

LIVING TO 100 SYMPOSIUM*

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Session 4A: New Models of Advanced Age Mortality Q&A

Presenters: Thomas P. Edwalds, Discussant
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ARNOLD DICKEY: I'm not sure if the two presenters are aware of the work that's going on with U.S. life insurance regulation reserves having to do with principal-based reserves and one of the problems we're dealing with right now is an attempt to choose a set of statutory mortality tables. We want to have a larger set. In the past, we've had them divided just by gender and smoking status, basically. So the idea here was to, also a lot of reinsurers have it done at various points and consequently we are aware of that, try to use an underwriting scoring mechanism. Just to give a little more for those who might not know about it, it's a mechanism whereby you look at the various rules that various companies use to determine preferred status for policies typically. And the idea is to find a way to map a set of responses that in particular a company gives. In other words, here's our set of underwriting rules. To get the top status, we have cholesterol in this range and we have this other indicator in this range and so on like that. So there's a set of perhaps 10 of those items. Would these techniques, the predictive modeling in particular, but maybe the other presenter would have some ideas too, are these techniques applicable in any way? Should we be looking into it for this project?

LIJIA GUO: Definitely, I will have to say it is applicable for what you mentioned.

THOMAS P. EDWALDS: I'll respond to that also, Arnold. Because you are aware that the committees have done a fair amount of work on this and they did not use a predictive modeling technique to determine the underwriting criteria score from that range of responses. I personally think it would have been superior to do so. By the time they got as far down in the process as they have, they certainly didn't want to try to start over. They were using what they called the knockout approach on the preferred criteria. They look at if you accept up to this cholesterol level and up to this blood pressure and up to this body mass index or whatever, then they assigned a score to that overall set of underwriting criteria and then tried to correlate that with the mortality data. I think, actually if they had used the technique like Lijia was proposing, it might have actually been a superior model. Not that I'm criticizing.

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TONY GREEN: I have two questions. First one to Louis. You talked about new methods that I've never worked with before. But based on the variation in mortality vis-à-vis mortality improvement, can you tell us of a way that you can actually incorporate some time varying nature into these models? And the second question, when you're doing the modeling for your decision tree and you're using the subset of data to model and the other set to test, is there a statistical way of choosing the sample that you used to model versus the part they're going to use to test?

LIJIA GUO: I think randomly partitioning your data is the best way.

TONY GREEN: Is there a percentage that you use?

LIJIA GUO: Oh yes. You can do 1/3, 1/3, 1/3.

LOUIS G. DORAY: In Canada the data is collected every ten years for the census. So one approach would be to do this analysis over 10 year periods and see if the parameters change over time. But there are not that many data that we can use with people at extreme age. That's what I would do. There were three cohorts we could use, at least. And then 2001 data will be available. So there will be four data sets. Estimate the parameters and see if there are changes.

THOMAS P. EDWALDS: Professor. Doray, would you consider using the period data to do these estimates separately and then when you get more points look at a trend?

LOUIS G. DORAY: Yes, yes. Do it over 10 year periods.

WARD KINGKADE: I have a question and a comment for Professor Doray. As I remember, in the analysis by Thatcher, Kannisto and Vaupel, the logistic model that they tested was a three parameter model and I wondered if you had looked at that? The comment that I have is a little different. I think that the utility of parsimonious models can't be overstated. My own experience is that the regression like procedures for estimating these things is better than maximum likelihood because what maximum likelihood does is maximizes the likelihood or alternatively minimize the loss function. The loss function is usually dominated by mortality at the very oldest ages where death rates are higher and probabilities of dying are higher. Whereas, the least square's line whether it's weighted or whether it's OLS, however you do it, gives you a better fit to each point at the ages that are not immediately the last ones. So I found that the regression like procedures have an advantage that maximum likelihood doesn't.

LOUIS G. DORAY: I haven't used at all the three parameter model. Because in that book they say the two parameters fits very well to most data and most periods. And what you say about maximum likelihood, that's probably why if you look in the paper, the estimated values all look the same, except the difference is in these 10 standard deviations of where maximum likelihood is much higher so that's why the fit isn't good for the variance. And it's much smaller when you use the least squares estimation, either weighted or unweighted.

LIJIA GUO: I would like to conclude my presentation with a little success story about predictive modeling. Everybody knows Progressive Insurance is a P&C company. A few years ago, I remember a former student who had just come to the US and had difficulty getting auto insurance. She couldn't get auto insurance from Allstate, State Farm, or any other company and finally ended up with Progressive. At that time, Progressive had just started taking all the high risk policies that State Farm or Allstate didn't want to write. What Progressive did was, take the so-called high risk drivers, high risk in terms of age versus the normal risk drivers. They took those individuals considered high risks by other companies and used new variables including a credit score and zip code to refine the high risk group and identify the good risks from this pool. Due to Progressive's success, now major P&C companies want to hire people from Progressive to lead their companies.

STEVEN HABERMAN: I'd like to make a comment which brings together the two papers and refers back to the gentleman from the census. I mean the debate about least squares versus maximum likelihood for Professor Doray's paper, I think is in the context of presenting a model using a normal distribution. But actually if we think the numbers of deaths of the very old ages, the best represented as Poisson random variables. And the thing to do is to use the generalized linear models formulation. If we were to do that, using a Poisson error structure, I would suspect that the maximum likelihood formulation would actually give us best results and it might be worth having a look at that.