

Evaluating Mortality & Disease Risk in the Individual

WIDESPREAD PUBLIC AVAILABILITY OF PERSONALIZED,
SOPHISTICATED, KNOWLEDGE-BASED, INDIVIDUAL HEALTH
RISK PREDICTION ENCOMPASSING KEY THERAPEUTIC AREAS.

Presentation to The 2004 Actuarial Healthcare Conference

University of Warwick April 26th 2004

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Evaluating Disease Risk in the individual

Bulletpoints for UK Actuarial Conference – Warwick April 2004

- Can the actuarial profession now still rely on the past to predict the future?
- What will be the impact of de-novo informed customer power on :
 - traditional actuarial methods?
 - healthcare insurance segmentation and potentially innovative pricing?
 - elasticity of demand for healthcare, life and critical illness cover
 - new business opportunities for agile companies?
 - those companies still using obsolescently static mortality rates?
- How can industry (and governments) proactively benefit by rapidly embracing this massive new information source within their own processes?
- Future impact on actuarial assumptions and risk profiles of the growth of cure by combined genetic profiling and tailored therapy in common, chronic, expensive to treat, non-Mendelian and multifactorial diseases which currently dominate the UK healthcare budget: questions to ask inside and outside any moratorium.
- To what extent can the profession benefit by liaising with other professions to understand the issues that will significantly impact the future?

Evaluating Disease Risk in the Individual

“We live in troubled times, my objective, in my Presidential Term, is to lead the profession through the transition. I expect to see the profession engage in ever-closer relationships of mutual understanding with other professions”

Jeremy Goford, President of the Institute of Actuaries

Evaluating Disease Risk in the Individual

“ Health Insurance is facing the biggest challenges in its history

- * Products are dated
- * Data is unreliable
- * Regulation is overbearing
- * Medical advances are leaving us standing
- * And the customer is still king ”

Simon Jeffrey, Chairman, Organising Committee,
The 2004 Healthcare Conference, Warwick University.

Evaluating Disease Risk in the Individual

- “ -> there will be a massive increase in information relating to :-**
- * the incidence of illness
 - * mortality & demographics
- > Intensification of price competition will reduce profit margins**
- > Need to maximise the potential of new information”**

Richard Willets. Institute of Actuaries Report, March 2004

But much of this information is already with us NOW, unanalysed

SO WE ARE COLLATING AND ANALYSING IT !!

PRESS RELEASE

Actuarial life tables are traditionally based on historical mortality data which is often more than a decade old. However, it is well known that longevity has recently been increasing very rapidly in Europe and the USA. Furthermore, substantial advances in the effectiveness of medical care in many therapeutic areas is having a profound impact on morbidity, mortality, and on healthcare resources consumed throughout a lifetime.

Using a variety of diverse data sources, and sophisticated hitherto-unused analytical techniques, a radical new approach will be presented which will revolutionise the way we predict healthcare outcomes, including morbidity and mortality, and will also show, numerically and graphically, to an individual (or company) the impact of what-if lifestyle changes and pharmaceutical interventions.

As well as opening up many new lines of business in the financial, life, healthcare, pension, annuities and managed care areas, this important new initiative also represents a powerful new source of information that will strongly support actuaries when analysing life, healthcare and annuity data in order to give the sort of advice that is typically required of you.

THERE ARE TWO SEPARATE DATA ISSUES HERE, and BOTH are needed to help the actuarial profession maintain its professional standards of accuracy :-

1. ACTUARIES SHOULD BECOME MORE RESPONSIVE TO RECENT MORTALITY & HEALTHCARE CHANGES.

Actuaries need to **START** to use the diverse data sources that have proliferated in recent years - sift out the quality information - incorporate it into your own calculations & projections

BUT WE ARE ALREADY DOING THIS, and
-> this new initiative is the main subject of my presentation today

2. EXPAND CONSIDERABLY THE CMIB INITIATIVE TO ENCOURAGE COMPANIES FOR MUTUAL BENEFIT ANONYMOUSLY TO SHARE MUCH MORE OF THEIR DATA

This radical approach transformed the pharmaceutical industry, saving some firms billions of pounds.

Evaluating Disease Risk in the Individual

The past decade has seen a massive proliferation of new healthcare data, some of high quality, some less so.

These diverse data sources come in very many forms, but few of these are used by actuaries (who rely on using historical data, such as mortality tables, which might then, say, be suffused and coloured, by underwriters using transformations and segmentations that they know from experience makes a profit for their company).

BUT, longevity, and improvements in healthcare and success rates, are currently in an unprecedented phase of rapid change.

Evaluating Disease Risk in the Individual

Even within the past decade, life expectancy has improved dramatically, as has the success rates for treating, for example, heart disease, and many forms of cancer.

The UK Government & NHS has made radical pledges concerning the success rates of heart attacks by 2007.

Preventative measures, such as anti-cholesterol therapies, are currently changing the entire epidemiological pattern of cardiovascular disease.

Actuaries and their companies need to be contemporaneously responsive to these current rapid developments lest calculations and predictions become seriously anachronistic.

Heart disease - risk factors & treatments

- The government target for reduced deaths from heart disease is 40% by the year 2010
- This equates to an annualised improvement rate of 5% per annum

How should actuaries best embrace such currently rapid changes in mortality, morbidity, and so many profound recent improvements in the delivery of healthcare?

We HAVE a solution!

ONSET OF CHRONIC, EXPENSIVE TO TREAT, DISEASES IN AN INDIVIDUAL IS A PRODUCT OF MANY FACTORS :-

RISK FACTORS ARE PARTIALLY SHARED BY MANY DISEASES

THE INTERACTION BETWEEN DISEASES IS HIGHLY COMPLEX

Vision impairment carries a significantly increased risk of mortality, and of arthritis

McCarty et al, Br J Ophthalmol, 85, 322-326, 2001

Fat intake is not just associated with an increased risk of coronary heart disease, but also of macular degeneration

Cho et al, Am J Clin Nutr, 73, 209-218, 2001

Homocysteine appears to be a risk factor for retinal disease

Martin et al, Eye, 14, 590-593, 2000

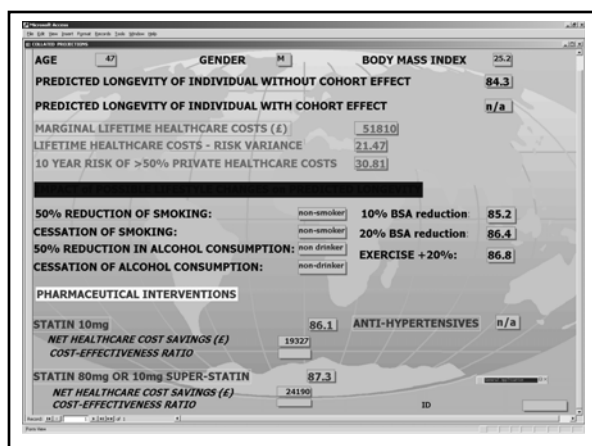
Clinical studies have shown cholesterol to be a strong risk factor for macular degeneration

Hypertension appears to be associated with macular degeneration

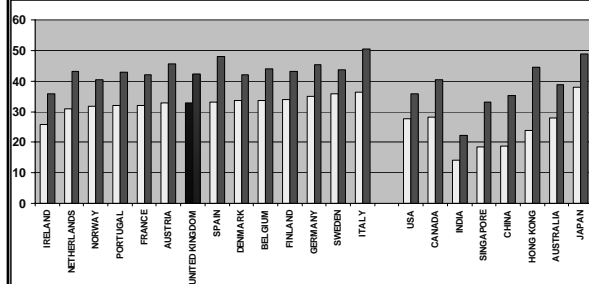
Hyman et al, Arch Ophthalmol, 118, 351-358, 2000

Women on hormone replacement therapy have a reduced risk of cataract and macular degeneration

Snow and Seddon, Int J Fertil Womens Med, 45, 301-313, 2000



Growth in National Populations > 50 years of age from 2000 to 2025



Modelling Disease Risk in the individual

- Current actuarial assumptions would be invalidated by a fundamental shift in expected mortality rates.
- The US has just released new mortality rates based on a cohort of deaths that occurred 20 years ago!
- Current significant improvements in mortality rates will strongly impact actuarial advice now being given for life cover, healthcare insurance, pension provision and value of annuities.

There are 19 bands of car insurance, yet currently only 2 for UK life and health insurance (3 in USA, and 3 at Direct Line, UK).

What will happen to healthcare and life insurance, and annuities, when individuals have transparent access to their own detailed risk profile covering a range of expensive-to-treat diseases?

Predicting Disease and Mortality Risk in the Individual

1. Can the actuarial profession now still rely on the past to predict the future?

Predicting Disease and Mortality Risk in the Individual

**Can the actuarial profession now still rely
on the past to predict the future?**

Whilst the US has just released 'new' mortality tables for actuarial use that are based on cohort data more than a decade old, other reliable sources show life expectancy for babies born in 2000 is now 74.1 years (up 0.2 from 1999), and that the gap in longevity between US males and females narrowed from 7.0 years to 5.5 years between 1990 and 2002.

Predicting Disease & Mortality Risk in the Individual

2. When people can easily assess their OWN healthcare and mortality risk, what will be the impact of this de-novo informed customer power on :-

- traditional actuarial methods?
- healthcare insurance segmentation and potentially innovative pricing?
- elasticity of demand for healthcare, life and critical illness cover
- new business opportunities for agile companies?
- those companies still using obsolescently static mortality rates?

Predicting Disease and Mortality Risk in the Individual

3. How can industry (and governments) proactively benefit by rapidly embracing such a massive new information source within their own processes?

**Predicting Disease and Mortality Risk
in the Individual**

4. Future impact on actuarial assumptions and risk profiles of the growth of cure by combined genetic profiling and tailored therapy in common, chronic, expensive to treat, non-Mendelian and multifactorial diseases which currently dominate the UK healthcare budget: questions to ask inside and outside any moratorium.

**Predicting Disease and Mortality Risk
in the Individual**

5. To what extent can the profession benefit by liaising with other professions to understand the issues that will significantly impact the future?

**This presentation will look into three
therapeutic area examples :-**

- Cardiovascular Disease
- Cataract
- Age-Related Macular Degeneration

CARDIOVASCULAR **DISEASE**

ONSET OF CHRONIC, EXPENSIVE TO TREAT, DISEASES IN AN INDIVIDUAL IS A PRODUCT OF MANY FACTORS :-

- **PHYSIOLOGICAL**
- **ENVIRONMENTAL**
- **GEOGRAPHIC**
- **DIETARY**
- **LIFESTYLE**
- **GENETIC**
- **PHARMACEUTICAL INTERVENTION**

--> Role Of Collating Epidemiological Data

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- **GENETIC**
- **PHARMACEUTICAL INTERVENTION**

MANY of these are options, therefore changeable, but people need good predictive information about benefits of any change.

<p>ONSET OF CHRONIC, EXPENSIVE TO TREAT, DISEASES IN AN INDIVIDUAL IS A PRODUCT OF MANY FACTORS :-</p>	
<p><u>LIFESTYLE CONSIDERATIONS & FUTURE MORTALITY</u></p>	
DIET	-> Time flies like an arrow, fruit flies like a banana
EXERCISE	-> How much, How often?
SMOKING	-> Mortality improvements UK Cohort effect
ALCOHOL CONSUMPTION	-> When Good, When Bad?
<p>What precisely ARE the benefits to a specific individual if they CHOOSE to moderate each or all of these factors?</p> <p>My GP just tells me “to cut down”, but I want to know numbers. MY numbers, MY benefits, at MY current age, MY weight, lifestyle, health status ; THEN I might change.</p>	

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ONSET OF CHRONIC, EXPENSIVE TO TREAT, DISEASES IN AN INDIVIDUAL IS A PRODUCT OF MANY FACTORS :-

DIETARY CONSIDERATIONS and MORTALITY

- Time flies like an arrow, fruit flies STILL like a banana
- Impact of obesity on the individual, & national budgets

Measuring and reporting precise health benefits and improvements in mortality of weight management and dietary change in the slightly overweight, seriously overweight, and the overtly obese at all ages

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**ONSET OF CARDIOVASCULAR DISEASE
IS A PRODUCT OF MANY FACTORS :-**

DIETARY CONSIDERATIONS and MORTALITY

- * World's obese (those of body mass index > 30) now estimated to be 1.7 billion
- * Main cardiovascular problem is abdominal obesity since it increases risk of atherosclerosis far more than overall obesity or peripheral fat mass (Circulation, 2003)
- * Impact of obesity on health will overtake that of tobacco
- * Only 1 in 100 obese people in UK currently on medication

*** Only 1 in 100 obese people in UK currently on medication**

ONSET OF CARDIOVASCULAR DISEASE IS A PRODUCT OF MANY FACTORS :-

Cardiovascular Disease and Mortality - other RECENT issues

- * The number of SEVERLY obese is growing twice as fast as those who are moderately obese (*Archives of Internal Medicine, 2003*)
- * Socioeconomic status in UK men and women between 30 and 40 years of age has a strong influence on their risk of developing coronary artery disease (*British Medical Journal*)
- * Impact of Homocystine/Folic acid
- * Impact of other Government Initiatives
- * Recent impact of anti-cholesterol therapies

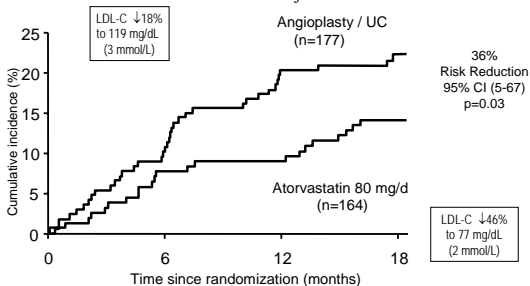
ONSET OF CHRONIC, EXPENSIVE TO TREAT, DISEASES IN AN INDIVIDUAL IS A PRODUCT OF MANY FACTORS :-

PHARMACEUTICAL INTERVENTION and IMPACT ON MORBIDITY & MORTALITY

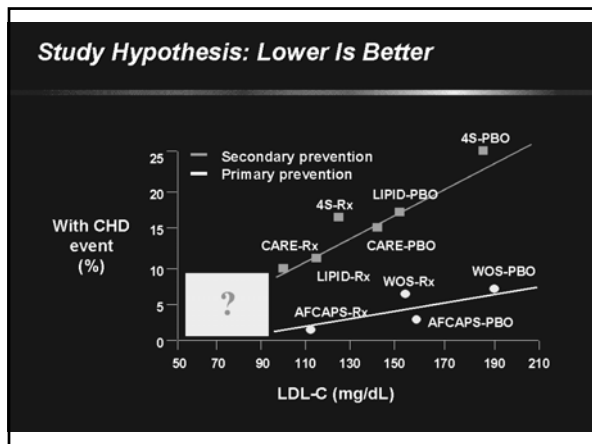
“ If I take this pill the doctor has given me what will it do to my chances of illness later, to my life expectancy? ”

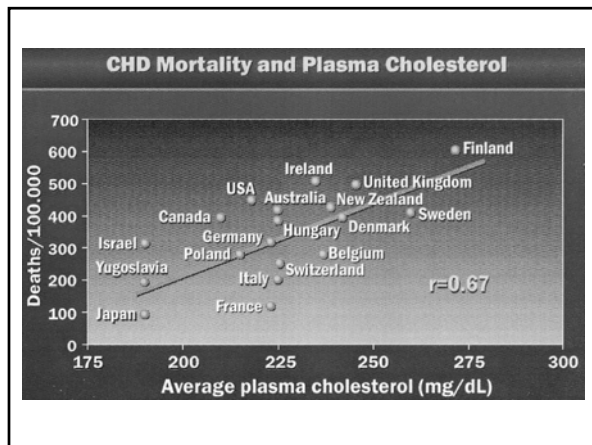
- Anti-hypertensives
- Statins - huge issues of poor compliance, yet benefits for all over-50s are profound for the nation, as well as for a large proportion of individuals on current diets

AVERT Cumulative Incidence of First Ischemic Events



Pitt et al, NEJM 1999; 341:70





- HEALTH ECONOMICS AND PATIENT OUTCOMES CAN BE VIEWED FROM A VARIETY OF PERSPECTIVES**
- Government (*i.e. national perspective*)
 - Patient
 - Family of patient
 - GP
 - Cardiologist / Ophthalmologist / rheumatologist
 - Nutritionist
 - Hospital manager
 - Insurance company
 - Employer
 - Community (*i.e. societal perspective; community/social services*)

DIFFERENT TYPES OF PATIENT OUTCOMES

Clinical

- Signs and symptoms
- Biochemical values
- Morbidity and adverse events; Severity Ratings, Mortality

Patient Satisfaction

- Quality/success of treatment
- Convenience of treatment
- Ability to pay - who pays?

Patient Quality of Life

- Physical function
- Social integration
- Ability to work and/or perform desired tasks

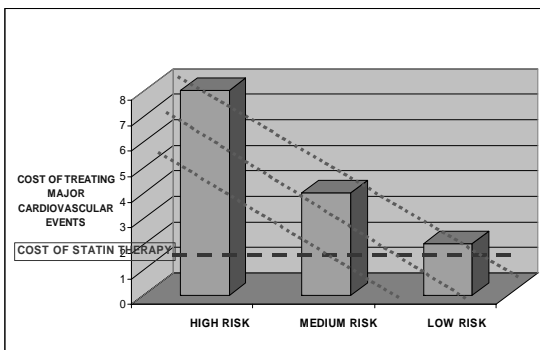
Economic Outcomes *Itemise all resources consumed :-*

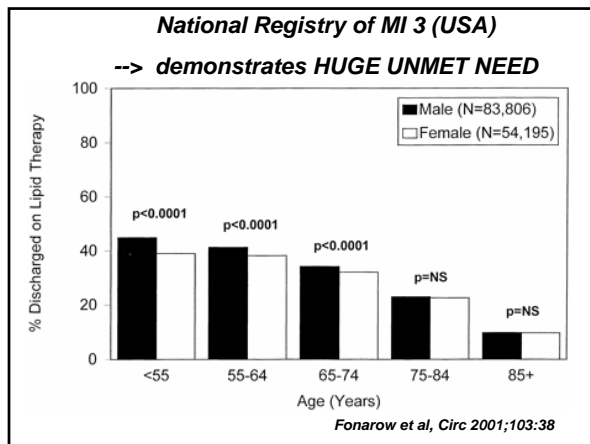
- Cost of procedures, tests, medications etc
- Physician, ophthalmologist and nurse time
- Time off work: employer and employee losses

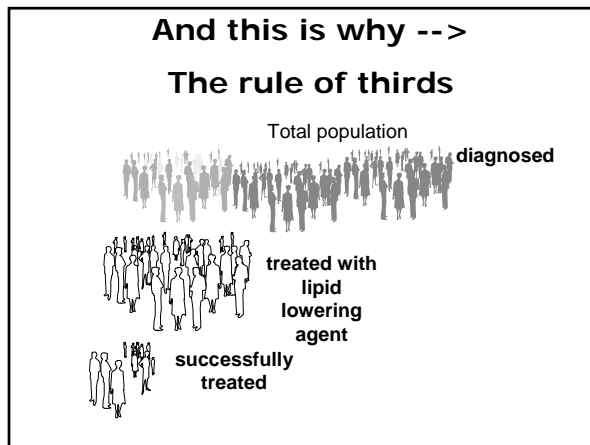
Health Economic Environment of Statins

- Millions of patients already receive statin therapy. Few classes of drug have higher sales. Demographics of ageing population means this usage will increase; therefore, determining their most clinically and cost-effective uses represents an important aim.
- Physicians segment their patients (in terms of cholesterol levels, family history, and lifestyle) into high risk and low to moderate risk groups. High risk patients get medication (+diet +exercise). Others may only get medication after some observation.
- Some statins are aimed more at the patient who requires primary, or secondary, prevention.
- Statins have a good safety profile but compliance can be poor
- Makers of various statins claim different slightly different outcomes all of which impact on cost or resource utilization.
e.g. differences in efficacy, potency, rapidity of action, half life in blood, hydropilicity, side effect profile, needs for liver monitoring etc

RELATIVE COST-EFFECTIVENESS PLANE FOR STATINS







Statins and the Prevention of Coronary Heart Disease

- Studies have shown the cost per year of life gained using statins in patients who have *already* had a myocardial infarction can be less than \$10,000
- This is well under the threshold (\$40-60K) for a treatment to be considered cost-effective
- It has similarly been found cost-effective to give statins to patients with angina

THEREFORE, shouldn't insurance companies be trying strongly to encourage their customers to comply with their prescribed statin therapies? Wouldn't this strategy increase the number of premiums received and, in critical illness cover, in many cases delay or even obviate payout altogether?

ONSET OF CHRONIC, EXPENSIVE TO TREAT, DISEASES IN AN INDIVIDUAL IS A PRODUCT OF MANY FACTORS :-

GENETICS and MORTALITY and TREATMENT and CURE

- ☐ Genetic testing identifies many single gene defects NOW
- ☐ Single gene therapies NOW coming online
- ☐ Gene tests have NOW matured into large scale screening of the entire genome, or just of those 100-200 genes that might be specifically 'involved' in a multifactorial disease process
- ☐ Early preventative multi-gene therapies for some multifactorial diseases (e.g. PRE-overt heart disease & stroke) WILL emerge. This may lead to radical changes in healthcare costing & priorities. Splicing-out 'unwanted' alleles = CURE = ACTUARIAL headaches

RISK PREDICTION IN THE INDIVIDUAL

Several simple risk models for cardiac disease have been generated in recent years. Some are used in GP surgeries to evaluate risk of heart attack in an individual.

Outcome prediction, however, has recently become very much more sophisticated. I recently published a landmark paper accurately predicting cardiac outcome in >600,000 US patients. Software derived from this knowledge-base now forms a major part of patient assessment, informed consent & unit management in hundreds of hospitals around the world.

Until NOW, no-one has yet developed any individual risk model for Cataract, AMD, Stroke, Depression, CNS Diseases, Rheumatoid Arthritis, Diabetes, Asthma, or any of the major forms of cancer.

RISK PREDICTION FOR THE INDIVIDUAL

Establishing a major, multi-disease risk software prediction tool for use in the general population (and in those with disease history)

REQUIREMENTS :-

- ABSOLUTE SCIENTIFIC AND MEDICAL CREDIBILITY
- GROUNDBREAKING STATISTICAL TECHNOLOGY INVOLVING PREDICTIVE MODELS WHICH EMBRACE FULL DISEASE LINKING
- TO SHOW RISK RANGES, AT ALL FUTURE AGES, FOR ALL KEY DISEASES
- TO PROMPT APPROPRIATE G.P. TESTS FOR IMPROVED PREDICTION
- LIFESTYLE "WHAT-IFs" IN TERMS OF EFFECT ON PREDICTIVE RANGE
- SIMPLE END-USER FUNCTIONALITY + VISUALS, with strong copyright protection
- DIRECT LINKS TO OTHER WEB RESOURCES (e.g. WebMD etc)

RISK PREDICTION FOR THE INDIVIDUAL

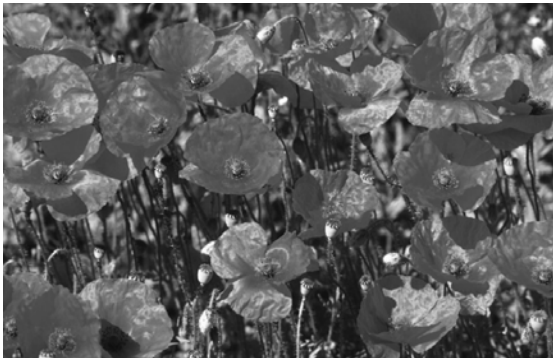
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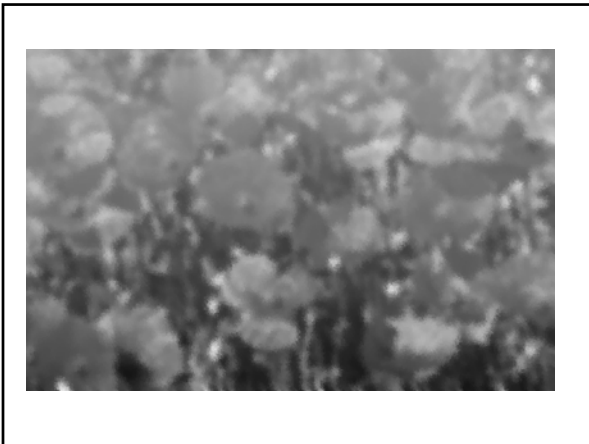
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FOCUSES ON CHRONIC, EXPENSIVE TO TREAT DISEASES

CARDIOVASCULAR DISEASES EYE DISEASES RHEUMATOID ARTHRITIS
MAJOR FORMS OF CANCER CNS DISEASES DIABETES
HYPERLIPIDAEMIA

CATARACT



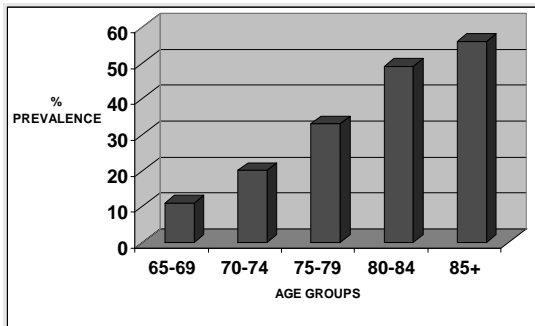








UK - PREVALENCE OF CATARACT



CATARACT

The incidence of cataract starts to rise in the over 50s.

There are about 2.5 million cataract patients over 65 in the UK, some 19.5 million people are at risk (rising to 26 million by 2025)

In the EU, currently 125 million are currently at risk, rising to 169 million by 2025.

By 75-85, most people will have a cataract, and about 50% of these have significant vision loss as a result of the condition.

Risk Factors for Cataract

- Smoking
- Age
- Bright Sunlight
- Low blood vitamin antioxidant levels
- Cardiovascular Disease
- Blood lipid levels
- Blood Homocysteine levels

National Differences in the Epidemiology of Cataract and its Economic Burden of Disease

Cost of Cataract Extraction (and post-operative care)	Total Cases per Year	National Burden of Disease (direct medical costs)
UK £1300	160,000	£208 million
Germany £1100	320,000	£352 million
France £ 929	405,000	£376 million
Italy £1246	245,000	£305 million
USA £1823	1,200,000	£2,188 million

CATARACT

In terms of non-direct and intangible costs, most cataract patients are beyond working age so most do NOT lose income as a consequence of their condition, NOR do many employers lose productivity.

Although financial evaluation is not straightforward, considerable resources are certainly used by community support services, and the family, to manage cataract patients. Swedish Study suggests £244 / patient / year.

In addition, patients certainly suffer substantial loss of quality of life, especially if both eyes are affected.

CATARACT - other costs

Structured questions to patients on cataract waiting list, about community services, such as home help, subsidised travel by taxi, medical treatment at home, visual aids, hospital stay & medical consultation, caused by their symptoms.

The total cost for the community for their 1458 patients on their waiting list for cataract surgery was an estimated SEK 5,200,000. Hospital stay and home help were the largest parts of this community expense.

Thus, the direct costs for society for one year caused by 1458 patients awaiting cataract surgery (with a mean waiting time of 9.8 months) was approximately the same as cataract operations on 800 patients

The cost of cataract patients awaiting surgery.
Stenevi et al, Acta Ophthalmol Scand 2000

Quality of Life and Time Trade-off

Can we put a value on quality of life ?

Studies show that patients with poor vision would trade between 2 and 6 years of perfect vision for every 10 years of life they have remaining

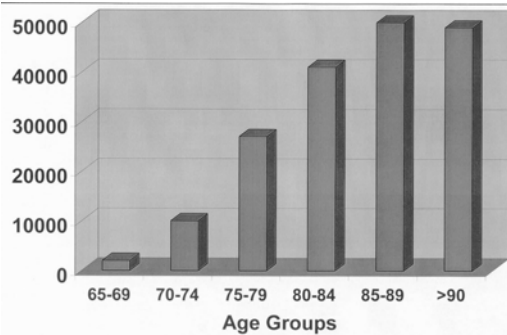
Age-Related
Macular
Degeneration
(AMD)

AGE-RELATED MACULAR DEGENERATION (AMD)



- Loss of central vision in the elderly
- Rarely leads to total blindness
- Reading, writing and recognition become difficult
- INADEQUATE TREATMENT

Age distribution of cases of Macular Degeneration in the UK (*Fletcher*)



Risk Factors for Macular Degeneration

- Smoking
- Age, gender
- Solar Radiation
- Low blood vitamin antioxidant levels
- Genetics - positive family history. Iris Colour
- Cardiovascular Disease
- Cholesterol and blood lipid levels
- Blood Homocysteine levels

Seddon et al

(Archives of Ophthalmology, August 2001)

showed a *direct* relationship between the dietary fats and the risk of developing advanced age-related macular degeneration

Cho et al

(Am J Clin Nutrition, Feb 2001)

Showed total fat intake to be associated with risk of AMD, and suggested a high intake of fish

Dietary fat modification	Antioxidant vitamins,
Homocysteine/folate	Statins

Age-Related Macular Degeneration

In most patients there is no definite treatment for macular degeneration. Only 10% of AMD patients would benefit from the currently available therapy, drug-laser treatment. Not a cure, at best it merely halts progression of the disease.

The cost of the Visudyne drug-laser treatment is ~ £1500. The process is carried out as a day case. But patients might need up to 5 treatments over the first two years, i.e. £7,500, although the realities of this will take time to become clear.

For the remaining AMD patients (>>90%) there is no therapy, although perhaps restoring adequate levels of antioxidants and lutein may also halt the progression of their disease. There is a suggestion that lutein can actually reverse the occurrence of the early signs (drusen) of AMD

Age-Related Macular Degeneration

Few patients in the UK, perhaps ~99% currently receive drug-laser therapy. The majority of AMD patients, therefore receive absolutely no therapy.

This means the costs to the country are just the eye examination (perhaps £60), plus extra nursing requirements in a proportion of patients in whom both eyes are affected.

Therefore, the direct total cost to the NHS of managing 99% of AMD patients is ~ £20 million for the 340,000 patients, but probably less because many AMD patients have a better eye.

AGE-RELATED MACULAR DEGENERATION

genetic +/- environmental basis to disease?

- **Number of AMD patients set to increase rapidly**
- **No reliable and lasting treatment**
- **Prevention**
 - at what age should we begin preventive measures, such as dietary antioxidant and lutein supplementation?
For clinical reasons? For economic reasons?
For reasons of maintaining patient quality of life?

Martin et al (Eye, 2000) 'concluded that homocysteine may be a risk factor for retinal vascular disease and could be simply and cheaply treated with folate and vitamins B6 and B12'

Plasma total homocysteine and retinal vascular disease.
Martin SC et al, Eye, 2000

There is a growing body of published evidence that SEVERAL diseases of the elderly all benefit from antioxidant vitamin supplementation.

In the elderly, dietary vitamin intake is either insufficient for their needs, or perhaps vitamin bioavailability is progressively compromised.

For example, patients with cataracts and/or macular degeneration are known to have a HIGHER incidence of coronary heart disease, and there is ALSO an association of both ocular and cardiovascular diseases with rheumatoid arthritis.

- > **CARDIOVASCULAR DISEASE**

AGE, SMOKING, BLOOD PRESSURE, GEOGRAPHY
DIETARY FAT, ANTIOXIDANTS, EYE DISEASE,
HOMOCYSTEINE/FOLATE, STATINS, ACE INHIBITORS

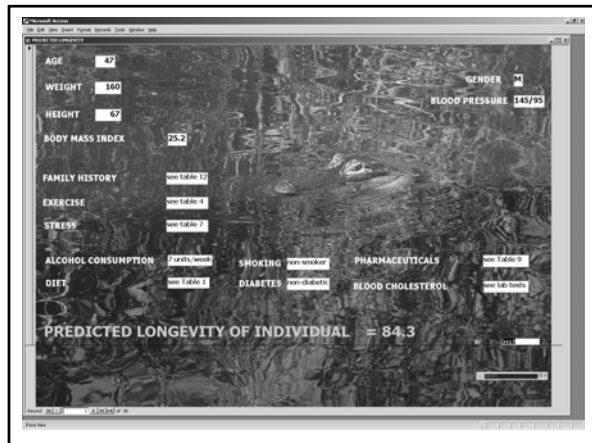
- > **CATARACT**

- > **MACULAR DEGENERATION**

AGE, SMOKING, GEOGRAPHY, VITAMINS C and E,
LUTEIN, IRIS COLOUR, CARDIOVASCULAR DISEASE,
STATINS?

- > **RHEUMATOID ARTHRITIS**

- > **DEPRESSION**



RISK PREDICTION FOR THE INDIVIDUAL

THREE MAIN SOFTWARE COMPONENTS :-

1. RISK PREDICTION IN EACH INDIVIDUAL

- Covers the year-by-year future risk of getting a range of major diseases based on information given by the individual
- GRAPHICALLY shows RISK RANGES, at all future ages, for all key diseases

2. SOFTWARE HIGHLIGHTS UNANSWERED QUESTIONS THAT WOULD IMPROVE PREDICTION RANGE(S)

- e.g. prompting of appropriate G.P. tests for improved prediction

3. LIFESTYLE "WHAT-ifs" IN TERMS OF EFFECT ON DISEASE PREDICTION

- + SIMPLE END-USER FUNCTIONALITY and GRAPHICS
- + DIRECT LINKS TO OTHER WEB RESOURCES (e.g. WebMD etc; GP IT systems)

RISK PREDICTION FOR THE INDIVIDUAL - 1

REQUIRES ABSOLUTE SCIENTIFIC & MEDICAL CREDIBILITY

and also

GROUNDBREAKING STATISTICAL TECHNOLOGY INVOLVING PREDICTIVE MODELS WHICH EMBRACE FULL DISEASE LINKING

Complex algorithms produced by the statisticians will be populated by the data derived from many diverse, relevant data sources

RISK PREDICTION FOR THE INDIVIDUAL - 2

SHOWS RISK RANGES, AT ALL FUTURE AGES, FOR ALL KEY DISEASES

Updates to be produced each year, in perpetuity, revising the previous year's data and algorithms as new information becomes available, or is published.

RISK PREDICTION FOR THE INDIVIDUAL - 3

PROMPTING OF APPROPRIATE G.P. TESTS FOR IMPROVED PREDICTION

One advantage of such an innovative approach is that the ranges of disease risk given by the software to the answers each individual can provide may be tightened considerably by the results of appropriate tests (blood pressure, cholesterol etc). The rationale, and relative importance, of any new test can be shared with the individual who can choose to have the test and input the result into the risk modelling software. The individual would have a vested interest in doing so, and the result is that more tests that **SHOULD** be done, **WILL** be done - i.e. it improves primary care and disease prevention.

STRONG NEED TO INTERFACE WITH PRIMARY CARE ELECTRONIC SYSTEMS

LIFESTYLE "WHAT-IFs" IN TERMS OF EFFECT ON PREDICTIVE RANGE

Rather than a patient hearing from their GP that they **SHOULD** stop smoking -> for the first time each individual will see **THEIR** absolute risk of developing a range of key diseases at all ages in their future, and then can also see - **NUMERICALLY** - how specific lifestyle changes (smoking, diet, drugs) will directly affect the risk. It's powerful - and will fundamentally affect how people view their risk of ill health.

SPEAKER'S CORNER

A TIME FOR EMBRACING, EVEN SHARING, SEVERAL POWERFUL NEW SOURCES OF HEALTHCARE & MORTALITY INFORMATION THROUGHOUT THE ACTUARIAL PROFESSION

Presentation to The 2004 Actuarial Healthcare Conference

University of Warwick April 26th 2004

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Evaluating Disease Risk in the Individual

“future increases in life expectancy, increasing awareness of the risk of providing longevity insurance, may well lead to worsening annuity rates. There is a lack of readily available information on the mortality assumptions being used in practice. Actuaries should be clear in spelling out the nature of the risks behind the promises they are making”

Richard Willets. Longevity in the 21st Century.
Institute of Actuaries & Faculty of Actuaries Report, March 2004

Evaluating Disease Risk in the Individual

**“ Health Insurance is facing the
biggest challenges in its history**

- * Products are dated**
- * Data is unreliable**
- * Regulation is overbearing**
- * Medical advances are leaving us standing**
- * And the customer is still king ”**

**Simon Jeffrey, Chairman, Organising Committee,
The 2004 Healthcare Conference, Warwick University.**

Evaluating Disease Risk in the Individual

I intend briefly to address 3 of these 5 key issues :-

1. *Products are dated*
- > 2. Data is unreliable
3. *Regulation is overbearing*
- > 4. Medical advances are leaving us standing
- > 5. And the customer is still king

Evaluating Disease Risk in the Individual

-> Current data used by actuaries is unreliable

BUT, THERE ARE TWO IMPORTANT NEW WAYS FOR THE ACTUARIAL PROFESSION TO START TO ADDRESS THESE CURRENT DEFICIENCIES AND ANACHRONISMS IN THE AVAILABILITY OF APPROPRIATE & RELEVANT HEALTHCARE INFORMATION

IN FACT, MUCH USEFUL EXTRA DATA IS OUT THERE, IT'S ABOUT COLLATING MANY DIFFERENT SOURCES

Evaluating Multi-Disease Risk in the Individual

1. Use more sophisticated forms of analysis on what you have but, more importantly, start to use the many additional, but currently unused, data sources that are out there, growing. In recent years there has been a massive proliferation of data that's relevant to you, but it's been overlooked by actuaries and companies because it needs collation and sophisticated analysis to be useful

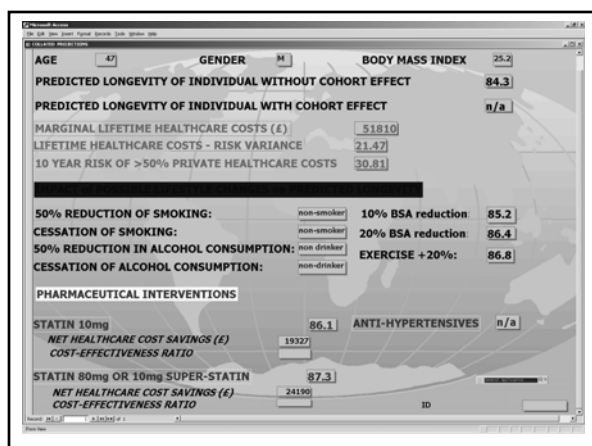
Coming from a multi-therapeutic area background of patient outcomes prediction in complex multivariate risk-factor studies involving hundreds of thousands of patients, how this approach will improve your own professional evaluations in a rapidly changing healthcare environment is the subject of my other presentation later

ONSET OF CHRONIC, EXPENSIVE TO TREAT, DISEASES IN AN INDIVIDUAL IS A PRODUCT OF MANY FACTORS :-

- PHYSIOLOGICAL
- ENVIRONMENTAL
- GEOGRAPHIC
- DIETARY
- LIFESTYLE
- GENETIC
- PHARMACEUTICAL INTERVENTION

--> Role Of Collating Epidemiological Data





The later presentation will look into three therapeutic area examples :-

- Cardiovascular Disease
- Cataract
- Age-Related Macular Degeneration

Also, some aspects of the FUTURE IMPACT OF GENETICS --> what mayhem COULD happen to actuarial predictions when more sophisticated genetic therapies start to be used, perhaps even prophylactically, on what represents your own thematic mainstream; chronic, expensive to treat, serious diseases.

Evaluating Disease Risk in the Individual

2. As a profession, share data better amongst yourselves

A successful precedent exists for this - pharmaceuticals

By 1993, 600 fiercely independent pharmaceutical companies were each spending tens of millions of pounds on each of their many clinical trials.

They each cut deals with the thousands of hospitals that undertook these trials for them, but because of confidentiality concerns, no-one knew what each other was paying each hospital.

Furthermore, no-one knew the structure of anyone else's clinical trial. With no external benchmarks, some trials were hopelessly inefficient, over-lengthy, over-detailed, costly. Whilst all usually satisfied government regulatory requirements, the *differences* between costs of 'similar' clinical trials were often astronomical.

Evaluating Disease Risk in the Individual

2. As a profession, share data better amongst yourselves

The pharmaceutical precedent - 2 :-

So, because hospital charges and clinical trial structures were not shared between companies BILLIONS of pounds were inefficiently squandered for years UNTIL one company persuaded a large number of the big drug companies to share all their data in one big anonymized pool. Results were then delivered back to the companies as reports, and as software -> trends, quartiles, ratios and, in the case of the thousands of hospitals - EXACTLY what each of the others had paid for each of the 1000s of tests (x-rays, lab tests etc) and the % of overheads charged. Again, up to an amazing 1000 fold variance of charges emerged, even within the same hospital!

Evaluating Disease Risk in the Individual

2. As a profession, share data better amongst yourselves

The pharmaceutical precedent - 3 :-

No pharmaceutical company EVER saw the RAW data of their competitors, yet on receiving the reports and software, all of them found many therapeutic areas in which they could become more efficient, whether by choice of hospital, by newly-informed negotiating power, or by amending their clinical trial structures to a quicker and more efficient format.

The parallel with your own industry is obvious. Having now spoken to many professionals in insurance & reinsurance, this particular outsider to your industry believes that something similar could be gained in your profession, to the benefit of all.

Evaluating Disease Risk in the Individual

2. As a profession, share data better amongst yourselves

The pharmaceutical precedent - 4 :-

For example, if insurance and reinsurance companies permitted the sharing of certain commercial data, tables, and sub-groupings etc - with the anonymized information, held impartially, say, by the Institute of Actuaries or CMIB, it could be analysed and returned in a mutually acceptable format back to UK actuaries and their companies as an unique resource to assist with many of their professional decisions. In this way, as with the drug companies, everyone would benefit. This approach is also consistent with the declared aim of the CMIB of improving the understanding of UK mortality trends.

Evaluating Disease Risk in the Individual

2. As a profession, share data better amongst yourselves

The pharmaceutical precedent - 5 :-

On discussing my suggestion, I feel many UK actuaries are intuitively keen on this idea, and I believe there is a significant chance of buy-in by the companies themselves if the clear benefits to them could be presented with sufficient enthusiasm and the Institute supported this approach, towards perpetuity.

Whilst I am currently wondering whether I should establish a formal Institute to handle all the data and analytical perspectives that my own initiative will produce, I also find myself wondering if I haven't stumbled upon a superb new central role for the Institute of Actuaries and/or CMIB in fostering a central repository of shared, anonymized data.

Predicting Disease Risk in the Individual

- As a profession, share data better amongst yourselves

Am I being heretical? You can make it happen if you want to.

I believe my suggestion represents an important step forward, and consistent with the absolute professionalism with which actuaries, the Institute, & the CMIB, would wish to be viewed.

The Institute, and the CMIB, COULD take a more active, strong central repository role in collating far more data from companies than they do at present - to the mutual benefit both of industry, individual companies, and your actuarial membership.

I have recently discussed this notion with your president, Jeremy Goford, who has supported that this suggestion be forwarded via Peter Nowell, the Chairman of the CMIB, for formal discussion.

Evaluating Disease Risk in the Individual

--> 4. Medical advances are leaving us standing

We know very well that people are living longer

-> your '1992 mortality tables 'will just NOT do now'

For example, irrespective of epidemiological changes in prevalence, cardiac and cancer management have improved out of all proportion in the last few years, and near-future projections make it a nonsense not to update your data as best as possible - especially as the information is already out there, albeit hard to collate.

Key Conclusions from :- “ Mortality in the Third Millenium ” *Richard Willets, Institute of Actuaries Report*

- Mortality rates for elderly people are set to improve at a faster rate than ever before.
- Life expectancy at retirement will surge upwards.
- The new CMI basis will probably *underestimate* the extent of the improvement.

Critical Illness - major areas of “concern”

*Richard Willets,
Institute of Actuaries Report, March 2004*

- Earlier diagnosis of cancer
- Low-grade cancers (e.g. prostate)
- Increasing cancer incidence
- Increasing use of CABG & angioplasty
- Improved detection of micro-strokes & mini-heart attacks
- Genetic testing
- Weak definitions
- Anti-selection

“We are on the eve of a genetic revolution which will see a leap in the cure rates for cancer...”

Cancer may not be cured by 2050, but it will be beaten and the disease will be as readily controlled as diabetes.”

Professor Gordon McVie

Evaluating Disease Risk in the Individual

--> 5. And the customer is still king ??

Well, here’s another, but converse, issue of professionalism:

Man, non-smoker, aged 27, wants critical illness cover. Father had a heart attack at age 32. Man is offered double premium. But, IF a closer inspection were allowed --> father, a smoker ALL his life, is STILL alive, aged 67!

Perhaps, a ‘fairer’ approach to the man would be to have his two main ‘exonerating’ details factored in, then maybe pay for his own cholesterol measured, and possibly have an echocardiogram to exclude hypertrophic cardiomyopathy. But there is NO forum for this - yet the customer is king? Surely in 2004, he should now receive knowledgeable, appropriately professional assessment by ALL those involved in offering his critical illness cover.

Evaluating Disease Risk in the Individual

--> 5. And the customer is still king

“ I cannot imagine any of the critical illness policies I sell today having much relevance in 2-3 years time. What’s more, the basis of pricing for policies will have to change out of all proportion.”

“ And yes, the trigger points for many of the policies I write are all wrong, totally out of sync with the rapidly improving success rates of patient care. I mean, do you realise that lots of people are having ‘serious’ cardiac events that would have killed or disabled them just a few years ago, but modern treatment often gets them out of hospital in a couple of weeks, likely destined to live a full lifespan, & enjoying it spending their big critical illness cheque !”

- these are also key areas where the in-built, up-to-date nature of our new data initiative, will be uniquely supportive for all actuaries.

THE FUTURE

*Richard Willets,
Institute of Actuaries Report, March 2004*

- There will be a massive increase in information relating to:-
 - the incidence of illness
 - mortality & demographics
- Intensification of price competition will reduce profit margins
- Changes in distribution may reduce market imperfections and increase the risk of anti-selection
- Hence the need to maximise the potential of the new information (which is where our new initiative comes in)

THE FUTURE

- The time is right for the compilation of a state-of-the-art resource that will provide actuaries, other professions, & even individuals, with unprecedented access to far better personal risk factor information than has hitherto been available.
- Our new initiative seeks to achieve this goal by collating information from a large number of high quality sources that have become available in recent years yet have traditionally not been embraced by actuaries because their collation is not straightforward and its analysis is, by its nature, highly complex.
- It’s use, though, will be straightforward. For actuaries, it will provide improved mortality and morbidity predictive information, plus predictive costs of likely future healthcare resources to be consumed in key therapeutic areas. It will even offer, for the first time, lifestyle what-ifs for individuals in relation to their lifestyle options, & pharmaceutical usage.
