AEN Newsletter   Number 3

Welcome to the third newsletter for members of the Actuarial Educators Network. These newsletters are intended to provide information that we believe will be of interest to members of the network, and through this improve the quality of actuarial education, and global access to this education. This edition has two featured articles- John Shepherd in Australia provides a thought-provoking view on effective learning, while Arni S.R. Srinivasa Rao provides our first research-focused article where he discusses health insurance modeling that he is working on in India.

Learning Is a Two-way stream

A few years ago one of my students wrote:

> *"I have experience for strong impact on discussion by learning <this course>. I did not know why discussion was very important to understand the concept. That day was week 10 workshop which was last week, we have taught about forward contracts on financial instruments. I was depressed after finishing workshop because I expected to understand the concept well as usual, which I could not. I asked to my friend how well he understood the concept and he said that he was able to solve the problem but could not understand either.*

> *So we went to library together to discuss about it and it took about three hours to figure out for only one problem. When he explained one way, I strongly disagreed with that and I express the concept with different way. But we could not solve the problem with either ways and we had to think the other way around. We was drawing the diagrams and trying to understand with all the method that we can apply. Finally we figured out the problem with understanding.*

> *We went outside after library closed and we have talked about our strong experience. I said, if I was trying to solve this problem alone, I may collapse with all confused ideas and I could not solve this problem at all and then he agreed with that. We were just happy to solve properly with discussion work.*

> *Suddenly one thing was come up in my head that was what the lecturer stated for the first lecture. He said that most people learn 70% of what they talk over with other and I could not aware it is that important. I have satisfied because I understood why he mentioned that. I am totally realised how discussion work is important."*

In teachers' common rooms students are sometimes criticised. *"I taught these people Markov Chains last year but they obviously didn't learn a thing!" "They're just not interested in life insurance law – I don't know what possessed them to want to be actuaries!"* The content may vary but the theme is familiar. However, many students – perhaps more than we realise – give a lot of thought to their study. It can be very instructive to listen to what they have to say.

At my first meeting with a new class I often show the following table:

Most people learn:
• 10% of what they read
• 20% of what they hear
• 30% of what they see
• 50% of what they see and hear
• 70% of what they talk over with others
• 80% of what they use and apply in real life
• 95% of what they teach someone else

I want to encourage people to think about their own learning – under what circumstances they find that they learn well or don't learn well. I want also to give a rationale for encouraging them to talk a lot with each other in class (and beyond).

Near the end of semester I ask students to write a page or two reflecting on their learning in that subject. I give a few trigger questions but leave it open for them to say whatever they want.   The responses are always a mine of information but I found the above quote particularly fascinating!

Apart from being evidence of every teacher's dream (a reflective student!) it also reminded me that students do want to understand what they are learning, and do listen to what we say.

And libraries are more than just sources of material!

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Are there population health benefits in India?: A perspective from Medical Insurance and Mathematical Modeling

Research Overview
I observed that, during the last decade or so in India, there has been an increase in the number of private insurance companies who are providing various health insurance services in the country. I was also curious to investigate, using models, answers to the following questions: (i) what is the impact of the ratio between premiums paid into private health insurance compared to benefits paid to those who have this insurance in delivering positive health outcomes? (ii) Which parties impact on this ratio - the government, the company or other parties? (iii) If private health companies are purely concerned for the health of the population, why is insurance not available to the population who are very old?

Since I have a background in the technical work associated with the dynamics of population age-specific rates, the mathematical theory behind computation of population changes and computation of life expectancy of population using age-specific mortality rates in the population, naturally the research questions came to mind are a) whether private health policies have any benefit from the perspective of the general health of the population? Moreover, I wondered whether there was any positive impact on any of these measures, especially on life expectancy at birth which is a simple but crude indicator of overall population health in a

country. Note that life expectancy in India has been increasing since the 1980s which was before the wide availability of private health insurance. This led to more specific questions including b) how many deaths have been avoided annually due to people having health insurance policies? c) what proportion of people have been buying at least one health insurance policy and how has this proportion changed over time? When I started to search for answers to these questions on the internet, I also found there are certain population groups in the country who are covered by the government with free health insurance policies. This led me to revise my questions a bit to frame a new question: d) what proportion of people have obtained free health insurance (without paying by their company or organization or by themselves) through at least one of the health insurance companies?

I thought answers to the questions would be readily available on the internet and was surprised to realise that most insurance companies do not provide health policies for the very old. The data available online does not help us to calculate answers to questions (a) to (c), however for (d) one can indirectly estimate with a range based on the people who are eligible under the free insurance program of the government. There is a scheme RSBY (Rashtriya Swasthya Bima Yojna) from the Government of India which provides health insurance for people who are below the poverty line in India [Ref1]. We are attempting to estimate eligible people from the policy documents of RSBY, but it is not clear whether we have data for answering questions (a) and (b) for people below the poverty line.

From my general interest in the impact of the health insurance market on overall health in India, I applied for my first project grant in 2009 related to Actuarial Science. I was thankful to get some funds to explore the field and in particular to answer the questions that I raised earlier [Ref2]. This is the first ever project in India which attempts to mathematically model life expectancies during the post health insurance era in the country and to the best of my knowledge, the first project in the last three decades funded by the Indian Statistical Institute that is purely related to actuarial science. Essentially, the project makes use of Alfred Lotka's celebrated theory of stable population, renewal equations (for example, see the works of William Feller) and the theory of multiple decrement tables. In addition, we try to bring dynamics into the population who are insured and not insured. In a simple setting, suppose X and Y are populations of insured and non-insured whose dynamics are explained by following two general equations

$$
\begin{aligned}
\frac{dX}{dt} &= f_1(\alpha_1, \alpha_2, \ldots, \alpha_k) \\
\frac{dY}{dt} &= f_2(\beta_1, \beta_2, \ldots, \beta_k)
\end{aligned}
$$

Where $f_1(\alpha_1, \alpha_2, \ldots, \alpha_k)$ and $f_2(\beta_1, \beta_2, \ldots, \beta_k)$ are functions explaining the dynamics of insured and non-insured populations with parameter sets $\tilde{\alpha} = (\alpha_1, \alpha_2, \ldots, \alpha_k)$ and $\tilde{\beta} = (\beta_1, \beta_2, \ldots, \beta_k)$ which are responsible for the dynamics. Total future person-years lived by a cohort of all the individuals in a country (i.e. combined populations of X and Y) is sum of total future person-years lived by a cohort of X individuals after recruitment into at least one health policy and total future person-years lived by a cohort of Y individuals not recruited into any health policy. There may be several cases that arise due to change in the dynamics of insured and non-insured populations. One needs to carefully remove non-insured population's total future person-years from total population's future person-years in order to obtain the gain due to insured population and hence expected time that a cohort of insured population would survive since the initiation (or recruitment) of the health insurance. Total insured and non-insured populations can be further divided into single year age groups, say X_i and Y_i for $i = 1, 2, \ldots, \infty$. Dynamics of X_i and Y_i can be computed from a similar model as explained earlier. Mortality pattern of X_i and Y_i are expected vary over time and age. Further, one can repeat the computations of life expectancies at each age.

Capacity Building

During the project period (2010-12), I had the opportunity to train two people on the related issues (Pratyush Singh completed a master's dissertation and Swagata Mitra worked as a project-linked staff member). We are ready with our theoretical framework and waiting for real data sets to test the results and finish our working papers. See details of working papers in respective references **[Ref3]** and [**Ref4].** Among other topics, training for these two students was provided on basic theory of simulations using renewal functions, integral equations of population change, life table constructions and indirect assessment of insurance impact, but not on the type of dynamic models explained above in this article. I look forward to train more students and project people ranging from various real life problems related to insurance to purely theoretical questions.

What Next?

In contrast to the concepts mentioned earlier, I have introduced new functions by generically naming them as 'multivariate force of mortality' which might be useful in understanding further research in changes in mortality due to causes other than age alone **[Ref5].** Such functions could be of help in pension related studies. Population heath insurance has its own benefits and to assess true benefits of various programs on overall population health of the country, it might take 15-20 years until the proportion of beneficiaries is expected to reach a substantial level. Experienced actuaries in the country may have answers for many of the questions raised in this article. There is also a necessity for launching evaluation projects by the government to study the performance of several programs in the country. Once such data becomes available in the public domain for researchers, issues like the impact of population health as a result of medical insurance can be debated.

References:

1. http://www.rsby.gov.in/about_rsby.html (browsed on 29 November 2011)
2. Author is a Principal Investigator for the Project Entitled "Multiple Decrement Tables in Population Health Insurance policies: Deterministic Approaches" funded by Indian Statistical Institute for the period 2010-2012.
3. Pratyush Singh, Swagata Mitra and Arni S.R. Srinivasa Rao (2011). Renewal theory and multi-stage simulation modeling in understanding the impact of the health insurances in India. (Working paper in progress).
4. Swagata Mitra, Pratyush Singh and Arni S.R. Srinivasa Rao (2011). Actuarial Modeling for The Health Insurance Impact in India. (Working paper in progress).
5. Arni S.R. Srinivasa Rao (2011). Multivariate Force of Mortality. arXiv:1111.5213

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Involvement in IAA Fund Meetings

The IAA Fund sponsored three recent meetings listed below in which presentations were made on the AEN.

Region	Dates	Host city and country	AEN Speaker
Southeast Europe	3-4 October 2011	Zagreb, Croatia	Andrew Gladwin
Africa	3-5 November 2011	Nairobi, Kenya	Cisca Venter
Latin America	21-22 November 2011	Bogota, Colombia	Eduardo Melinsky

All of these meetings included a number of distinguished speakers on topics relevant to the actuarial profession including Solvency II and Enterprise Risk Management. The focus is on equipping emerging actuarial societies to become full members of the IAA, and education and the work of the Actuarial Educators Network is a key component in achieving this.

Future Meetings of Actuarial Educators

Please note this updated list of upcoming conferences for Actuarial Educators –we hope that you will be able to take part in some of these opportunities from around the world.

Region	Event	Dates	Host
North America	47th Actuarial Research Conference	1-4 August 2012	University of Manitoba, Winnipeg, Manitoba (Canada)
North America	48th Actuarial Research Conference	1-3 August 2013	Temple University, Philadelphia, Pennsylvania (USA)

The intention is still to hold an international meeting directly under the auspices of the AEN, and open to our members around the world. This would be in May 2013 in The Hague, Netherlands. Any suggestions from members in terms of the format and content of this conference will be very welcome at this stage.

Opportunities Around the World

In conjunction with Actuaries Without Borders (AWB), a section of the IAA, the AEN would like to publicise opportunities to support the development of education in emerging actuarial associations. New opportunities are listed below.

University of Mauritius
The University of Mauritius is establishing an actuarial science program at its campus in Reduit, close to the capital Port Louis on this Indian Ocean island. In order to develop the program, the university would like to find external examiners for the actuarial subjects. These external examiners should be Fellows of the UK or South

African professions, and have teaching and examining experience in the subjects that they will play an external examiner role for; the relevant subjects include Mathematics of Finance, Financial Economics, Contingencies, Modelling and Applied Statistics, and the university is happy to accommodate different external examiners for each subject. The university will remunerate the external examiners appropriately. Please contact Naushad MamodeKhan at n.mamodekhan@uom.ac.mu for further information.

Course Catalog

The Education Subcommittee of Actuaries Without Borders is currently in the process of compiling a catalog of courses that their members are willing to teach as volunteers in other countries. To participate in this project, you need to be an AWB member and complete a questionnaire sent out by the IAA secretariat. If you are interested in participating and are not a current AWB member, please go to http://www.actuaries.org/SECTIONS/SECTION_MEMBERSHIP_EN.cfm and choose AWB under section selection. Once you have joined, you will receive a cover letter and the questionnaire.

Membership and Final Comments

A reminder to all our members: we have our own website at www.actuarialeducators.org, hosted by the IAA. The website is intended primarily as a resource for educators and researchers, and we would like to populate it with useful papers and other materials. If you have a contribution to the website, please send it to Christian Levac – we would like to build a high-class resource base to improve actuarial education and research globally.

We intend to add a searchable database of members shortly, so if you haven't added in your details, please take a few minutes to do so at http://www.actuaries.org/AEN/Membership.cfm.

At the time of writing there are 336 members of the network. If you know of any educators, or people interested in actuarial education, who would be interested in the network, please encourage them to join by filling out the abovementioned form (http://www.actuaries.org/AEN/Membership.cfm)

The AEN is still in its formative stages and we would value any suggestions on how the AEN can achieve its objectives. Please send these to Christian Levac or Andrew Gladwin (agladwin@oldmutual.com).

Finally, you are receiving this newsletter because you are currently on our e-mail distribution list. We would very much like you to remain part of the network, but if you do want to opt out, or are receiving this e-mail in error, please inform Christian Levac (christian.levac@actuaries.org) who will remove you from the distribution list.