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LETTER FROM THE EDITOR

Dear Readers:

Welcome to the Spring 2011 issue of ReFlections! I hope you find this issue both enjoyable and informative.

It is my pleasure to introduce ReFlections' newest contributor, Scott Rushing. He is a Vice President and Actuary in the U.S. Pricing Department. In his article, he analyzes and shares his insights about the prevalence of four categories of underwriting requirements and their impact upon mortality as associated with a broad range of age and amount requirements.

In the second article, I discuss the potential mortality implications of insurance applicants whose attending physician statements note the presence of edema without providing information about likely cause(s). The article covers the pathophysiology of this important physical finding and, I hope, will help underwriters recognize the relationship of the sign "edema" to a range of disease states.

With this issue, we will start covering the activities of The Longer Life Foundation, RGA's not-for-profit partnership with Washington University in St. Louis. Since its founding in 1998, LLF has funded more than 61 research grants investigating aspects of mortality, morbidity and longevity. LLF also funds the Longer Life Center at Washington University, which cultivates prognosis-related research.

Finally, I encourage you to attend RGA's next webcast, entitled Moral Hazard and Anti-Selection, which will be available "on demand," starting May 25 and continuing for two weeks.

I welcome your feedback!

J. Carl Holowaty M.D., D.B.I.M.

EDEMA: WHAT IS IT, AND WHY IS IT IMPORTANT?

By Dr. J. Carl Holowaty M.D., D.B.I.M.

Senior Vice President and Chief Medical Director

Medical risk selection utilizes the assignment of either debits or credits for specific diseases or conditions, which are then subcategorized on the basis of the severity of the condition(s). Fortunately, in most cases, either the applicant or the attending physician informs us of the diagnosis or condition.

This, however, is not always the case.

Edema, usually paraphrased in lay terms as "swelling," is one such condition. A thorough understanding of the pathogenesis and etiology of this condition can help underwriters differentiate the relatively benign causes of edema from those with much more significant mortality implications, and thereby make appropriate assessments of risk, even in the absence of adequate knowledge about the disorder.

In this article, I will discuss the evaluation of edema, which is not a disease, but a physical sign often mentioned in attending physician statements, and in many cases without reference to its underlying disease state (or states). I will talk about ways in which underwriters can evaluate edema and its





potential underlying disease states so that, it is hoped, underwriters can be helped to make appropriate risk assessments.

About Edema

Edema is defined as “an observable increase in normal interstitial fluid volumes.” In lay terms, this means externally visible or palpable swelling. Edema can, of course, be present internally, in which case other methods of observation or measurement are necessary.

Approximately two-thirds of all body fluid is intracellular. The remaining one-third is found in extracellular space. One-quarter of extracellular fluid is intravascular fluid (also known as plasma) and the other three-quarters is interstitial fluid. Interstitial fluid is an important substance that contains dissolved solutes that bathe and surround cells and tissues. It is found in the interstitial spaces (or interstitium), which are the spaces or gaps between cell structures. This is part of extracellular space. When this fluid is found to be present in excess, the term “edema” applies.

In healthy people, the interchange of fluids between cells, tissues and the interstitium is well regulated, and a balance is maintained. When this regulation is altered, edema may develop. By understanding the forces that influence the interchange of intracellular and extracellular fluids, it is possible to determine the conditions under which edema results and more importantly, to try to link a possible specific disease state to an appropriate underwriting action.

The transfer of fluid within the body has been studied for more than a century. The various forces that result in net movements of intracellular and extracellular fluids are termed “Starling Forces” and are expressed as Starling’s Law of Capillary Exchange.

Starling’s law states:

$$\text{Fluid accumulation} = K[(P_c - P_w) - \sigma(\pi_{pl} - \pi_{if})] - Q_{lymph}$$

This law, when applied, explains the various forces affecting fluid flows that can contribute to the development of edema.

At first glance, this formula can look intimidating and not very user-friendly, but once the factors are defined and explained, and examples of the formula’s utility are put forth, it is actually quite intuitive.

K = hydraulic conductance. This measure is directly proportional to cell membrane surface area and inversely proportional to cell membrane thickness. If cell membrane surface areas increase, fluid accumulates in the interstitium. Conversely, if the cell membranes thicken, less fluid will accumulate interstitially, since it is more difficult for the fluid to pass through the membranes.

P_c = mean intracapillary pressure. This is a hydrostatic pressure, and is the pressure exerted by blood as it flows through the capillaries.

P_w = mean interstitial liquid pressure. This is also a hydrostatic pressure, and denotes the pressure exerted by fluid in an interstitial space.

π_{pl} = oncotic pressure of the plasma. Oncotic pressure is a type of osmotic pressure, and is a function of plasma protein concentrations. Oncotic pressure “pulls” fluid across permeable membranes from areas of high protein concentration to areas of low protein concentration.

π_{if} = oncotic pressure of the interstitial space. This pressure is also dependent upon protein concentrations within interstitial fluid.

σ = reflection coefficient of macromolecules. This is a measure of the shape, size and electric charge of the large molecules in semi-permeable cell membranes. This factor also shows the ease with which fluids can cross these membranes.

Q_{lymph} = lymphatic flow. The flow rate can increase when needed in healthy people, but if the lymphatics are blocked, the flow rate decreases, thereby increasing fluid accumulation.

The next factor in understanding edema is to evaluate the individual components of Starling's Law as well as the physical structures involved in fluid transfer within the body.

While there are continuous two-way exchanges of fluids between capillary intravascular spaces and interstitial spaces, because of high hydrostatic pressure in the arterial capillaries, there is a net flow of fluid into those interstitial spaces. Unless this fluid is removed, there would be an ever-increasing amount of interstitial fluid, representing as edema.

Fortunately, a healthy body has several mechanisms to remove this fluid and return it to vascular circulation. This is accomplished firstly via the venous capillaries, which have relatively low hydrostatic pressure.

The second mechanism is the lymphatic collecting system, the proper functioning of which is critical to avoidance of edema. The lymphatic circulation system can accommodate significant increases in fluid volumes, but if the system is impaired or obstructed in any way, edema will result.

Another force, which is represented in Starling's Law, is oncotic pressure. This is determined by the concentration of proteins within fluids in interstitial spaces as well as in intravascular spaces. Concentrations of proteins in these spaces provides osmotic pressure. Differences in pressures between interstitial and intravascular spaces determines the rate and direction of the flow of fluids. Areas of higher osmotic pressure will "pull" fluid from areas of lower osmotic pressure.

With an understanding of what Starling's Law represents, it is relatively easy to determine how changes in the relative values of each of its components will increase or decrease a body's tendency to accumulate excess fluid.

For example, increased venous mean intracapillary pressure (P_c) can result in edema.

This pressure can rise due to:

- *Localized* venous obstruction from conditions such as thrombophlebitis;
- *Generalized* venous obstruction secondary to congestive heart failure (CHF); or
- Increased cell membrane permeability due to burns, chemical trauma, infection, or inflammation.

Reduction of effective arterial volume can also result in edema. Arterial volume can decrease due to severe dehydration or blood loss, and can also occur when there is reduced cardiac output. In order to maintain blood pressure and restore arterial volume, the kidneys are signaled to retain fluid and salt. If salt and water intake is insufficient, fluid will accumulate in interstitial space, resulting in edema.

Possible Causes

It is also important to consider several of the more common clinical diseases or conditions that can cause edema, and then understand how they relate to Starling's Law. Ten common causes are listed below, followed by explanations.

1. Lymphedema

Capillary beds drain either through the venous or lymphatic system. Conditions obstructing drainage via either system, such as thrombophlebitis, chronic lymphangitis, surgical resection of regional lymph nodes, pressure from tumors (benign or malignant), or parasitic infestation such as filariasis, will result in lymphedema.



Edema shown above: Top left to right, Angioedema Foot and tongue, bottom left to right, Chemosis in Eye; Edema of lip

2. *Congestive Heart Failure (CHF)*

Systolic failure implies ineffective emptying of blood from the heart in systole (low ejection fraction), whereas diastolic failure is due to impaired relaxation of the ventricles during diastole (normal ejection fraction). Both types of failure result in pooling of blood within the heart and within venous circulation, effectively reducing arterial volume. This signals the kidneys to retain more water and salt. As CHF becomes more severe, venous and lymphatic pressures will increase to the point where edema will occur, either in pulmonary circulation (left-sided heart failure) resulting in pulmonary edema, or more generally in systemic circulation.

3. *Nephrotic Syndrome and other Hypoalbuminemic States*

These conditions can result from severe nutritional deficiency, protein-losing enteropathy, congenital hypoalbuminemia, severe chronic liver disease, acute burns, and lymphatic blockage. All of these conditions lead to a loss of plasma protein and reduced colloid osmotic pressure, which promotes a net movement of fluid into interstitial spaces, resulting in edema.

4. *Cirrhosis*

In cirrhosis, the diseased liver fails to produce adequate serum proteins such as albumin. This lack of circulating serum albumin contributes to a decrease in oncotic pressure as well as effective arterial blood volume. A secondary contributing mechanism for edema from cirrhosis is the decrease in the liver's metabolism of aldosterone, which leads to increased salt and water retention. A third factor is the obstruction of hepatic venous blood flow, which increases both splanchnic blood volume and hepatic lymph formation, leading to intrahepatic hypertension/portal hypertension and stimulates salt and water retention as well. Initially, this third factor results in localized edema within the peritoneal cavity, but ultimately, as hypoalbuminemia worsens, peripheral edema will occur as well.

5. *Inflammation and Infection*

These conditions lead to edema due to localized changes in the permeability of the tissue, which is often mediated by cytokines or possibly bacterial toxins.

6. *Angioneurotic Edema or Angioedema*

This condition can be relatively benign and self-limiting, or progressive and life-threatening.

Episodes tend to be transient, and symptoms will depend on the location. This condition could be linked to allergies or stress, but the mechanism is poorly understood.

7. *Iatrogenic Edema*

This condition refers to edema induced by medical therapies, such as administration of medications, that have the side effect of fluid retention, or intravenous administration of fluids in hospital settings in excess of kidneys' capacity for fluid excretion.

8. *Edema of Nutritional Origin*

This type of edema is rarely seen in insurance applicants, and usually only occurs during periods of profound starvation and in the terminally ill.

9. *Idiopathic Edema*

This unusual condition is found almost exclusively in women and results in periodic episodes of edema unrelated to the menstrual cycle. It has an orthostatic component and is aggravated by hot weather.

10. *Miscellaneous Causes*

These would include conditions such as insect or other animal bites.

Edema is often observed in the obese as well, although uncomplicated obesity alone does not cause edema. The most common complications of obesity that predispose edema are: chronic venous insufficiency, lymphedema, idiopathic edema, and pulmonary hypertension secondary to obstructive sleep apnea.

Notes For Underwriters

Now that the nature and causes of edema have been explored, it is important to apply this knowledge to help differentiate between those causes of edema with limited mortality implications and those with potentially serious consequences.

This involves evaluating clinical, laboratory and historic clues as to the origin of the edema, and of course some ability to determine the relative probability of the various etiologies. In many cases, attending physician statements lack concise linkages between edema and causality, and it is up to the underwriter to evaluate the entire risk and apply appropriate debits.

A good starting point in the evaluation is to consider the location of the edema. If it is generalized, this would increase the probability that the edema is secondary to advanced cardiac, renal, hepatic, or nutritional disorders. If the edema is localized, the specific location will provide insight into the causality. For instance, edema limited to the peritoneal cavity (ascites) might suggest the presence of a hepatic disease such as cirrhosis.

A common scenario is to see reports of localized peripheral edema, particularly in the leg(s). While this can certainly be secondary to local disease processes such as thrombophlebitis, it is important not to overlook less advanced forms of CHF as the cause. A valuable clue in this instance is to consider whether the edema is unilateral or bilateral. A systemic condition such as CHF is more likely to cause bilateral, relatively symmetrical edema compared to the often unilateral edema associated with venous disease.

The next step in the evaluation of edema is to review laboratory findings. This would include evaluation of parameters such as albumin, creatinine, and electrolytes. Abnormalities of these constituents would suggest a systemic rather than local problem. Likewise, urinalysis revealing marked albuminuria or hematuria would suggest a renal connection.

Next, information from an attending physician's statement or other sources of medical history must be carefully considered. A prior history of heart, kidney, or liver disease would certainly increase the likelihood that these conditions could be the causes of the edema. It is important, however, not to overlook the possibility of coexisting local causes of edema such as peripheral venous disease and heart disease, which could considerably complicate the evaluation.

A further step is to consider any additional clinical findings such as the mention of either pitting or non-pitting edema, orthostatic changes, or dyspnea (including orthopnea).

Lastly, review of use of medications should not be overlooked. For instance, long-term use of diuretics or digitalis would suggest that heart disease might be the primary cause of the edema.

Summary

Edema is an important physical finding, and can be due to a variety of conditions with differing mortality implications. Understanding the reasons for the development of edema is useful in considering the most likely cause for its existence. Consideration of various factors, such as location, duration, as well as clinical signs, symptoms, and history, can help determine the probable cause. In the elderly, especially, it is important not to overlook the coexistence of multiple sources for the presence of edema. ■

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Dr. J. Carl Holowaty is Senior Vice President and Chief Medical Director of RGA Reinsurance Company. He is responsible for the management of the medical department; research, development and maintenance of RGA's underwriting manual; and editing RGA's medical newsletter, ReFlections. In addition to his responsibilities at RGA, Dr. Holowaty serves as the Deputy Medical Director of the Longer Life Foundation. Dr. Holowaty earned his medical degree and a BSC in biochemistry from the University of British Columbia. He is a member of business and insurance industry organizations AAIM, CLIMOA and MMDA.

By Scott Rushing FSA, MAAA

Vice President and Actuary, Global Research and Development

When underwriting life insurance policies, the types of evidence usually requested by insurance companies include medical evidence such as collection of fluids, attending physician's statement, electrocardiograms, prescription histories, and non-medical evidence such as motor vehicle reports, inspection reports, and possibly several other items. The type of underwriting exam requested will also vary, as underwriting requirements for life insurance policies typically vary by age of the applicant and amount of coverage requested.

RGA recently completed an in-depth age and amount mortality study that examines the prevalence of four categories of underwriting requirements and then compares actual-to-tabular mortality results across a broad range of issue ages and policy face amounts.

This article briefly describes the methods used to conduct this study, and provides an introduction to some of the results observed. The focus of this article will be on the type of underwriting exam used.

Method of Analysis

RGA maintains an extensive internal database containing age and amount underwriting requirements dating back to the late 1990s for more than 80 of our top U.S. client companies. This database is useful both for benchmarking purposes and for identifying emerging trends.

By linking this requirements database to corresponding policies in our internal reinsurance administration system, we were able to create an internal age and amount mortality study. This linkage also enabled us to incorporate a far broader range of variables into our traditional analyses, which, we hope, will improve understanding of how underwriting requirements can influence mortality results.

To conduct this study, we used internal mortality tables to calculate actuarial exposure counts and expected

tabular claim counts. A/E ratios were then created by comparing actual claim counts to the expected tabular claim counts.

The results are expressed in Tables 1 and 2 on the following pages, by band and by issue age. (Results were left blank when the claim count for a specific cell was less than 30 claims.)

This age and amount study focuses on mortality levels for calendar years 2005-2009, and includes fully underwritten policies issued from 1997 onward. All policies included in the study were reinsured on an automatic basis from the date of issue.

Underwriting Exam Type

Underwriting medical history interviews and exams given to life insurance applicants typically fall into one of four categories:

1. *Application only*: the interview is typically conducted by an agent or through a tele-underwriting process (usually involves a call center, medical professional, or an underwriter). A medical history is taken, but no physical exam is conducted and no physical measurements are taken.
2. *Non-medical exam with physical measurements (PM) taken (height, weight, pulse, and blood pressure)*: a paramedic performs the exam, but the applicant interview is typically conducted by an agent or through a tele-underwriting process.
3. *Paramedical exam*: a paramedic conducts both the applicant interview and a physical exam with physical measurements.
4. *Medical exam*: a physician performs the exam. The medical history should be taken by the physician, but may sometimes be completed by the doctor's nurse.

Prevalence Results for Underwriting Exam Type

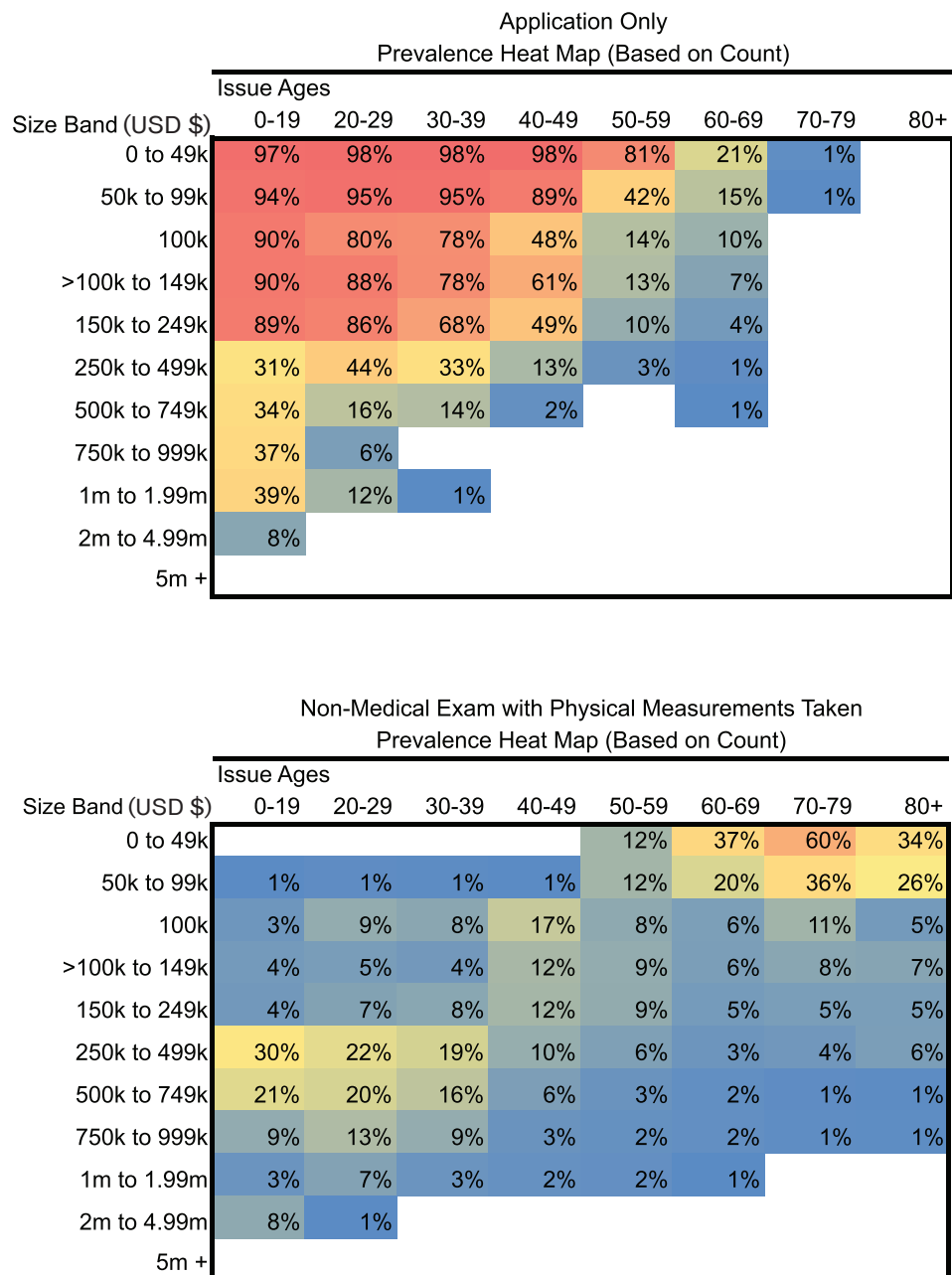
The four heat map tables in Figure 1 (below) show the prevalence of the four underwriting exam types, by issue ages and face amounts. The prevalence results are based on actuarial exposure counts from our mortality study. Combining the numbers in each of the four corresponding cells for the intersections of issue age and face amount will add up to 100%.

For example, in the four cells for issue ages 70-79 and face amounts from USD \$50,000 to USD \$99,000:

- Application Only: 1% of total exposure for this cohort
- Non-Medical Exam with Physical Measurements: 36% of total exposure
- Paramedical Exam: 54% of total exposure
- Medical Exam: 9% of total exposure

Adding the four percentages together yields a sum of 100%.

Figure 1: Prevalence Heat Maps



Paramedical Exam
Prevalence Heat Map (Based on Count)

Size Band (USD \$)	Issue Ages							
	0-19	20-29	30-39	40-49	50-59	60-69	70-79	80+
0 to 49k	3%	2%	2%	2%	8%	39%	23%	21%
50k to 99k	5%	3%	4%	10%	47%	63%	54%	40%
100k	6%	10%	14%	34%	77%	81%	72%	46%
>100k to 149k	6%	7%	17%	26%	77%	82%	63%	53%
150k to 249k	7%	8%	24%	39%	81%	86%	61%	47%
250k to 499k	12%	34%	48%	77%	90%	86%	50%	38%
500k to 749k	17%	65%	70%	91%	95%	79%	41%	29%
750k to 999k	30%	81%	90%	96%	95%	63%	33%	25%
1m to 1.99m	36%	74%	85%	87%	78%	46%	13%	10%
2m to 4.99m	46%	60%	53%	55%	37%	26%	3%	1%
5m +	24%	30%	33%	26%	14%	8%	1%	

Medical Exam
Prevalence Heat Map (Based on Count)

Size Band (USD \$)	Issue Ages							
	0-19	20-29	30-39	40-49	50-59	60-69	70-79	80+
0 to 49k						3%	15%	45%
50k to 99k						1%	9%	35%
100k						2%	16%	50%
>100k to 149k						5%	29%	39%
150k to 249k						4%	33%	48%
250k to 499k	27%				1%	9%	46%	56%
500k to 749k	27%			1%	1%	19%	58%	70%
750k to 999k	24%		1%	2%	3%	35%	66%	73%
1m to 1.99m	22%	7%	11%	11%	20%	54%	87%	90%
2m to 4.99m	38%	39%	47%	45%	62%	74%	97%	99%
5m +	76%	70%	67%	74%	86%	92%	99%	100%

Source: RGA

The "Application Only" table in Figure 1 shows that underwriting using just an application (non-medical exam with no physical measurements) is most commonly found at the youngest issue ages and the lowest face amounts.

Adding physical measurements to a non-medical exam becomes more common at older issue ages for face amounts under USD \$100,000 and for the under-40 issue age group for face amounts in the USD \$250,000-USD \$749,000 range.

Use of a paramedical exam covers the largest cross-section of issue ages and face amounts. Use of a medical exam is most common over age 70 or for face amounts of USD \$1 million and above.

For issue ages 20-59, many companies allow a paramedical exam up to and including USD \$1 million, but require a medical exam for applications requesting over USD \$1 million in coverage.

Mortality Results for Underwriting Exam Type

Raw A/E ratios are significantly higher for the < USD \$100,000 face amount band. There is also a much higher concentration of preferred risks (with lower mortality) at younger ages and at higher face amounts. These and many other factors must be considered when interpreting the following results. In addition to

the raw mortality results, it is helpful to display raw mortality results relative to the totals.

Overall claim counts, actual mortality divided by tabular expected mortality (raw A/E ratios), and A/E ratios relative to the totals by band and type of underwriting exam, are given in the following table:

Table 1: Results by Band

(All \$ in USD)

Data	BAND	Application Only	Non-Med w/ PM	Paramed	Med	Total
Actual Claim Counts	< \$100,000	8,997	3,597	5,173	903	18,670
	\$100,000 - \$249,999	6,633	1,715	11,714	814	20,876
	\$250,000 - \$999,999	1,489	1,147	10,153	1,231	14,020
	\$1,000,000 +	9	45	2,006	1,667	3,727
Total		17,128	6,504	29,046	4,615	57,293
A/E Results	< \$100,000	161.8%	150.9%	134.6%	153.2%	150.9%
	\$100,000 - \$249,999	131.0%	121.0%	112.3%	122.2%	118.8%
	\$250,000 - \$999,999	113.7%	110.7%	102.9%	122.8%	106.1%
	\$1,000,000 +		128.6%	107.0%	111.1%	109.0%
Total		143.4%	133.5%	111.7%	122.8%	123.0%
A/E Relative To Total	< \$100,000	107.3%	100.0%	89.2%	101.5%	100.0%
	\$100,000 - \$249,999	110.3%	101.9%	94.6%	102.9%	100.0%
	\$250,000 - \$999,999	107.1%	104.4%	97.0%	115.7%	100.0%
	\$1,000,000 +		118.0%	98.2%	101.9%	100.0%
Total		These are not meaningful				

Source: RGA

When looking at A/E ratios for all face amounts, the use of paramedical exams appears to have the biggest impact on reducing mortality.

Results for the full medical exam category are a bit misleading. As seen in the prevalence heat map tables in Figure 1, the 70 and older cohort had the highest number of individuals receiving full medical exams, and so had the biggest impact on A/E results for policies under USD \$1 million requiring a medical exam.

Using a more in-depth analysis, the A/E differentials observed between the paramedical and medical groups in Table 1 appear to be driven more by the company mix in each category than by the type of exam administered.

Overall claim counts, actual divided by tabular expected (raw A/E's) results, and A/E's relative to the totals by issue age and type of underwriting exam are given in Table 2, below:

Table 2: Results by Issue Age

Data	Issue Age	Application Only	Non-Med w/ PM	Paramed	Med	Total
Actual Claim Counts	0-29	2,079	247	490	7	2,823
	30-49	10,438	1,808	9,666	339	22,251
	50-69	4,602	2,952	16,511	1,325	25,390
	70+	9	1,497	2,379	2,944	6,829
Total		17,128	6,504	29,046	4,615	57,293
A/E Results	0-29	123.5%	112.9%	104.3%		118.3%
	30-49	144.6%	119.4%	109.2%	101.1%	124.2%
	50-69	152.0%	134.8%	112.1%	111.6%	120.1%
	70+		157.8%	121.3%	132.5%	132.7%
Total		143.4%	133.5%	111.7%	122.8%	123.0%
A/E Relative To Total	0-29	104.3%	95.4%	88.1%		100.0%
	30-49	116.5%	96.2%	87.9%	81.5%	100.0%
	50-69	126.5%	112.2%	93.3%	92.9%	100.0%
	70+		118.9%	91.4%	99.8%	100.0%
Total		These are not meaningful				

Source: RGA

When the credibility of the data allows a comparison to be made, adding physical measurements to a non-medical exam seems to improve mortality results.

Non-medical results for both the “application only” and “with physical measurements” groups in the over-70 issue age category look high, but this is primarily due to the large number of policies in this group with face amounts under USD \$100,000.

As they should, paramedical results appear to be a substantial improvement relative to non-medical results for all ages. When looking at the display by issue age, results for medical exams appear better than those for paramedical exams below age 70. Over age 70, the

large number of smaller face amount policies seems to increase raw mortality, causing medical mortality results to look worse than paramedical results.

Conclusion

This article has examined both the prevalence of various underwriting exam types as well as the resulting mortality experience. Both the applicant's age at issue and the amount of insurance being requested had a significant impact on the results of our study. Reasonable care should be applied when interpreting the results.

RGA is currently looking at the mortality results for several other underwriting requirements. These may be covered in future editions of ReFlections. ■

Scott Rushing FSA, MAAA

Vice President and Actuary
Global Research and Development



Scott Rushing is a Vice President and Actuary in the Global Research and Development unit of RGA Reinsurance Company. He is a principal architect of RGA's U.S. Mortality Markets internal experience analysis capabilities, which has turned RGA's data into a key competitive differentiator. He has co-authored several life insurance industry research papers, including a widely publicized paper on the use of prescription drug histories to predict mortality risk, and a study on post-level term mortality and lapse experience sponsored by the Society of Actuaries. Scott earned his Bachelor of Science in Business Administration (B.S.B.A.) degree in Actuarial Science from Drake University, Des Moines, Iowa, and his Master of Arts (M.A.) degree in Statistics from the University of Missouri - Columbia. He is a Fellow of the Society of Actuaries and a Member of the American Academy of Actuaries.

WATCH THIS SPACE

Future issues of ReFlections will feature information about the activities of The Longer Life Foundation (LLF), the not-for-profit partnership between Reinsurance Group of America, Incorporated (RGA) and Washington University in St. Louis's School of Medicine.

Since its inception in 1998, LLF has donated more than USD \$3.1 million, funding to date 61 research grants supporting groundbreaking research. Papers detailing the results of many have been accepted for publication in leading peer-reviewed medical journals.

The research we fund:

- Enables a better understanding of the determinants of morbidity and longevity.
- Improves understanding of mortality and risk selection.
- Improves understanding of essential major public health issues.
- Promotes quality and quantity of life.
- Provides access to the specialists and cutting-edge research facilities of Washington University in St. Louis to help the insurance industry.



You can read more about LLF at www.longerlife.org

Please feel free to contact Dr. Philip Smalley, Vice President and Medical Director, RGA International Corporation, if you have any questions or want more information.

Phillip Smalley M.D., FRCPC

Managing Director

Longer Life Foundation:

A RGA/Washington University Partnership

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NEXT WEBCAST

**May 25
ON DEMAND**

Topic: Moral Hazard and Anti-Selection
Presenter: Tim Rozar, Vice President & Actuary
Client Services, RGA

Target Audience: Pricing actuaries, underwriters and risk management professionals

Insurance consumers have an information advantage over insurance companies: they know more about themselves than the insurance companies could possibly hope to know. This simple fact has a profound impact on the industry's risk assessment process.

This webcast will provide a framework to understand better the impact of asymmetric information on life insurers, giving concrete examples of adverse selection and suggesting ways to bridge the applicant-insurer information gap.

Please contact Debbie Smith (dsmith@rgare.com) to register.

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