods are used to test the effectiveness of net runs attributable metrics.

- **Comparison with Batting and Bowling Averages:** Data from IPL matches between 2010 and 2013 was analyzed. The adjusted net runs attributable were compared to traditional batting and bowling averages. The results showed that while traditional averages were not entirely inaccurate, the adjusted metric provided a more contextually accurate assessment of player performance.

- **Expert Picks vs. Metric:** The adjusted net runs attributable were calculated for each player in 280 matches and compared to the expert's choice for the player of the match. The metric matched the expert's choice about 50% of the time, and 60% when excluding players from the losing side. When considering the top three players, the metric matched the expert's choice 80% of the time, indicating a close but improvable correlation.

- **Examples of Matches:** Specific matches were analyzed to illustrate discrepancies between expert picks and the metric. For instance, in a match between Kolkata and Hyderabad, Jacques Kallis was found to have contributed more than Gautam Gambhir, who was named player of the match. Similarly, in a match between Mumbai and Kochi, RP Singh's economical bowling was more impactful than Brendon McCullum's batting. However, there were instances where the metric did not align with the expert's choice due to situational factors, such as Dwayne Smith's match-winning performance in the final moments.

- Overall, the adjusted net runs attributable metric provides a more systematic and contextually accurate way to determine the best player in a cricket match, though it acknowledges the importance of situational factors and expert judgment.

Conclusion and Final Remarks

- There is a critical role of accurate measurement in data analytics, emphasizing the need for context in evaluating cricket performance.
- ·The introduction of the "net runs attributable" metric provides a more precise and fair assessment of players by considering the quality of opponents and the resources utilized.

About the author(s)



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Vidhi is an aspiring actuary with over two years of experience in the non-life insurance sector. She has expertise in IFRS 17, reserving, and stress testing. In her free time, she loves playing sports and enjoys listening to music.

Events

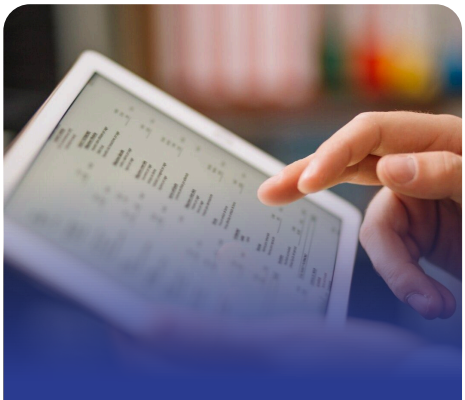


Events: 24th GCA
Session #11: Decoding Mortality Trends



Reportage by

Ritika Kalra



Speaker:

- Mr.Parth Dave (Head of Pricing, Munich Re India Branch)

Summary :

Understanding Mortality Shifts, Key Drivers, and Emerging Patterns in India of the Protection Business.



Quotable Quotes

"Understanding mortality is not simply about counting deaths, but about interpreting how societal forces shape the course of human life."



Top Takeaways



The mortality experience largely depends on the underlying business profile.

Top Takeaways



Better / Granular collection and maintenance of data is required for deeper understanding of the mortality experience.

Top Takeaways



Ultimate experience of Indian Protection business has not yet fully emerged.

Session notes

Session #C11: Decoding Mortality Trends

Date: 19-Mar-2025

The speaker of the session Mr.Parth Dave talks about how mortality has evolved over the last 10 years for the protection business. Study of mortality trends is important to calculate the difference in our Actual vs Expected experience.

- To study the trends in mortality, an experience study was conducted on Male lives (As 85-90% of the data available is for male lives and less credible data is available for female lives) with parameters of the study taken on Calendar Year basis and Expected mortality basis taken as 100% of IALM 12-14 Male (ALB). The Study period taken for the analysis is 1 Jan 2013 – 31 Dec 2023.
- Various key parameters/risk factors like Smoker/Non-Smoker, Gender, Occupation, Location, Income, Underwriting were considered while deducing the trends in mortality.

The key points observed in the study were as follows:

- The rate of growth in the number of policies issued each year has decreased across the years as the premium rates have increased in the last few years.
- The trend in actual vs expected experience was observed for each calendar year and it was seen that the Actual vs Expected experience showed a drastic increase for the year 2020-2021. This could be due to the COVID identified claims being incorporated in the study and if we remove 3 months of exposure, we could still see the mortality experience getting heavier with each calendar year and no mortality improvement was seen. To analyse this more in detail, the standardization was done on other variables considering we are doing a multi-variant analysis.
- When the mortality experience was seen for the medical non-smoker business with Sum Assured greater than 50 Lakh (which constitutes 75% of the portfolio of protection business), it was observed that the rate of increase in mortality is high. The question that arises in our minds is that what are the drivers stimulating this increase? To dig deeper into this, experience was checked based on gender, and we could see that the business mix is driven mainly by male lives as the credible data for females is still not available. Moreover, the experience differential between males and females is consistent across all years.
- The other variable used in the study was Underwriting and it was concluded that the business mix is driven by medically underwritten smoker business. The differential between medically underwritten smoker business and medically underwritten non-smoker business is getting wider with each year.
- The other factor which has a substantial impact on mortality is location. Though we could see that the percentage of new business written is getting increased in all cities, but it was broadly observed that 60% of the business historically has come from Top 10 cities (Metro cities like Mumbai, Bangalore etc.). While doing the analysis, we could see a shift in this trend and more business is now coming from "Other than Top 10 cities" as well. It was observed that the A/E differential gets wider with each cohort.
- To dig deeper into this, "Other than Top 10 cities" was divided into more sub cities and it was concluded that with each cohort the mortality experience has become more heavier due to the entire experience being caught up in the data (Ultimate experience observed after 3+ years) with each evolving year.
- Experience based on Occupation was also checked given the available data and it was concluded that in more recent cohorts, the business mix is driven by Salaried category. The A/E differential between Salaried and Non-salaried in Top 10 cities is not high but as we move locations, this differential gets wider.
- The next parameter used in the study was Annual Income (based on CPI Index) and it was observed that as income increases, mortality experience becomes better due to better lifestyle and better socioeconomic profile. But it was also observed that as the income increases, the A/E differential between the salaried and non-salaried gets narrower.
- The other factor used in the analysis was sum assured considering it to be a great proxy for socioeconomic profile. It was concluded that even though the business mix is moving towards higher sum assured in the recent cohorts (which means better socioeconomic profile) but still there are no mortality improvements being observed. The reason behind this, is that it all depends upon the business mix in the underlying profile of the business and not only on sum assured.
- Mortality experience based on distribution channel (Agency/Bancassurance/Web Sales) was also observed and it was concluded that the experience is consistent across all distribution channels, and it depends on the underlying profile. If the underlying profiles aligns then the experience will automatically align.

- Mortality experience was also analyzed based on duration and issue year and it was observed that for Protection business, even 3+ years of experience cannot be declared as Ultimate, as in India the ultimate experience has not matured to its full extent and is yet to emerge. Close monitoring of later duration experience is necessary to prevent writing long-term contracts driven by select mortality.

Conclusion and Final remarks

- There has been a significant shift in socioeconomic profile of insured lives over the years.
- Constant monitoring of business mix is absolute necessary for experience analysis.
- The key drivers for the analysis are Location, Occupation, and Income.
- The more credible and granular data is available, the deeper insights can be deduced from the experience analysis.
- Using historical experience based only on sum assured and channels may not be accurate.
- Ultimate experience of Indian Protection business is yet to emerge.
- Old-age mortality is yet to emerge.

Watch full session



About the author(s)



Ritika Kalra

Actuarial Team Lead
L&R Actuarial Team Accenture

Ritika has more than 10 years of actuarial experience spread across Pensions, Reinsurance and Life domain. She loves travelling to different countries and exploring new places.

Events



Events: 24th GCA

Session #16: Role Of Actuaries In The PMFBY Scheme



Reportage by

Vidhi Gogri



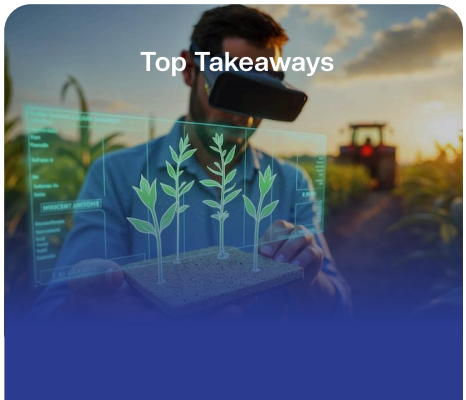
Speakers:

- Mr. Siddesh Ramasubramanian
- Mr. Sarthak Mahajan

Summary :

This session covered the Pradhan Mantri Fasal Bima Yojana (PMFBY), its evolution, technological interventions, risk transfer models, actuarial insights, and future plans for improving crop insurance in India.





Top Takeaways

PMFBY Evolution: The scheme has evolved significantly since its launch in 2016, incorporating feedback and technological advancements to better serve farmers.



Top Takeaways

Technological Interventions: YesTech and WINDS are key technological initiatives enhancing yield estimation and understanding climate impacts on crops.



Top Takeaways

Risk Transfer Models: The 80:110 and 60:130 models help balance risk between insurers and the government, ensuring the scheme's sustainability.



Top Takeaways

Actuarial Insights: Actuaries play a crucial role in analyzing data, assessing risks, and ensuring the scheme's affordability and sustainability.



Session notes

Session #16: Role of Actuaries in the PMFBY Scheme Date: 19-Mar-2025

Speakers of the session who have chosen a different path in their respective careers

- Mr. Siddesh Ramasubramanian is the Chief Executive Officer of InRisk, specializing in innovative climate insurance solutions.
- Mr. Sarthak Mahajan is the Head of Actuarial & Data Analytics at CPMU-PMFBY, Ministry of Agriculture & Farmer's Welfare, Government of India. He has been instrumental in leveraging data analytics to enhance the efficiency and reach of the PMFBY scheme.

1. Role of actuaries in PMFBY

Actuaries play a crucial role in PMFBY by ensuring the scheme's financial sustainability and effectiveness. Their responsibilities include:

- Risk Assessment: Analyzing historical data to assess the likelihood and impact of risks on crop yields.
- Data Analysis: Evaluating heterogeneous data at various levels to ensure accurate pricing.
- Premium Calculation: Using techniques like the burning cost approach and frequency-severity approach to determine appropriate premium rates.
- Budget Estimation: Helping the government estimate the budget required for running the scheme, including expenses and premium subsidies.
- Balancing Coverage and Affordability: Ensuring the scheme remains affordable for farmers while providing adequate coverage.
- Catastrophic Modeling: Developing region-specific models to assess and price catastrophic risks accurately.
- Collaboration: Working with reinsurers and other stakeholders to refine pricing models and enhance the scheme's overall effectiveness.

Overall, actuaries ensure that PMFBY remains viable, fair, and beneficial for both farmers and the government.

2. Technological Interventions in PMFBY

Technological interventions like YesTech and WINDS are enhancing the effectiveness of the PMFBY scheme.

- YesTech uses satellite images and AI/ML for crop yield assessment. It is managed by The National Product Forecasting Center (NPFC). This reduces reliance on traditional crop cutting experiments, speeds up the process, and ensures more precise yield estimates. Consequently, it leads to better risk management, fairer premium pricing, and tailored coverage for farmers, ultimately improving the scheme's efficiency and sustainability. Currently, yields are calculated using a blend of YesTech (30%) and traditional crop cutting experiments i.e. statistical method (70%).
- WINDS collects hyper-local weather data through Automatic Weather Station (AWS) and Automatic Rain Gauge (ARGs). AWS calculates or records the temperature and humidity.whereas ARG record all the rainfall. This data helps in accurately assessing crop loss and understanding climate impacts, leading to better risk management and more precise premium pricing. Ultimately, it ensures tailored coverage for farmers, improving the scheme's efficiency and sustainability.

These initiatives improve yield estimation, climate impact understanding, and premium pricing, ultimately benefiting farmers with more accurate and tailored coverage.

3. The Alternate Risk Transfer Models (ARTM) introduced by the Government of India to support insurance companies during hard market conditions in the PMFBY scheme

The Government of India introduced three Alternate Risk Transfer Models (ARTM) to support insurance companies during hard market conditions in the PMFBY scheme:

- Cup and Cap 80:110 model - If the loss ratio exceeds 110%, the state government bears the excess losses, and if the loss ratio is below 80%, the premium surplus is returned to the state government.
- Cup and Cap 60:130 Model - Losses beyond a 130% loss ratio are shared by the central and state governments, and premium surplus below a 60% loss ratio is also shared by them.
- Profit and Loss Sharing Model - This model involves different brackets for sharing losses and premiums but has not been widely adopted.

The 80:110 and 60:130 models are more commonly used, with the former adopted by states like Andhra Pradesh, Karnataka, Maharashtra, Madhya Pradesh, and Uttar Pradesh, and the latter by Tamil Nadu, Rajasthan, and Pondicherry.

Conclusion and Final remarks

- PMFBY has evolved to provide extensive coverage from sowing to post-harvest, ensuring farmers are protected against various risks throughout the crop cycle.
- The adoption of advanced technologies like YesTech and WINDS has revolutionized yield estimation and climate impact analysis, making the scheme more efficient and reliable.
- The introduction of risk-sharing models such as 80:110 and 60:130 has helped maintain the scheme's viability by balancing risks between insurers and the government.
- Actuaries play a pivotal role in analyzing data, assessing risks, and ensuring the scheme's financial sustainability, making it affordable for farmers and the government.
- Ongoing efforts to develop region-specific catastrophic models and involve reinsurers aim to further refine premium pricing and provide tailored coverages, enhancing the scheme's overall effectiveness.

Watch full session



About the author(s)



Vidhi Gogri

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Vidhi is an aspiring actuary with over two years of experience in the non-life insurance sector. She has expertise in IFRS 17, reserving, and stress testing. In her free time, she loves playing sports and enjoys listening to music.

Events



Events: Webinar

9th Webinar On Banking, Finance And Investments



Reportage by

Kashish Bhoir



Speakers:

- Ms. Prerna Nagpal FIAI, FIA, Calibration Lead – STAR RW ESG, WTW
- Mr. Abhishek Mathur, Founder & CEO, GetLaw.in
- Mr. Phanesh Modukuru, Chairperson, AGBFI (Opening Remarks)
- Mr. Vignesh Mehta, Member, AGBFI (Closing Remarks)

Summary :

- Accurate credit modelling with ESG factors and expert judgment is crucial for managing market volatility.
- Generative AI enhances efficiency in finance by automating tasks and supporting decision-making.





Effective credit modelling requires realistic risk factor calibration, incorporating ESG factors, and expert judgment to navigate market volatility.



Generative AI improves efficiency in finance by automating tasks, but attention to data security, privacy, and model bias is crucial for reliable results.

Session notes

9th Webinar on Banking, Finance and Investments Date: 09-Nov-2024

Session 1: Modelling credit risk scenarios using stochastic techniques for asset managers

Overview of Global Corporate Bond Spreads

- ·Defaults nearly doubled in 2023 due to inflation and higher rates.
- Tough financing and tight liquidity for lowest-rated borrowers.
- Credit stress increased, raising default rates to 3.7% (from 1.9% in 2022).

Calibrating risk factors using Real World ESGs

The process for modelling risk using real world ESGs:

- Historical Data: Use expert judgment and historical data windows to establish baselines.
- Fit Models: Apply expert judgment to calibrate risk factors by fitting historical data to selected models.
- Capture Dependencies: Identify and correlate inter- and intra-model relationships using common data points.
- Overlay Views on Projections: Integrate qualitative views for short- and long-term mean, volatility, and correlations to ensure realistic dynamics.

Credit modelling: requirements of a good model

- Stochastic credit spreads with realistic term structures and percentiles.
- Linked transitions and defaults ensuring sensible expected returns.
- Control over mean reversion, sector dynamics, and market independence.
- Non-zero correlation with nominal interest rates.
- Accurate curve fitting with stable long-term projections.

Credit modelling: complexity of modelling and validation

Complexity of credit modelling:

- Credit spreads and excess returns are more reliable than transition matrices due to their frequent availability and market-weighted nature.
- Model discrepancies can arise from differences in how not-rated entities and rare defaults are handled.
- Discrepancies in default probabilities occur due to varying rating criteria and agency-specific sample sizes.
- Speculative-grade ratings show more volatility than higher-rated ones, with smaller sample sizes affecting accuracy.

Credit modelling validation:

- The model should capture long-term credit spread averages, excess returns, and short-term risk distributions.
- Account for credit spread changes and the speed of mean reversion.
- Ensure the model fits initial data and considers correlations across ratings.
- Model must reflect accurate transition and default probabilities for both short- and long-term horizons.

Challenges for developing markets

- ·Data selection balances capturing volatility with maintaining relevance to current conditions.
- Limited data for corporate yield curves can result in unstable calibration.
- Low liquidity in spreads may require synthetic data, affecting correlations and projections.

Conclusion:

- While the credit landscape in 2023 faced heightened stress with rising defaults and liquidity challenges, building robust credit models remains essential for navigating such volatilities.
- By using expert judgment, incorporating ESG factors, and ensuring realistic calibrations of risk factors and correlations, accurate models can be developed to reflect market dynamics, support sound decision-making, and adapt to changing economic conditions.

Session 2: Practical Generative AI Applications for the busy Banking & Insurance Professional

Introduction to Generative AI:

- Creates content (images, audio, text) and follows strict privacy policies.
- Helps automate tasks like report generation, data extraction, and customer service in finance.
- Tools like Copilot, ChatGPT, and Claude enable various AI-driven solutions.
- Companies should deploy internal tools to stay up to date with the latest AI tech.

General Process for using AI tools:

- **Objective:** Achieve a specific outcome such as data analysis, report generation, decision-making, or visualization.
- **Data Requirement:** Relevant data needed for the task, typically in formats like CSV, Excel, Word, etc.
- **Tools Used:** AI platforms (e.g., ChatGPT, Custom GPT tools, Julius AI) or specialized tools tailored to the task (e.g., Excel AI for data analysis, AI for statistical modelling).
- **Prompt:** Provide clear instructions based on the task eg, Conduct Exploratory Data Analysis .
- **Output:** The outputs generated are downloadable, and if needed, users can request the AI to make changes or adjustments based on their requirements.

Challenges:

- Data security and privacy are critical when implementing AI to protect sensitive financial information.
- AI models may generate incorrect or misleading information, especially with complex financial data.
- Regulatory compliance is essential to ensure adherence to financial regulations.
- Model bias can impact decision-making and fairness.

Conclusion

- GenAI in finance increases efficiency, enhances decision-making, and helps in improving client engagement.
- Partnering with experts will allow institutions to fully leverage AI while managing risks and building custom reliable systems.

About the author(s)



Kashish Bhoir

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Kashish is an aspiring actuary currently working in the employee benefits domain. She has a passion and strong interest in finance. Her hobbies include reading and exploring new places.

Podcast

Leadership Conversations

Actuarial 360: Conversations Beyond Numbers

Join Surabhi Handa as she sits down for a conversation with the first female President of the Institute of Actuaries of India - Ms. Preeti Chandrashekhar.
Ms. Chandrashekhar opens up about her career, the evolving role of actuaries in an increasingly complex world, and the future of the actuarial profession in India and beyond. From emerging trends in risk management to the growing opportunities for actuaries in diverse industries, this conversation covers it all!





Actuarial 360: Conversations Beyond Numbers

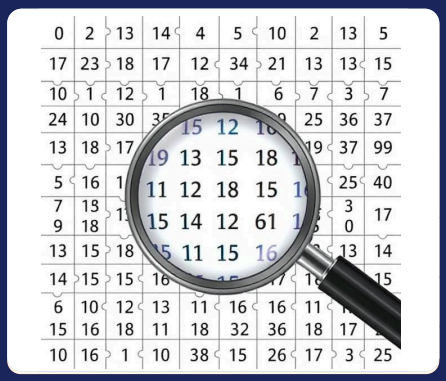


Rapid Fire with Ms. Preeti Chandrashekhar





Puzzle



Number Search Puzzle

Number Search

Solve these crosswords by filling the correct number in each cell based on the clues provided. Take your time and as many attempts as you want (most importantly, don't give up). These are no more trickier than developing replicating portfolios! Enjoy this brain teaser by the Puzzle master: **Kathan Jain.**

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Solution

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About the author(s)



Kathan Jain

Lead Consultant
Ankolekar & Co.

Kathan is a Fellow member of the IAI and the IFoA with a specialization in Pensions & Other Benefits and holds a B.Sc. in Actuarial Science from YCMOU. He's obsessed with food and enjoys binge-watching & solving puzzles in his free time.

Humour

Humour

An actuary walks into Ā

A light-hearted take on the hopes, aspirations, trials, tribulations and perhaps even foibles of everyday actuaries in their everyday lives.



Private Insurers

by B.M. Sampad

If you ask for consent, that's **Prudential**

If you're committed, that's **Bandhan Life**

If you **Just** do it with your partner, that's **Legal and General.**

If you have an **Allianz** outside the marriage, that's **Generali** illegal

If you get caught, that's a **Federal** offence

If you're with a professional, that's **Commercial Union**

If you're in a crowd, that's **Group Life**

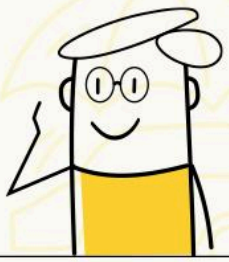
If you're paying the rent in kind, that's **Credit Access**

If you're excessive, that's **Max Life**

If you're getting fancy, that's **Royal Sundaram**

If you're in an open relationship, that's **Liberty Mutual**

And, if you get entangled with the mafia, that's **Go Digit**



The Actuary India
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The Actuary India is the flagship magazine of the IAI that has been in publication for over two decades. We aim to provide our members and the larger actuarial community a platform to connect, exchange views and promote thought-leadership and research beneficial to the profession.

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