# 2020 Living to 100 Discussant Comments 6B:  Disease and Longevity



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# Discussant Comments Session 6B: Disease and Longevity

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***Chronic Diseases and Longevity Risk: An Application to Type II Diabetes Insurance Products*** – Hsin-Chung Wang, Ph.D., Alethia University; Jack C. Yue, ASA, Ph.D., National Chengchi University, Ting-Chung Chang, Ph.D. - Chihlee University of Technology

Wang & Yu's paper discussed a critical illness application. Critical illness (CI) policies are especially popular in Asia and have some more limited penetration in other countries. Diabetes is a good condition to study in that context as it is a "gateway' conditions to many serious complications, especially from a cardiovascular and circulatory perspective.

The definition of a condition is a critical challenge for CI policies. Wang and Yu decided to use a data analytics driven definition which facilitate analysis but is subject to possible gaming of the system, especially in locations with a less centralized health system. The quality of the Taiwanese health data was superior, and this may not be easily portable to other countries.

Using models that were designed for mortality (like the Lee-Carter and the Cairns-Blake-Dowd models) for morbidity was creative and some models seemed to work well. The approach of using partial SMR to help fill datasets that are incomplete or too volatile using information from bigger related datasets is a useful pointer as this is a common situation for many actuarial applications.

The advantage of looking at disease from a data analytics angle is the rigorous exploration of the data. The chart of incidence clearly showed a temporal pattern that would have been missed using aggregated data. Looking at time series is important in analyzing conditions as patterns and discontinuities may become obvious and identifying them could clarify the underlying data pattern. Changes in definition, in public and medical perception may change how the data is identified and reported which will create artefactual data distortions.

I want to point out the surprising results, especially for male diabetics, which generally contradict the medical literature. I suspect this is due to a definitional issue as the population of diabetics was selected for their number of visits and regular visits and good follow-ups are essential in controlling diabetes and its deleterious effects.

Taiwan is probably a best-case scenario from a data completeness standpoint and this level of completeness will be difficult to achieve in the U.S., at least until Electronic Health Records become the norm.

I want to point out again the importance of the definitions of covered conditions in a CI context. It is critical for the viability of the CI policy that the definitions are not easily manipulated by a potential claimant. I am not sure that the number of visits would be sufficiently safe from that perspective. In addition, having a definition that is compatible with accepted medical definitions is desirable.

***Understanding Multimorbidities*** – Sam Gutterman, FSA, CERA, FCA, FCAS, HONFIA, MAAA

Gutterman's paper is a thorough and easy read and will get the reader quickly up to speed on the challenges of understanding the impact of multiple medical conditions on mortality. As recent mortality improvements trends have been concerning, there is a renewed interest in understanding causes of deaths. Understanding comorbidities is a key component of analyzing causes of deaths. Underwriting manuals are still mostly based on the presumption

that each impairment is independent and therefore the ratings are additive, although most manuals adjust for the most obvious violations. The paper allows us to reflect on the fact that many conditions have multiple risk factors and that, not rarely, those risk factors affect more than one condition as well.

Gutterman suffers from the same definitional challenge as Wang & Yue. How to define comorbidities in a way to be able to measure their impact on each other consistently is difficult, which makes the risk hard to quantify.

The Venn diagram reflecting multiple morbidities, frailty and disability is important to keep in mind. It is critical in elderly underwriting but Gutterman reminds us that frailty and disability can play an important role even at younger ages in the case of multiple morbidities. I found a Belgian study of 85+ years old which quantified the numbers in the Venn diagram. 75% had multiple morbidities, 20% were frail, 35% had some disability and 5% had all three. Although 5% appears small it would have a big impact on mortality.

As modern medicine is more and more able to thwart crisis that would have been fatal in the past, a greater percentage of the population will carry the burden of severe conditions in the future. The consequences of that extra baggage are not well understood. There was a discussion yesterday that if treating the root cause of a disease improves mortality forever, medical advances in treatment only provide an immediate benefit and create a more vulnerable population in the future. This is a worthwhile point to keep in mind when studying future mortality improvements.

Gutterman pointed that out that multiple comorbidities play an important role at younger ages but that the mixture of conditions is quite different than what it is at older ages. Mental illness plays an important part at the younger ages.

Polypharmacy, or having a lot of prescriptions for different diseases, can be a measure of multiple morbidities. In the US market, the industry has access to a variety of providers of prescription information and prescription information has been quickly adopted by the life insurance industry as a valuable underwriting tool, allowing the underwriter to look at a current prescription snapshot but also at the evolution of use through the years. The development of predictive models based on that data can provide useful insights on the impact of comorbidities on mortality.

Increase prevalence of any condition may be due to a real increase but may also be due to a change in definition or an increase awareness from both patients and doctors. Gutterman points out the importance of this problem but does not proposes solutions. One must keep in mind the additional challenge of comparing multi morbidities from country to country (which is necessary to some extent because research studies in this domain are pretty rare) as prevalence of each cause of death varies significantly by country due to a combination of different prevalence of underlying risk factors and healthcare practices.

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