

RGA Claims and Underwriting Seminar

Brought to you by LADUCA

“Diabetes Update”

Dr Paul Davis – Chief Medical Officer, RGA International

“Trauma Insurance In Our Markets”

What History Tells Us & What the Future May Bring

Michael Renny – Technical Risk Consultant, RGA Australia & New Zealand



diabetes update

Paul R Davis MB BS HONS FRACP

Medical Director RGA International - Sydney

2011

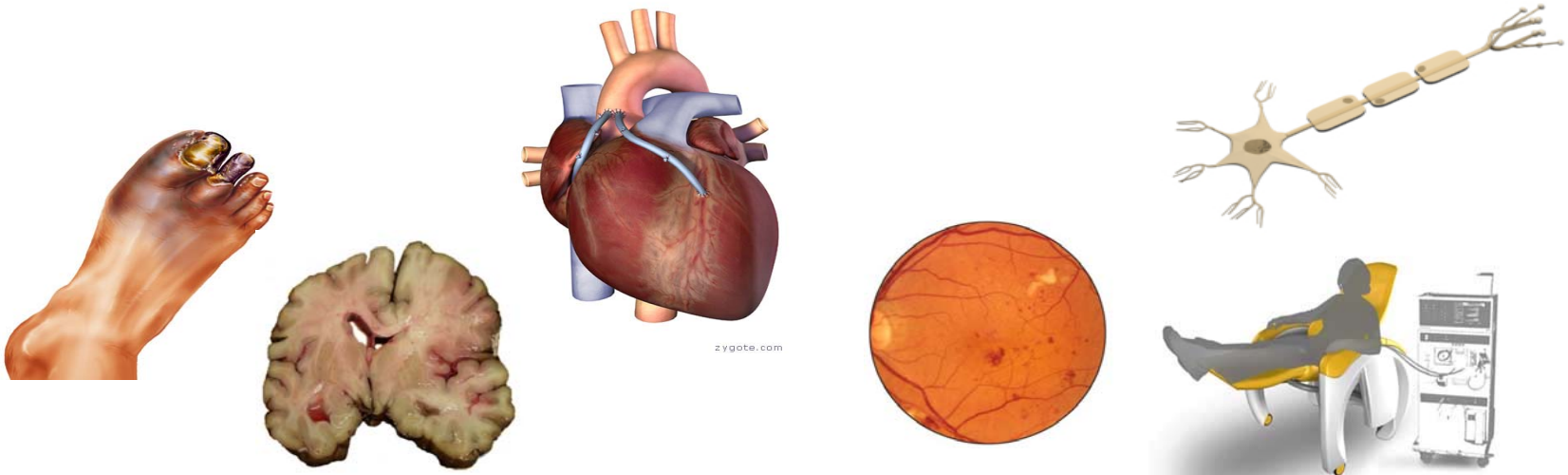


130 years of experience. The power of innovation.

www.rgare.com

type 2 diabetes

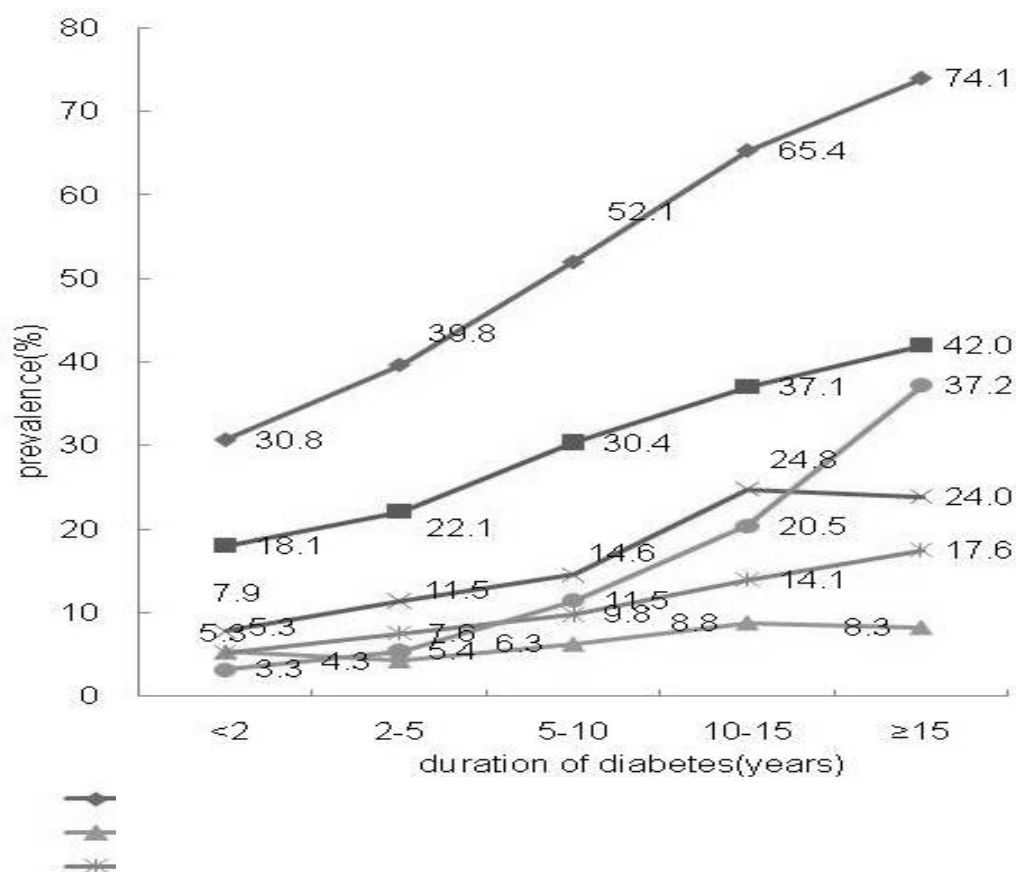
- a disease characterized by hyperglycaemia
- results from defects in insulin action or secretion or both
- precipitates organ failure
- doubles vascular events
- doubles vascular mortality
- responsible for 10% all vascular deaths - T2DM prevalence 8%
- doubles all cause mortality
- MR 200%



relative risk of complications vs population

	Age Standardized Relative Risk Ratio (DM over General Population)	
	Male	Female
death & disability	201%	185%
blindness	359%	297%
stroke	339%	275%
ESRF	557%	518%
CABG	149%	179%
cancer & CIS	125%	130%

type 2 diabetes & chronic complications



all

cardiovascular

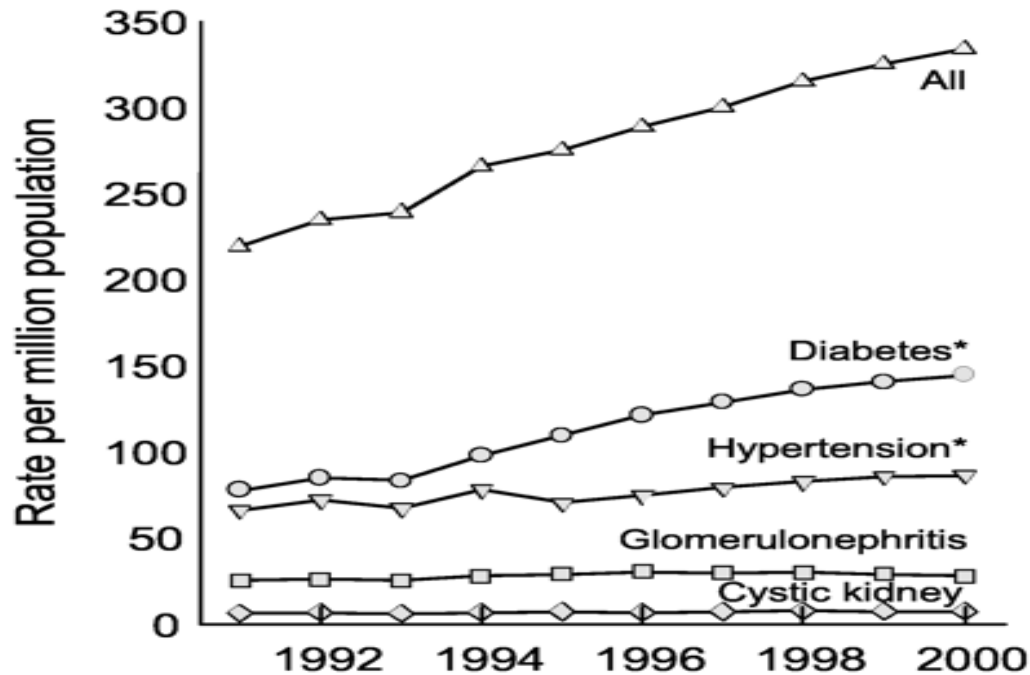
eye

neuropathy

renal disease

stroke

end stage renal failure by cause



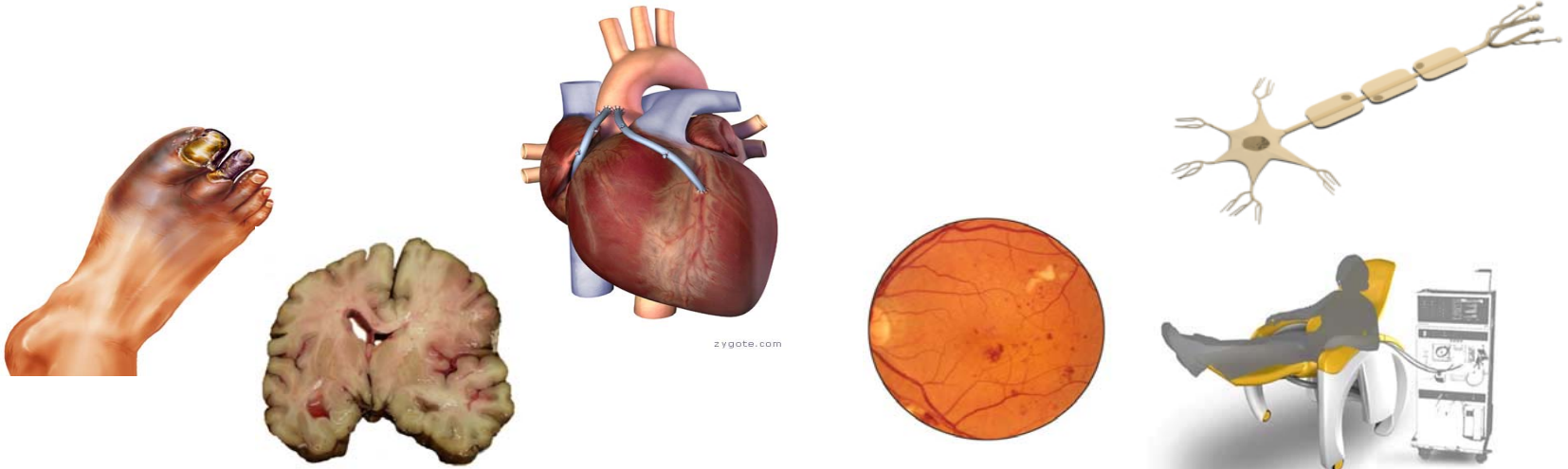
*These disease categories were treated as being mutually exclusive.

USRDS

Australian numbers on dialysis increasing 6% per year

T2DM all cause mortality by age - UK

Age (years)	Men hazard ratio (CI ₉₅)	Women hazard ratio (CI ₉₅)
35–54	3.35	3.07
55–64	2.21	3.28
65–74	1.84	2.44
75–84	1.58	1.97
85–89	1.44	1.65
All	1.77	2.13

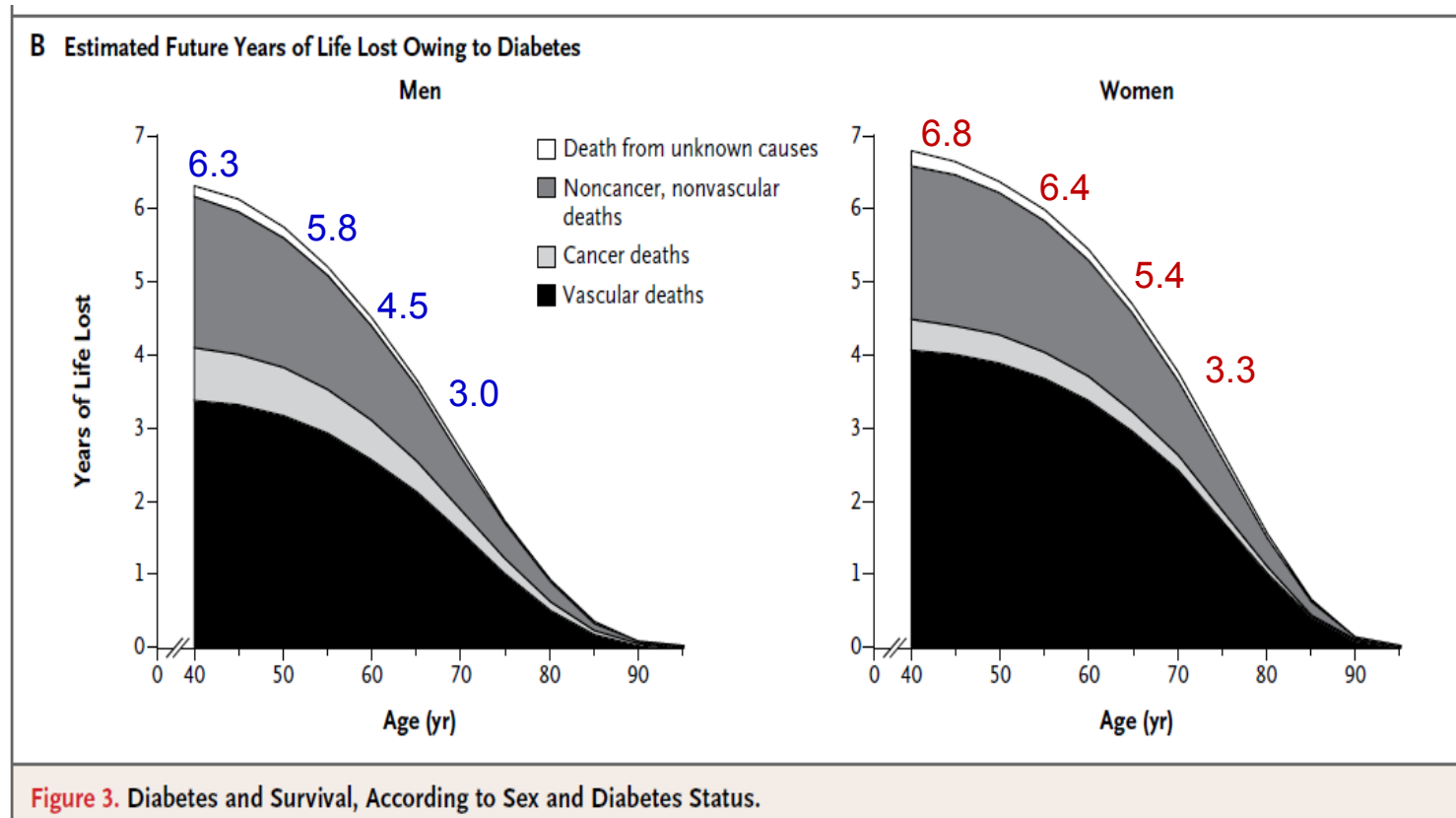


type 2 diabetes & risk of dying

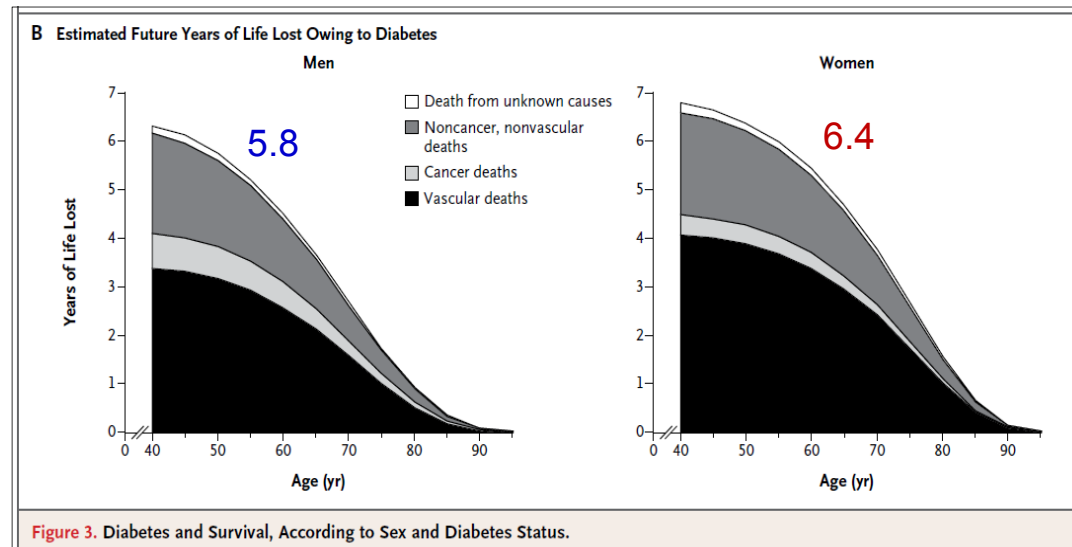
Variable	Hazard ratio
Male sex	1.33
Diabetes duration < 5 years	Reference
Diabetes duration 5–9 years	1.14
Diabetes duration 10–14 years	1.27
Diabetes duration ≥ 15 years	1.38
Current smoker	1.50
Ex-smoker	1.25
Non-smoker	Reference
BMI 15–19 kg/m ²	1.38
BMI 20–24 kg/m ²	Reference
BMI 25–29 kg/m ²	0.97
BMI 30–34 kg/m ²	1.13
BMI 35–54 kg/m ²	1.43

years of life lost from diabetes by cause

diabetics with known vascular disease excluded



years of life lost and extra mortality



		LE Ins	LE pop	em ins	em pop
6 yrs life lost	M 50	34.6	31.6	101	100
	F 50	37.8	35.3	108	107

excess all cause mortality in DM with cancer

Long-term All-Cause Mortality in Cancer Patients With Preexisting Diabetes Mellitus

Table 3. Pooled Hazard Ratios of Long-term, All-Cause Mortality in Cancer Patients With and Without Preexisting Diabetes Mellitus in Selected Cancer Sites

Cancer Site	Studies (Estimates), No.	Total Patients, No.	Patients With Diabetes, No.	Pooled HR (95% CI) ^a	I ² , %
Endometrial	4 (4) ^{40,42,46,48}	2900	429	1.76 (1.34-2.31)	44.3
Breast	4 (4) ^{40,41,43,45}	13 019	1107 ^b	1.61 (1.46-1.78)	0
Prostate	3 (3) ^{37,40,47}	6264	555 ^b	1.51 (0.94-2.43)	47.1
Gastric	3 (3) ^{37,40,50}	6200	687 ^b	1.36 (0.92-2.01)	83.6
Colorectal	6 (7) ^{33,34,36,37,39,40}	54 740	8028 ^b	1.32 (1.24-1.41)	52.4
Hepatocellular	3 (5) ^{30,37,44}	3724	848 ^b	1.30 (0.99-1.70)	68.9
Lung	4 (5) ^{29,37,38,40}	11 109	989 ^c	1.15 (0.99-1.34)	47.7
Pancreas	4 (4) ^{28,37,40,49}	1681	477 ^b	1.09 (0.70-1.69)	73.4

type 2 diabetes & vascular outcomes

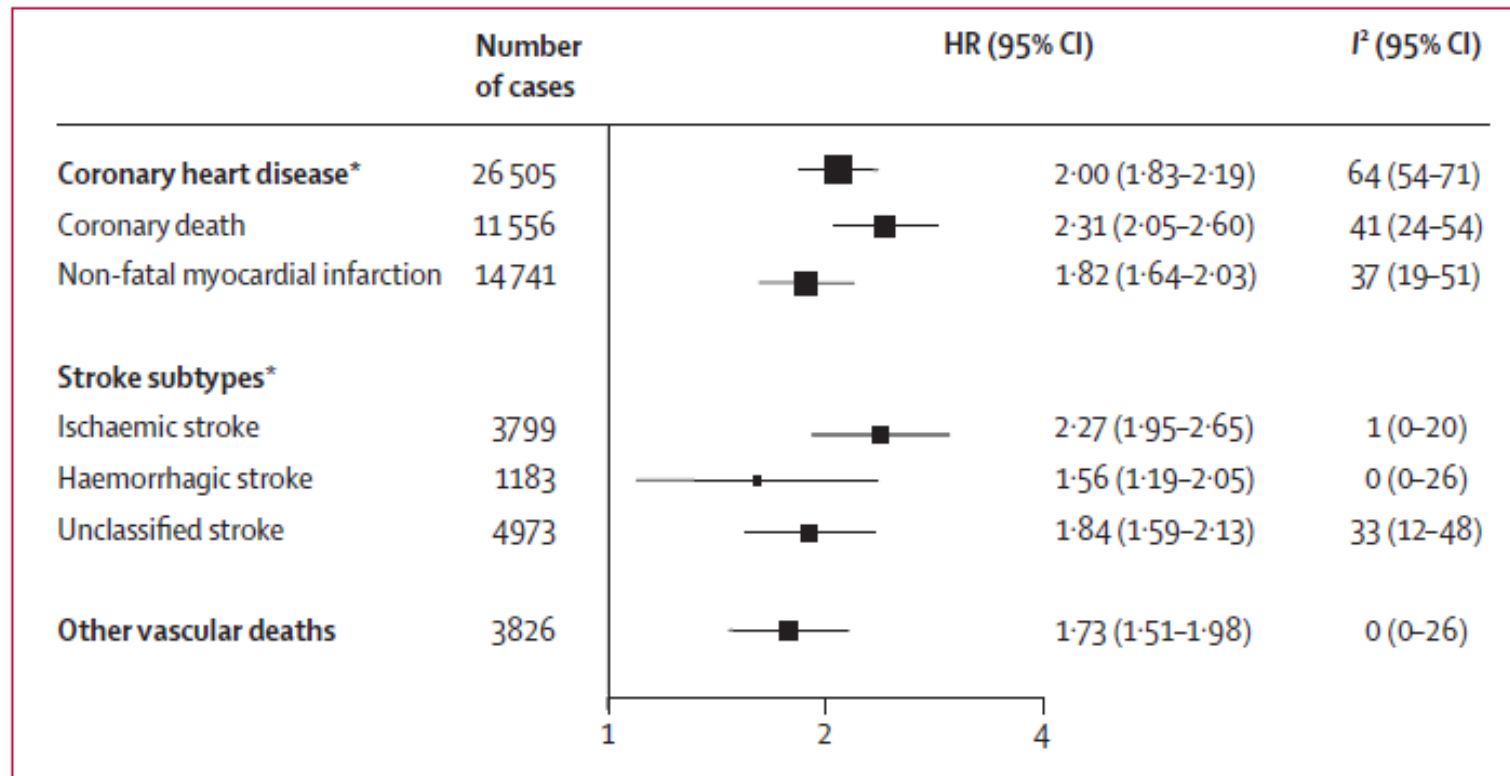


Figure 1: Hazard ratios (HRs) for vascular outcomes in people with versus those without diabetes at baseline

* fatal & non fatal CAD events

risks for macrovascular events

Table 2 Increase/decrease in relative risk^a, holding everything else constant, for different types of macro-vascular events and death from a change in risk factors levels

Risk factor (units)	Myocardial infarction, %	Other IHD, %	Congestive heart failure, %	Stroke, %	Event fatality, %	Diabetes mortality, %	Other mortality, %
HbA _{1c} (1% increase)	13 (7–18)	13 (6–21)	17 (5–31)	14 (5–23)	12 (1–24)	—	—
Systolic blood pressure (10 mmHg increase)	11 (5–16)	10 (3–19)	12 (0.4–25)	32 (21–43)	—	—	—
Total:HDL cholesterol (1 unit increase)	24 ^b (0–55)	31 ^b (0–74)	—	12 (7–18)	—	—	12 (2–22)
Smoking	41 (17–71)	—	—	43 (0.4–103)	—	—	36 (3–79)

Figures are means (95% confidence intervals).

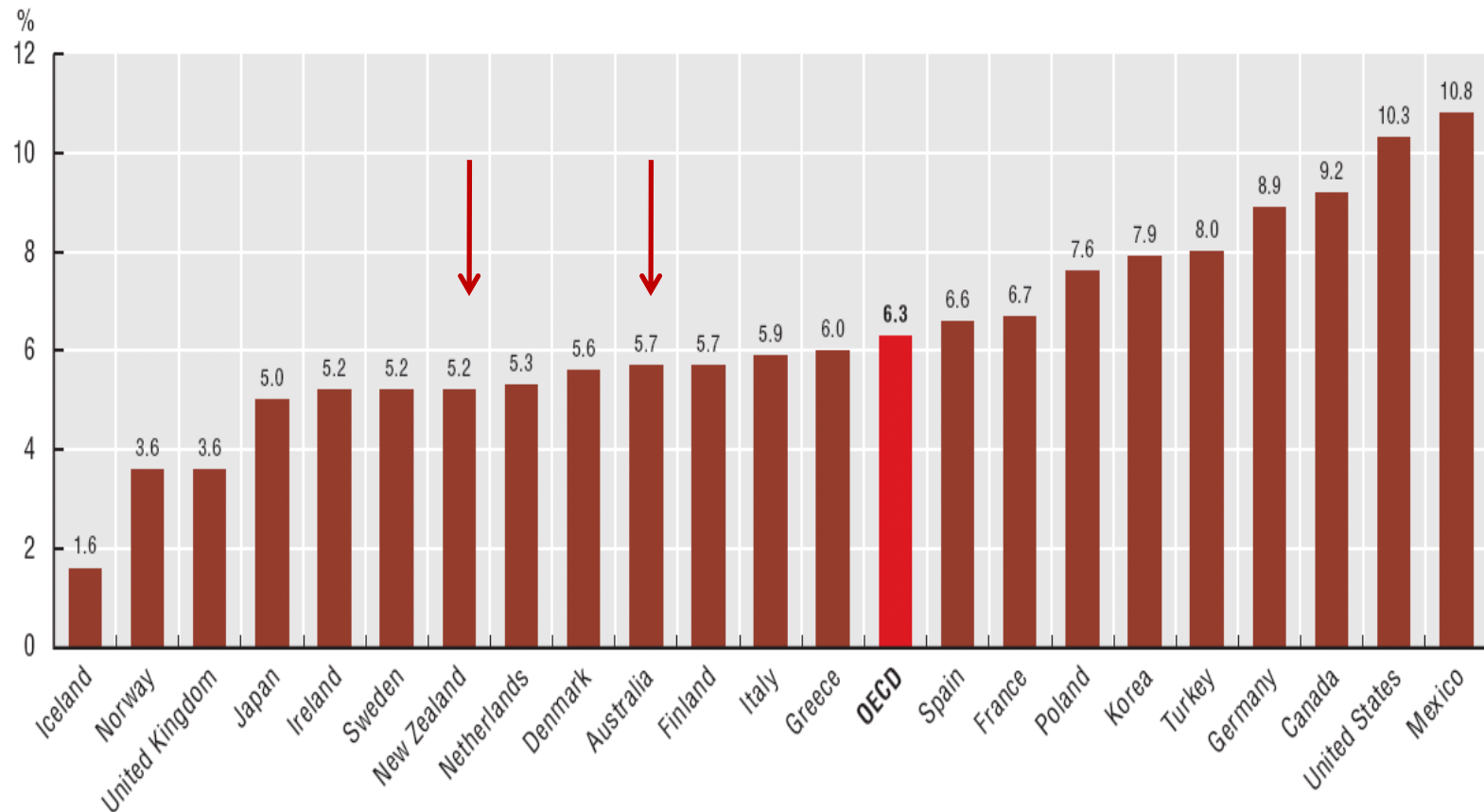
^aCalculated using hazard ratios from UKPDS 68¹⁶ where a positive(negative) value means increase(decrease) in relative risk.

^bEstimated from the UKPDS outcomes model using a patient aged 55 years with the average risk factor levels of the UKPDS population.¹⁷

type 2 diabetes & cause specific death

- Emerging Risk Factors Collaboration
- 97 prospective studies with data for cause specific death
- HR for cause specific death
 - 1.80 any cause
 - 2.32 vascular death
 - 1.25 cancer death
 - 1.73 non vascular non cancer death
 - 1.88 cause of death unknown

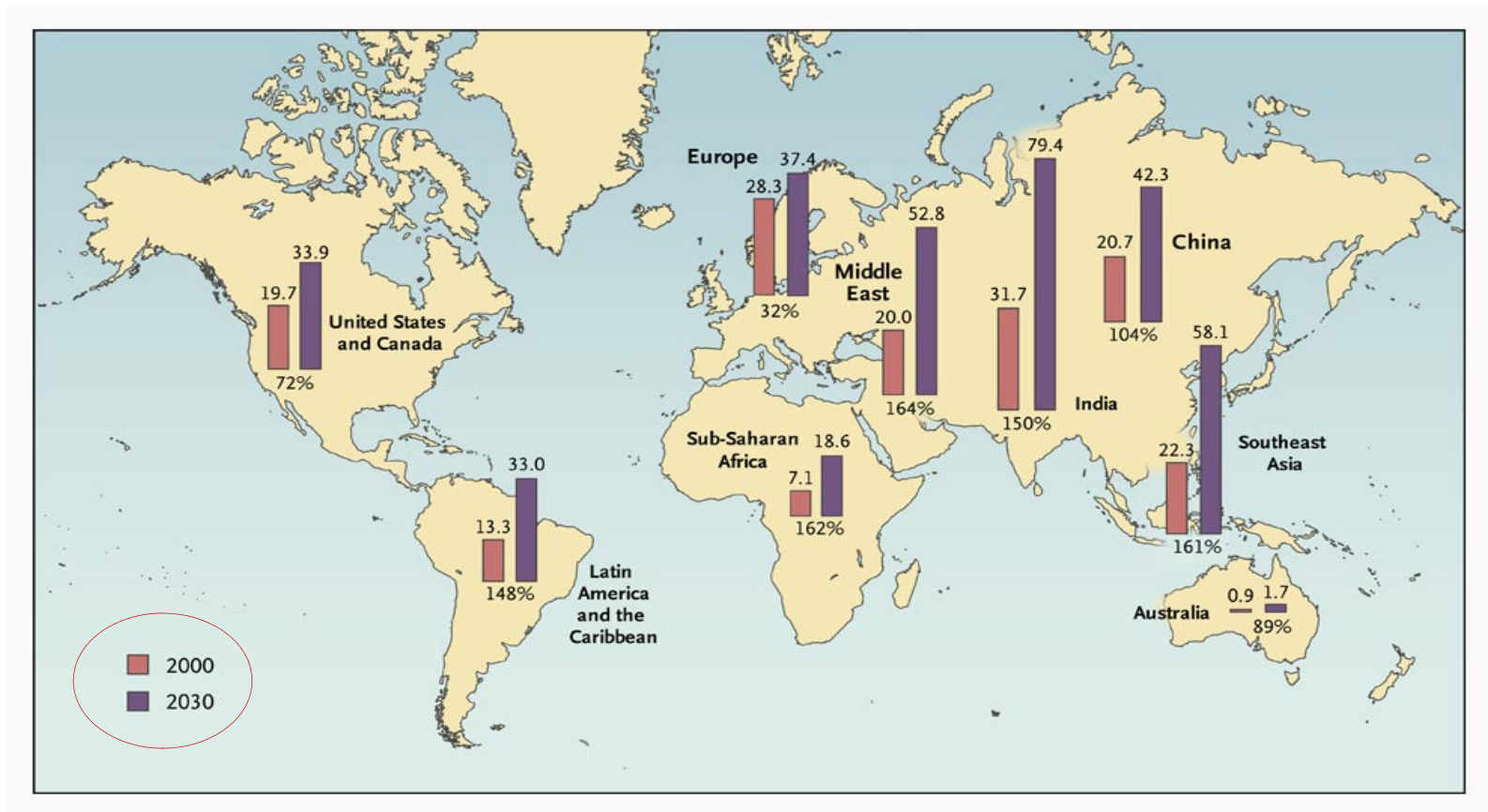
global prevalence of diabetes 2010



Note: The data are age-standardised to the World Standard Population.

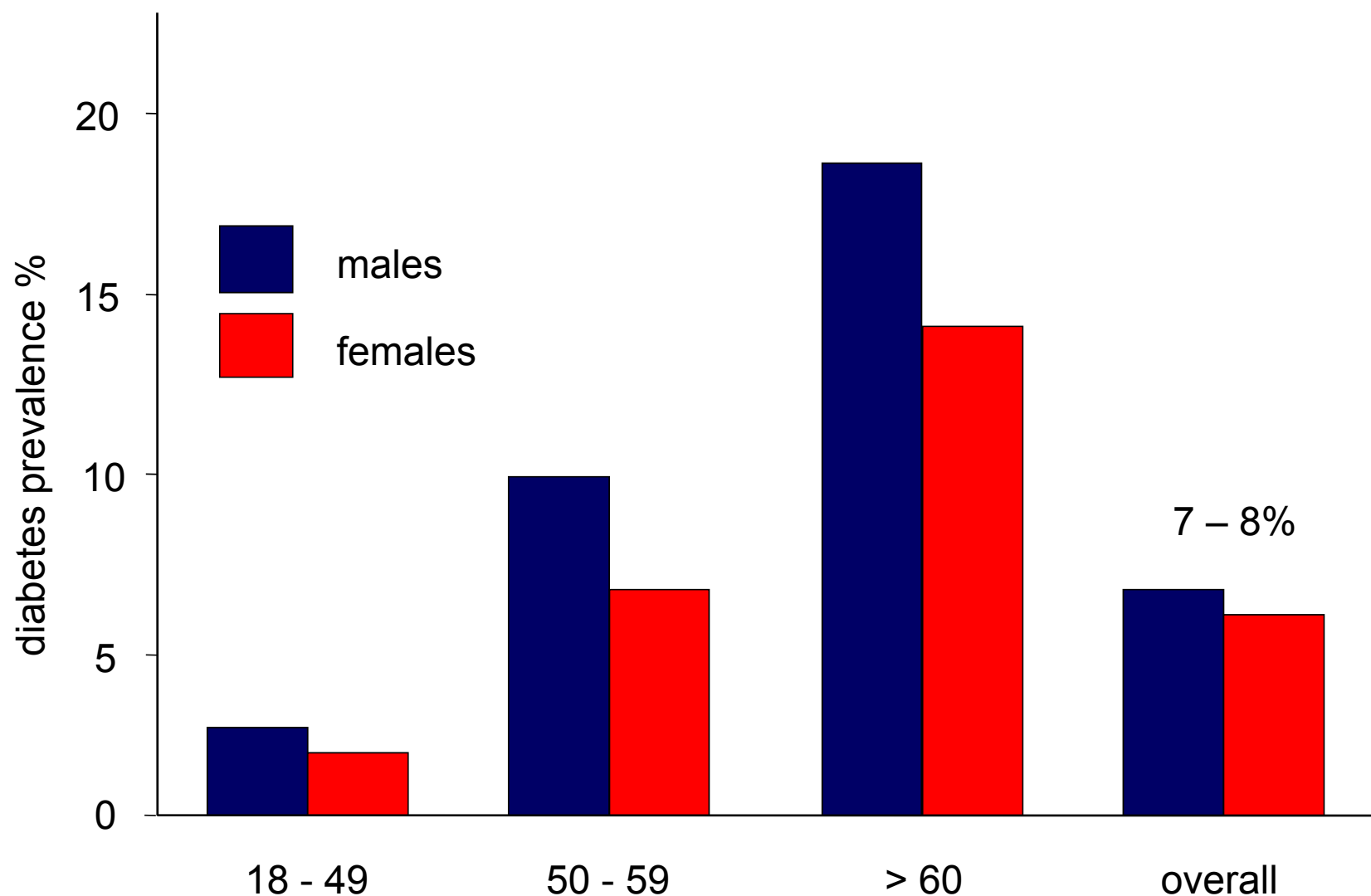
age 20 - 80

predicted T2DM prevalence increase

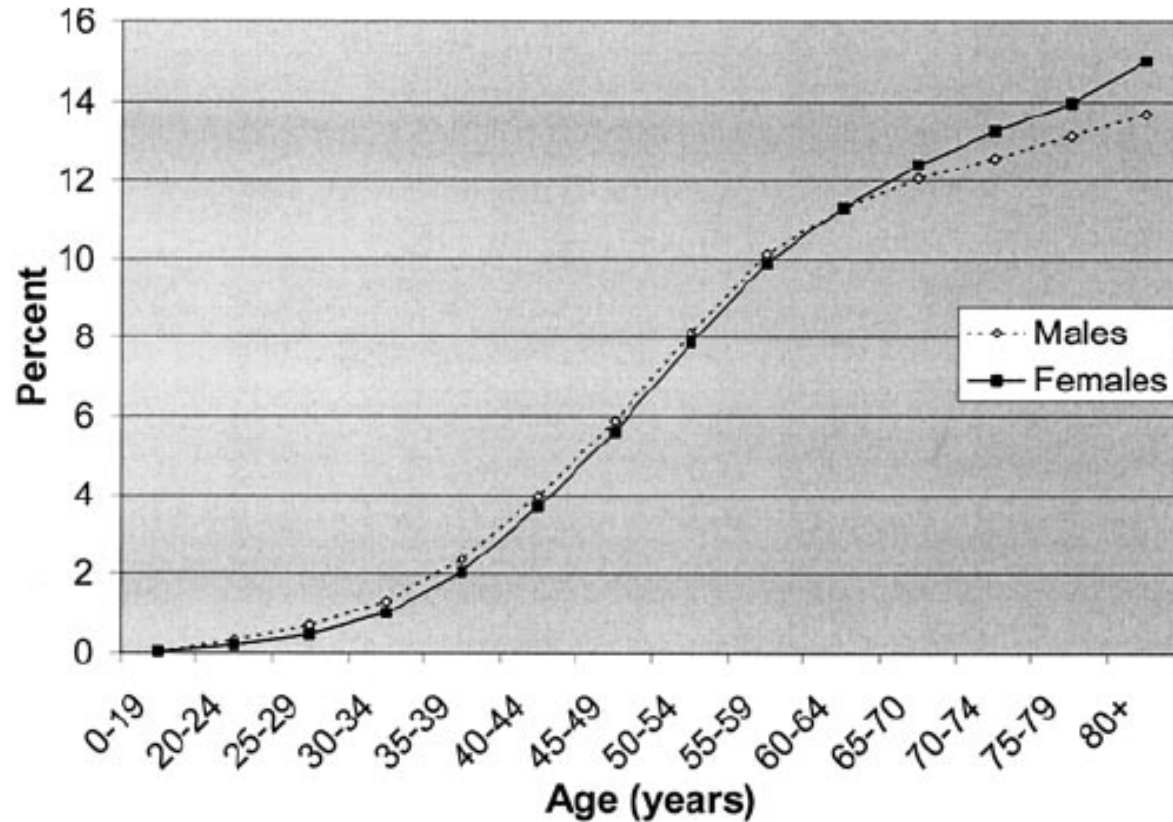


millions of population

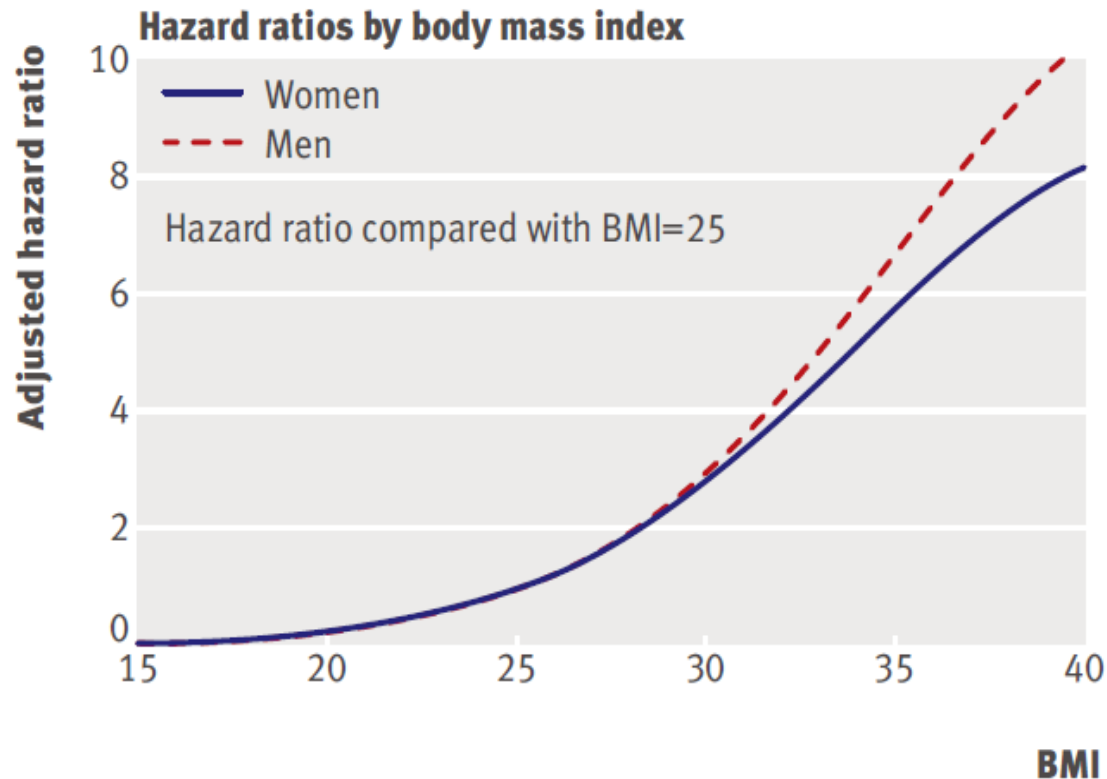
diabetes prevalence in ANZ adults



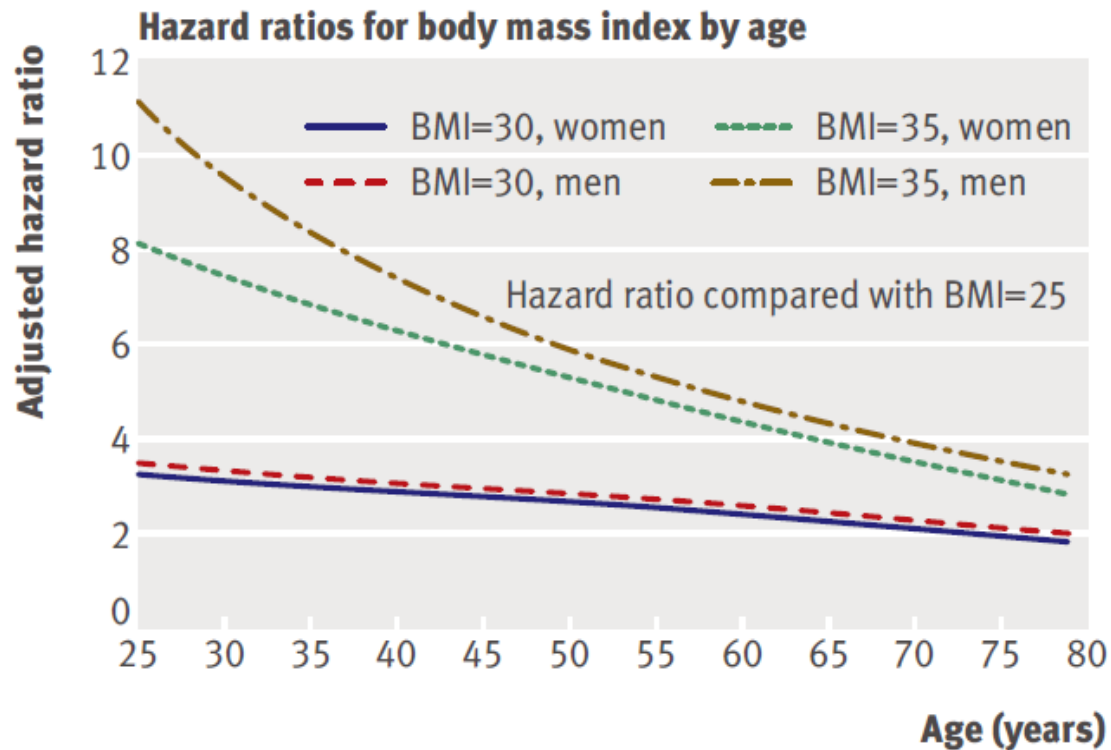
diabetes prevalence by age



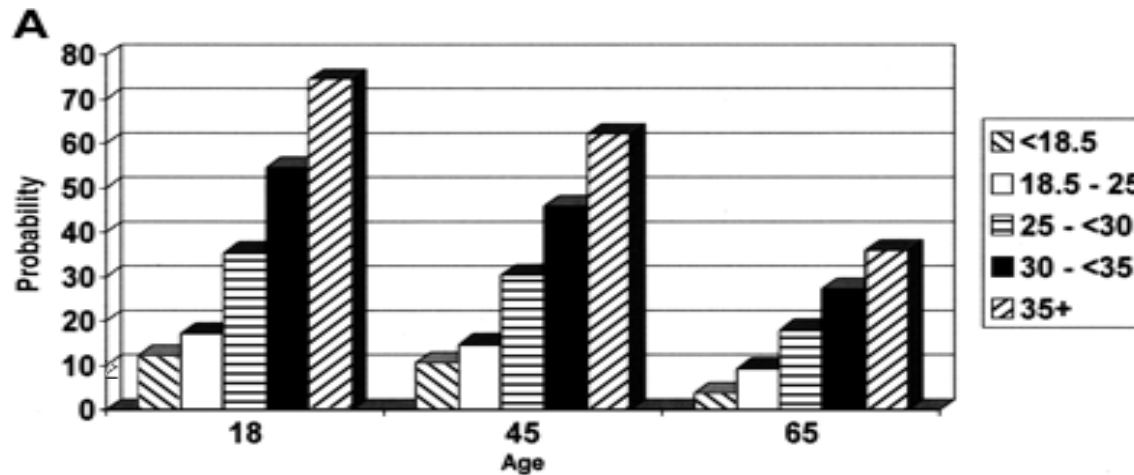
risk of diabetes by BMI



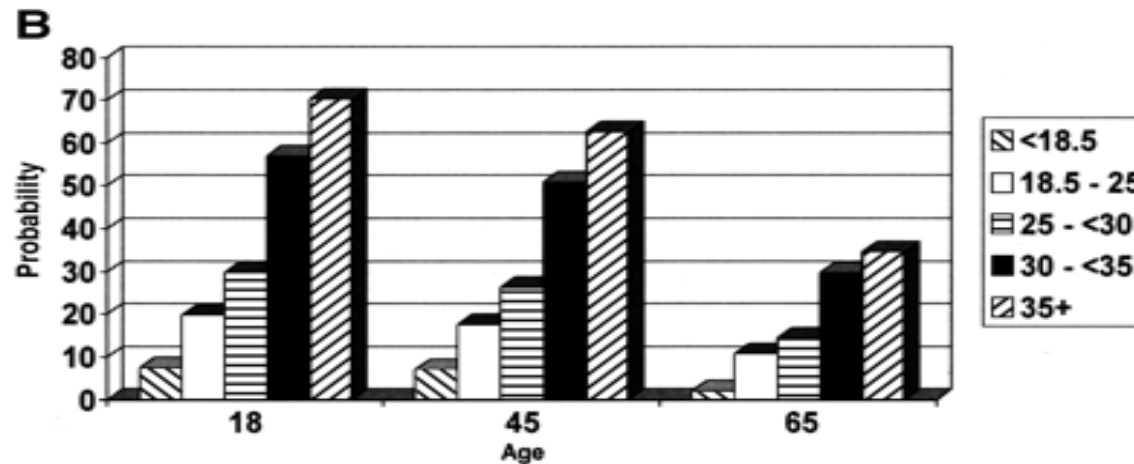
risk of developing diabetes by BMI & age



risk of developing diabetes by BMI & age

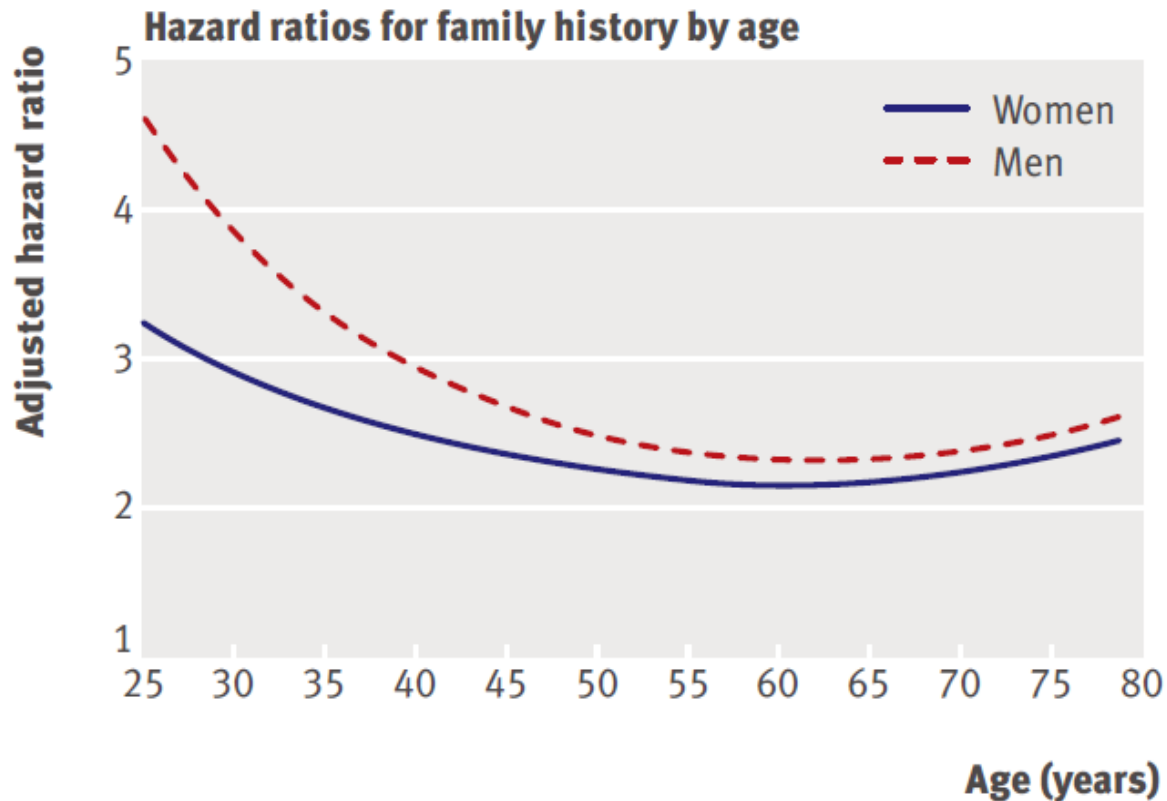


females

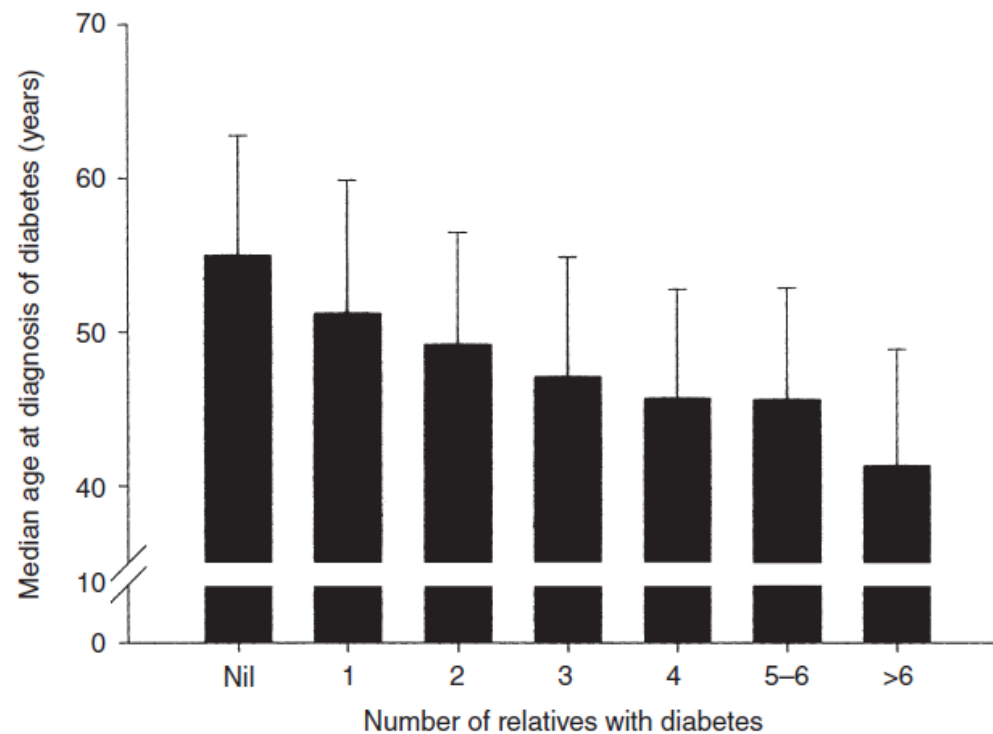


males

risk of diabetes with family history by age



Strong family history predicts a younger age of onset for subjects diagnosed with type 2 diabetes



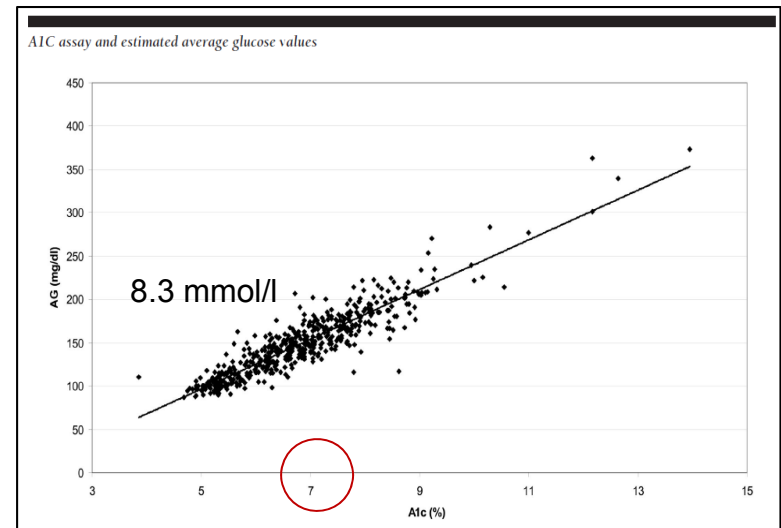
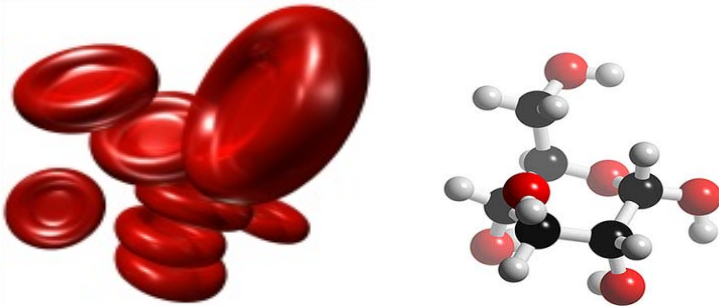
diabetes & pre diabetes risk

Table 3. Multivariable-Adjusted Odds Ratios for Diabetes and Prediabetes.*

Variable	Total Diabetes	Prediabetes
	Odds Ratio	Odds Ratio
Male sex	1.26	1.06
Age, per 10-yr increment	1.68	1.37
Family history of diabetes	3.14	1.32
Less than college education	1.57	1.17
Overweight†	1.43	1.42
Obesity‡	2.17	2.05
Systolic blood pressure, per increase of 10 mm Hg	1.17	1.12
Triglycerides, per increase of 50 mg/dl (0.56 mmol/liter)	1.28	1.20
Urban residence	1.22	0.90

diabetes control by HbA1c

- blood glucose binds to red cells
- glycosylated haemoglobin
- HbA1c
- red cell life span is 3 months
- glucose saturation of red cells → control over 3 months



red cell lifespan 90 days

diabetes control by HbA1c

HbA1c 7.0%

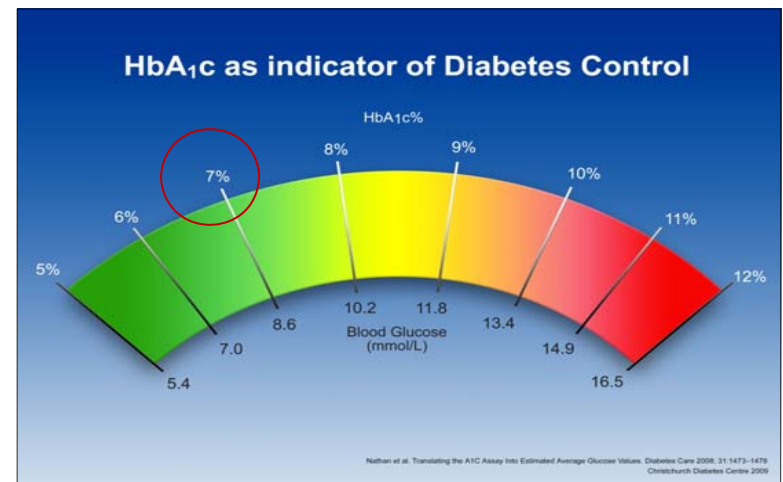
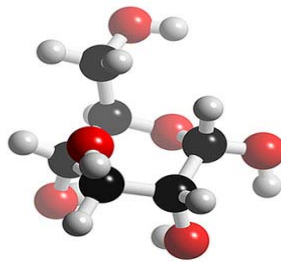
- reduces retinopathy
- reduces neuropathy
- reduces nephropathy
- reduces non fatal MI & non fatal stroke (?)

HbA1c <6.0%

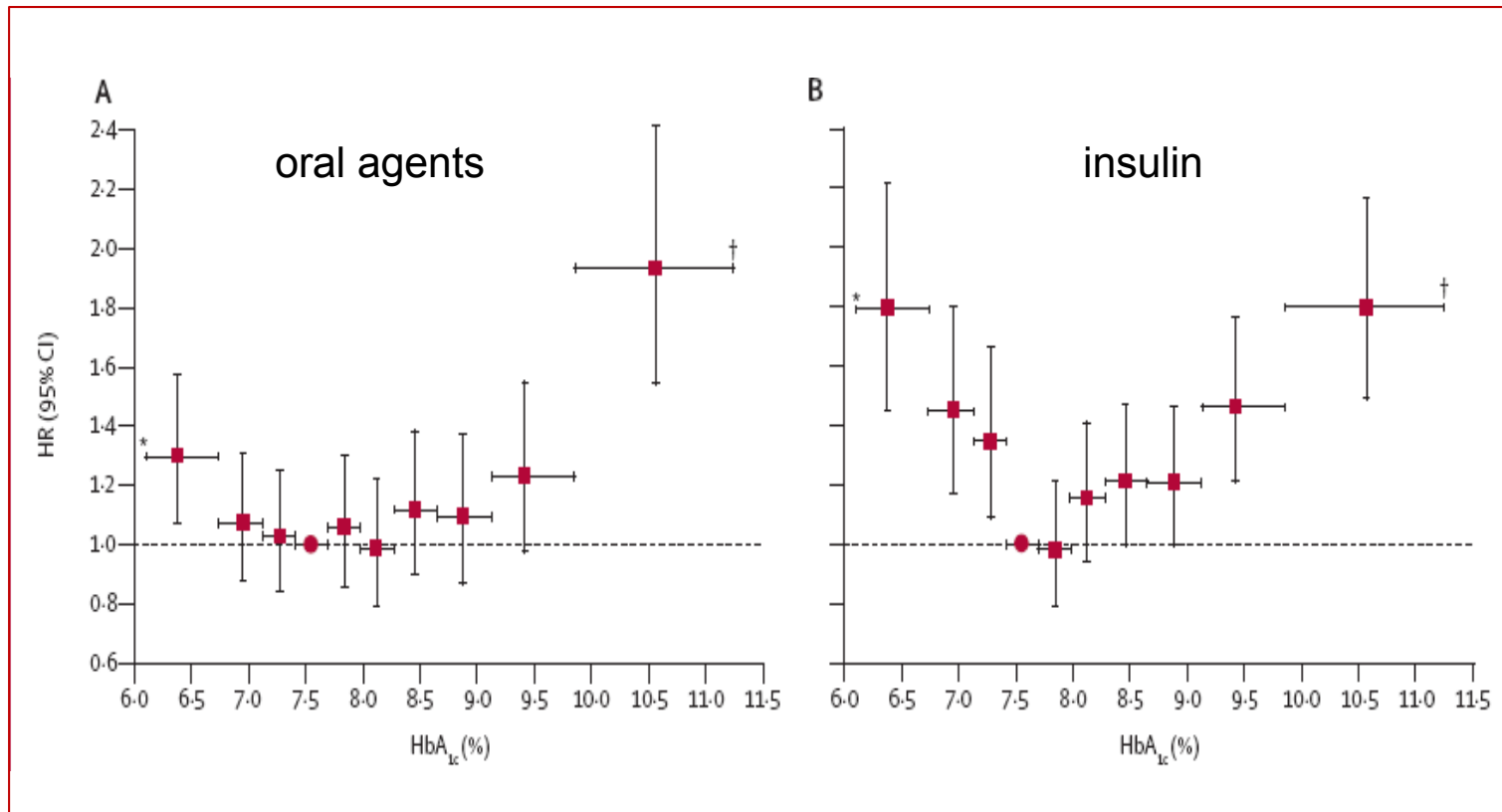
- 20% increase in all cause mortality in diabetics - ACCORD

HbA1c < 4.0%

- increases all cause mortality in non diabetics

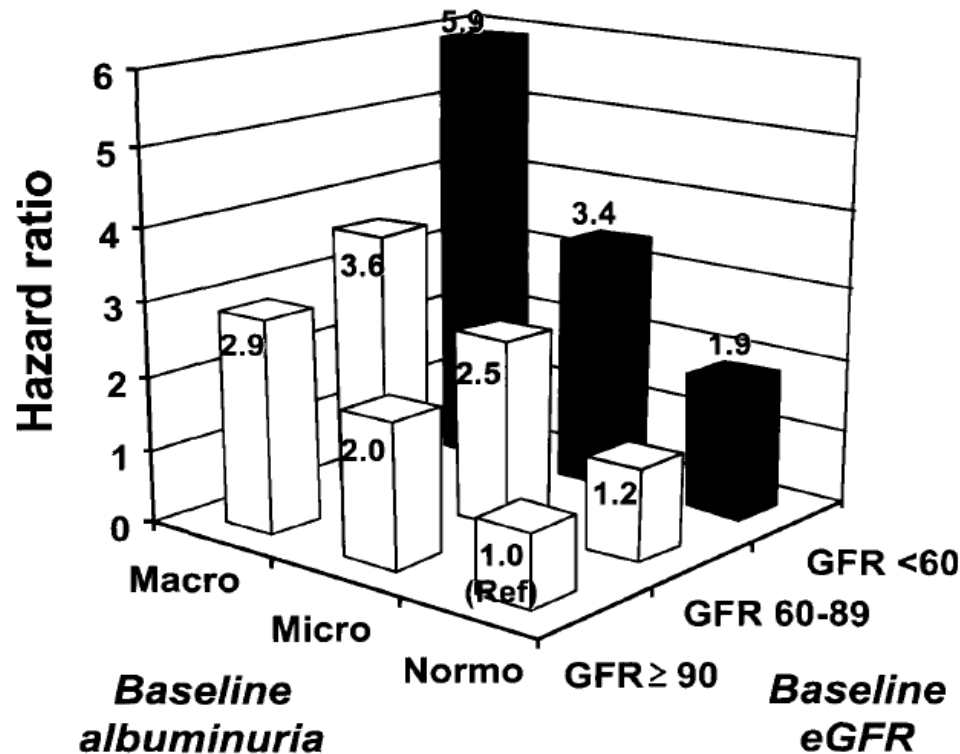


HbA1c predicts mortality



death by urine albumen & GFR

Cardiovascular death

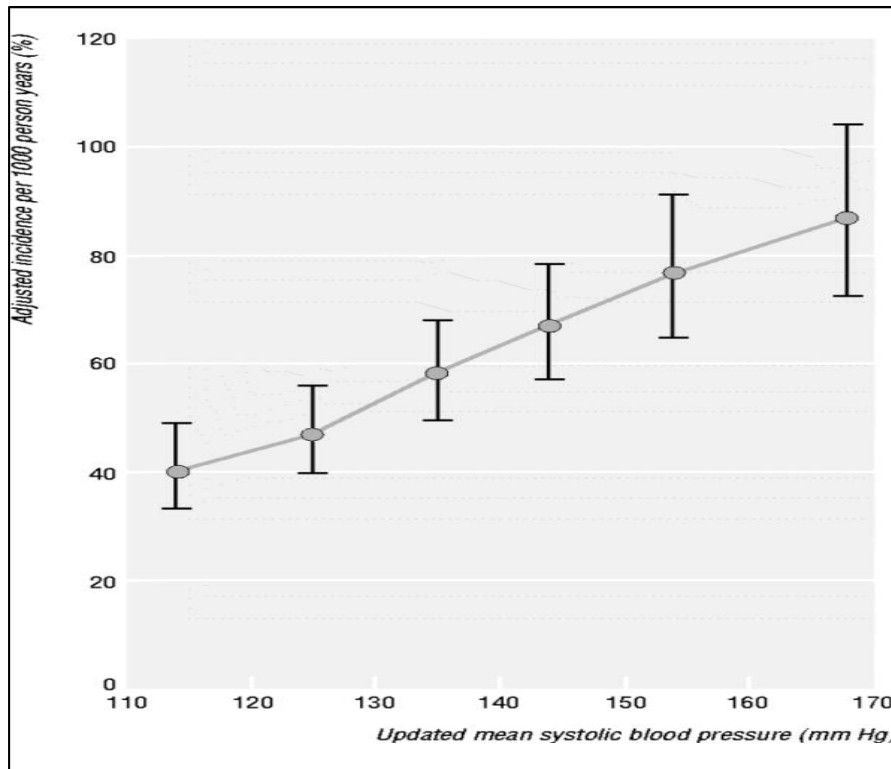


UMA & annual mortality rate

- no microalbuminuria 2.7%
- microalbuminuria 5.9%

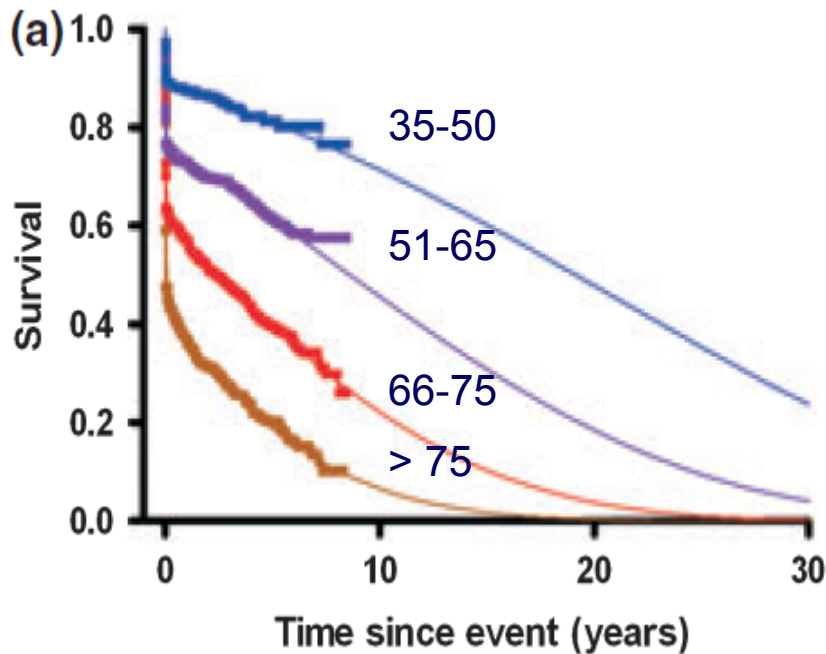
Figure 2—Combined effects of albuminuria and eGFR levels at baseline on the risk for adverse outcomes. The estimates are adjusted for baseline covariates, including age, sex, duration of

Ix of any DM related endpoint vs SBP

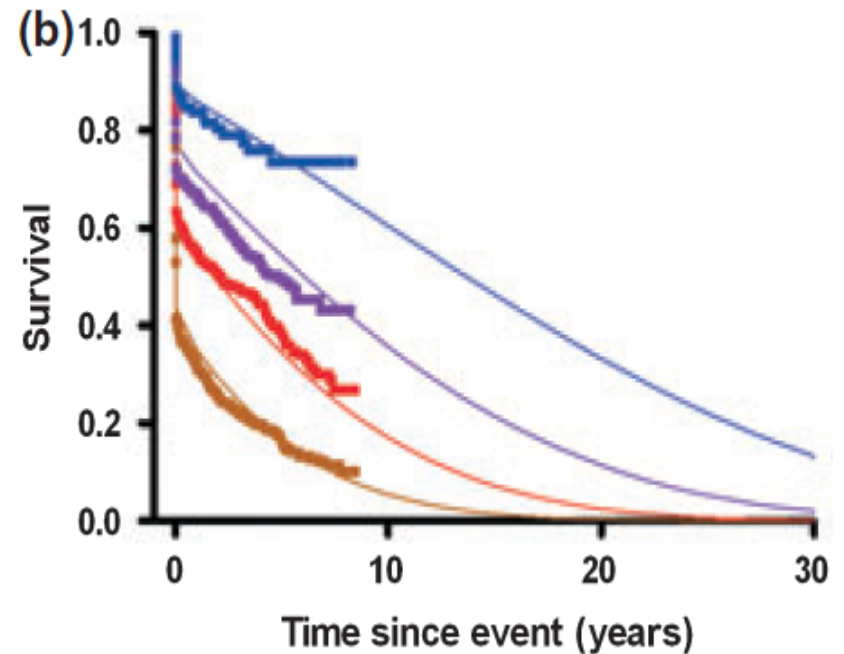


- adjusted age, sex, DM duration
- no threshold
- double risk SBP 120 → 160

survival after MI in T2DM - Australia



males



females

LE years post events in T2DM - Australia

Table 4 Predicted life expectancy* by age for men and women with Type 2 diabetes and no prior co-morbidities, following five major complications

	60 years		70 years		80 years	
	Predicted life expectancy in years (95% CI)					
Age at event		1-month survivors		1-month survivors		1-month survivors
Men						
Complication						
Myocardial infarction		12.5		8.3		5.3
Stroke		11.3		7.4		4.6
Heart failure		5.2		4.3		3.1
Amputation		9.9		6.4		4.0
Renal failure		4.7		4.2		1.9
Women						
Complication						
Myocardial infarction		10.6		7.5		5.1
Stroke		10.6		7.5		5.1
Heart failure		6.1		5.2		3.9
Amputation		10.6		7.5		5.1
Renal failure		6.8		4.2		1.9

*Mean and 95% confidence intervals.

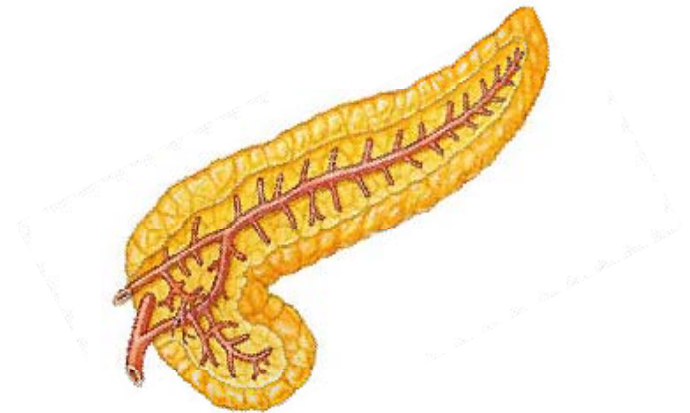
why are we still here

- we know who will get diabetes
- we know the mortality excess
- we know LE after vascular events
- we know the risks for mortality

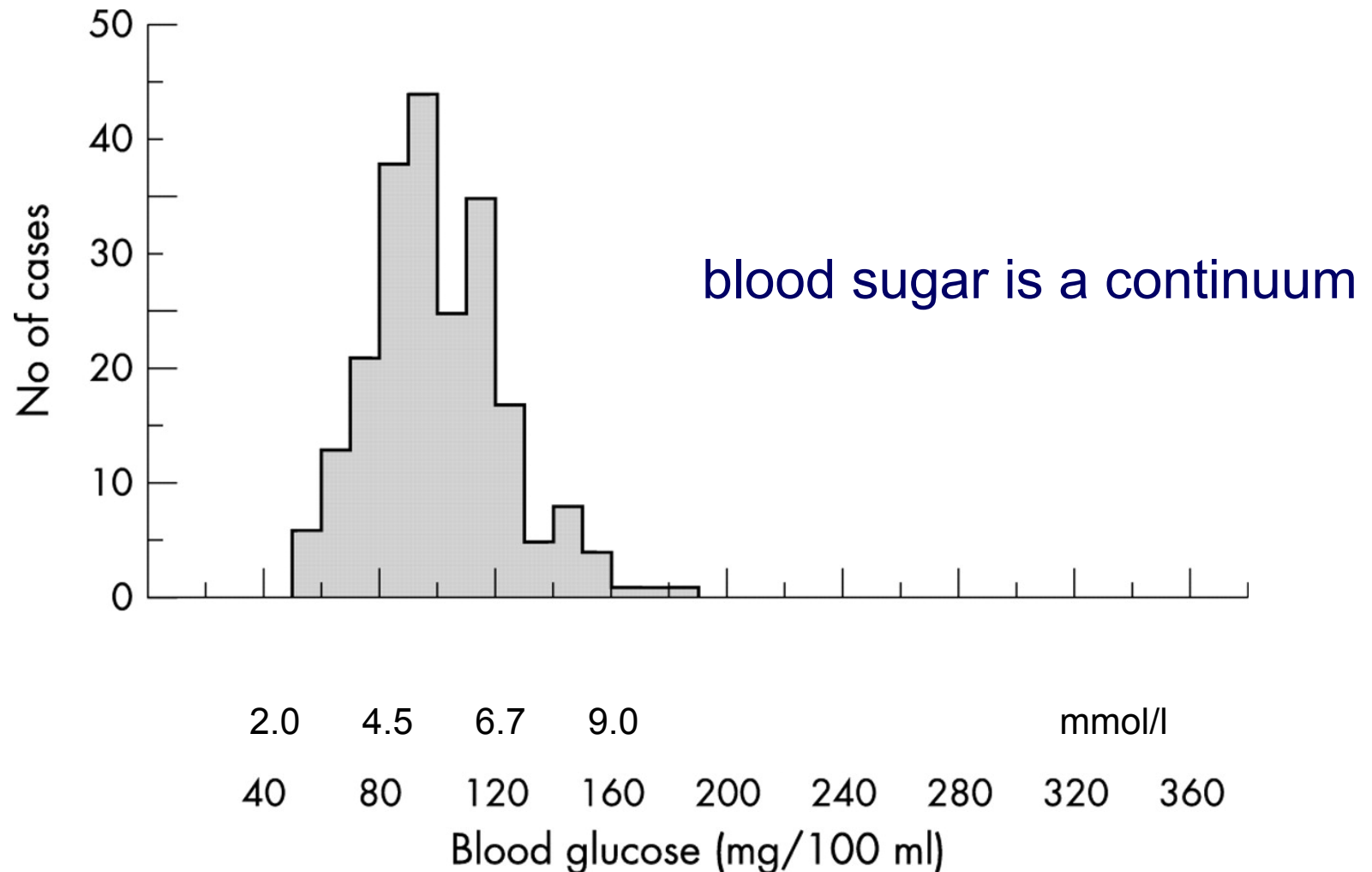


type 2 diabetes

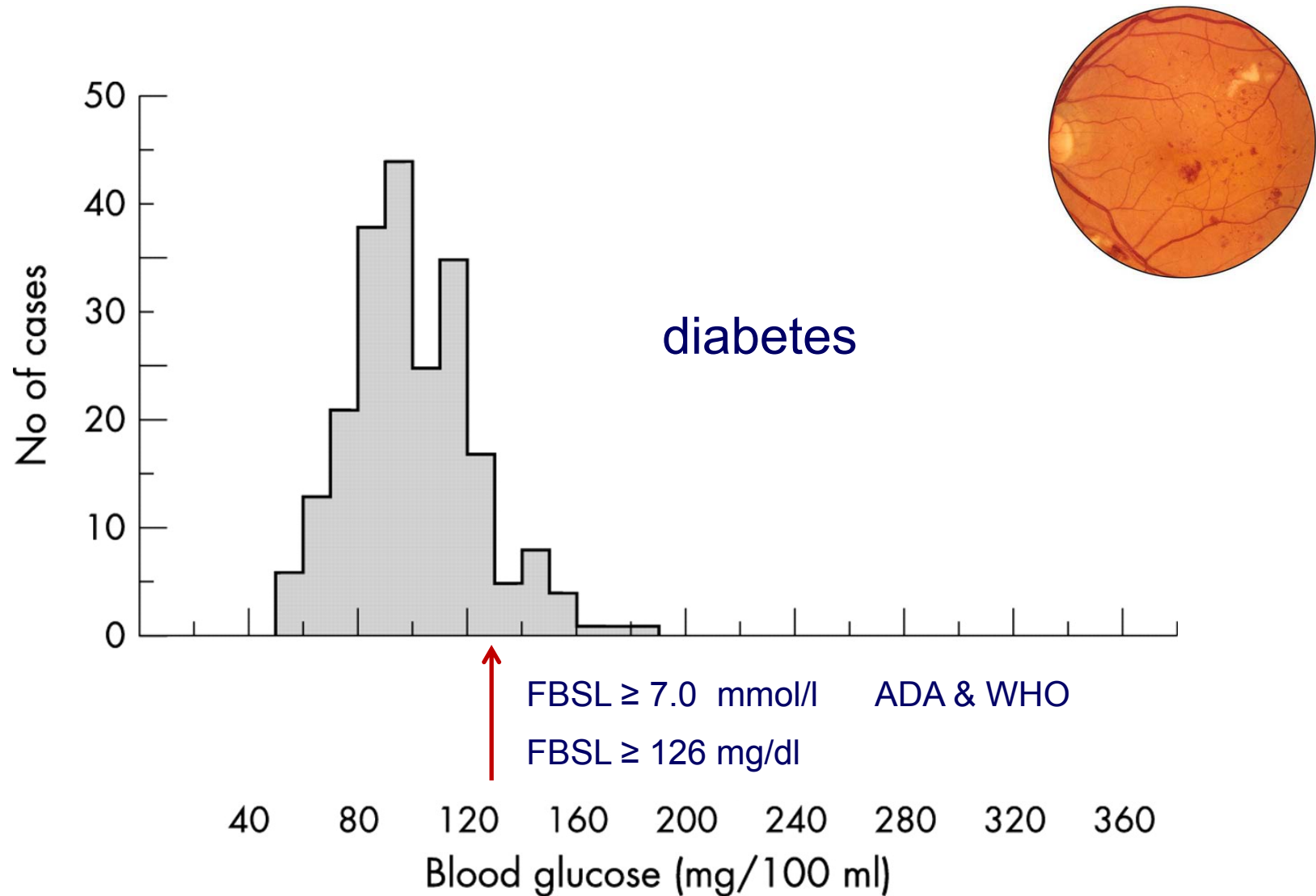
- what exactly is diabetes
- how is it defined
- how should it be diagnosed
- is diabetes the risk it used to be
- are all diabetics the same
- can we risk stratify
- is diabetes always substandard
- are our offers correct



distribution of blood sugar in populations



distribution of blood sugar in populations



diagnosis of diabetes

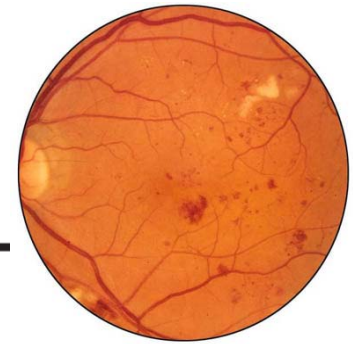


Table 3—Criteria for the diagnosis of diabetes

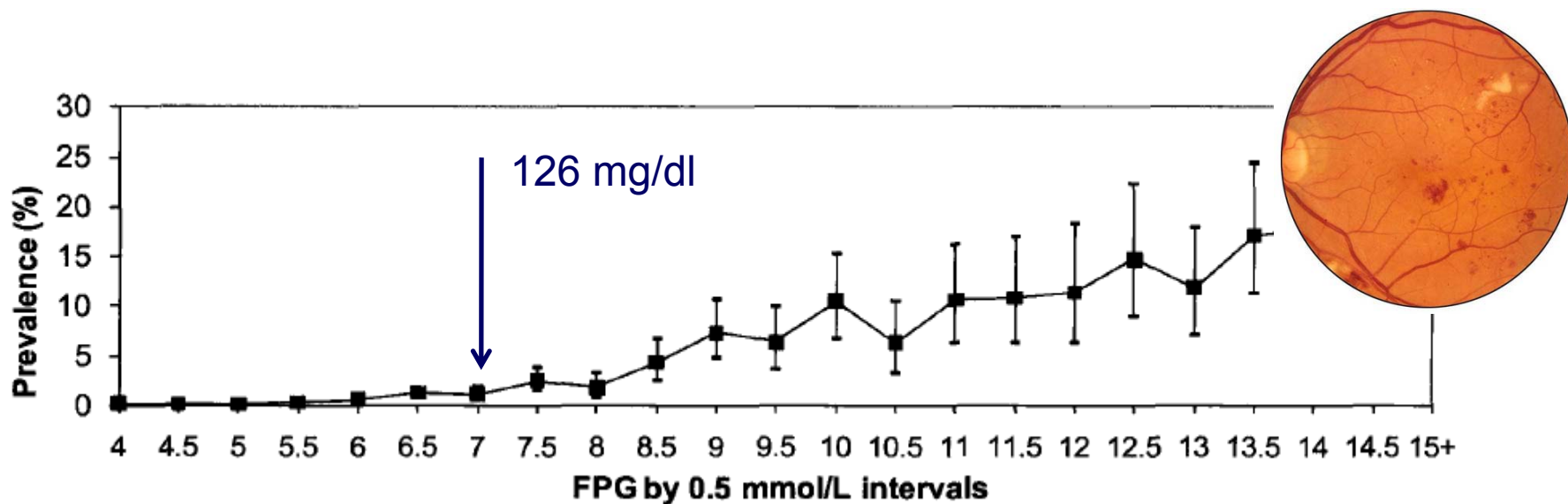
FPG ≥ 126 mg/dl (7.0 mmol/l)

OR

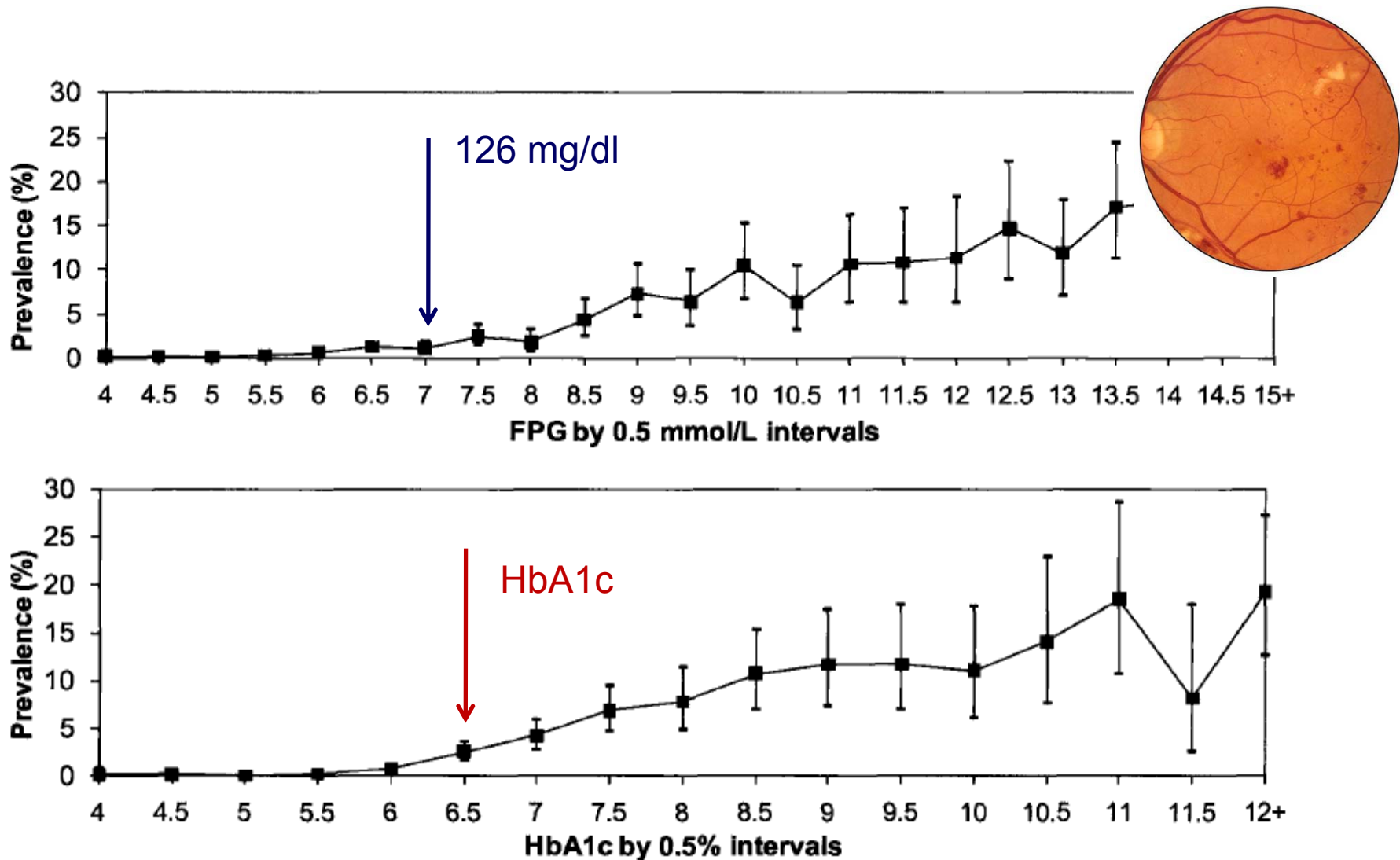
2-h plasma glucose ≥ 200 mg/dl (11.1 mmol/l) during an OGTT.

should be confirmed by repeat testing.

prevalence of retinopathy age 40 - 75



prevalence of retinopathy age 40 - 75



diagnosis of diabetes



Table 3—Criteria for the diagnosis of diabetes

A1C $\geq 6.5\%$.

OR

FPG ≥ 126 mg/dl (7.0 mmol/l)

OR

2-h plasma glucose ≥ 200 mg/dl (11.1 mmol/l) during an OGTT.

should be confirmed by repeat testing.

International Expert Committee Report on the Role of the A1C Assay in the Diagnosis of Diabetes

- The A1C assay has several advantages over laboratory measures of glucose.
- Diabetes should be diagnosed when A1C is $\geq 6.5\%$. Diagnosis should be confirmed with a repeat A1C test.
- If A1C testing is not possible, previously recommended diagnostic methods (e.g., FPG or 2HPG, with confirmation) are acceptable.

HbA_{1c} as a diagnostic test for diabetes

In June 2009, an international expert committee published a report recommending the use of an HbA_{1c} value of 6.5% or more as a diagnostic criterion for diabetes

As racial disparities in HbA_{1c} levels exist, the optimal threshold for diagnosing diabetes varies by ethnic group

In the Chinese population, an HbA_{1c} threshold of 6.3% may be acceptable as a diagnostic criterion for diabetes

In people at high risk of diabetes, an HbA_{1c} threshold of 6.3% was more efficient than a fasting plasma glucose threshold of 7.0 mmol/l

HbA _{1c} (%)	75 g oral glucose tolerance test		
	Normal glucose tolerance (n=3748)	Impaired glucose regulation (n=837)	Diabetes (n=301)
≥6.3*	74 (2.0)	104 (12.4)	189 (62.8)

fasting glucose & CAD

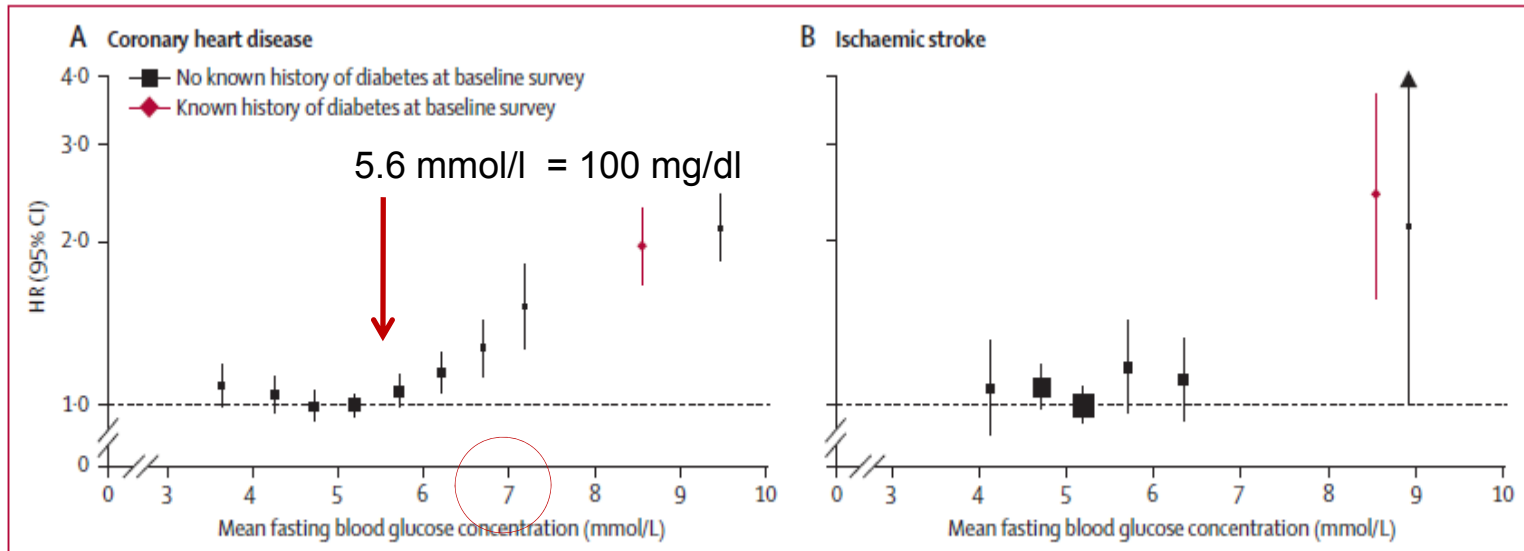
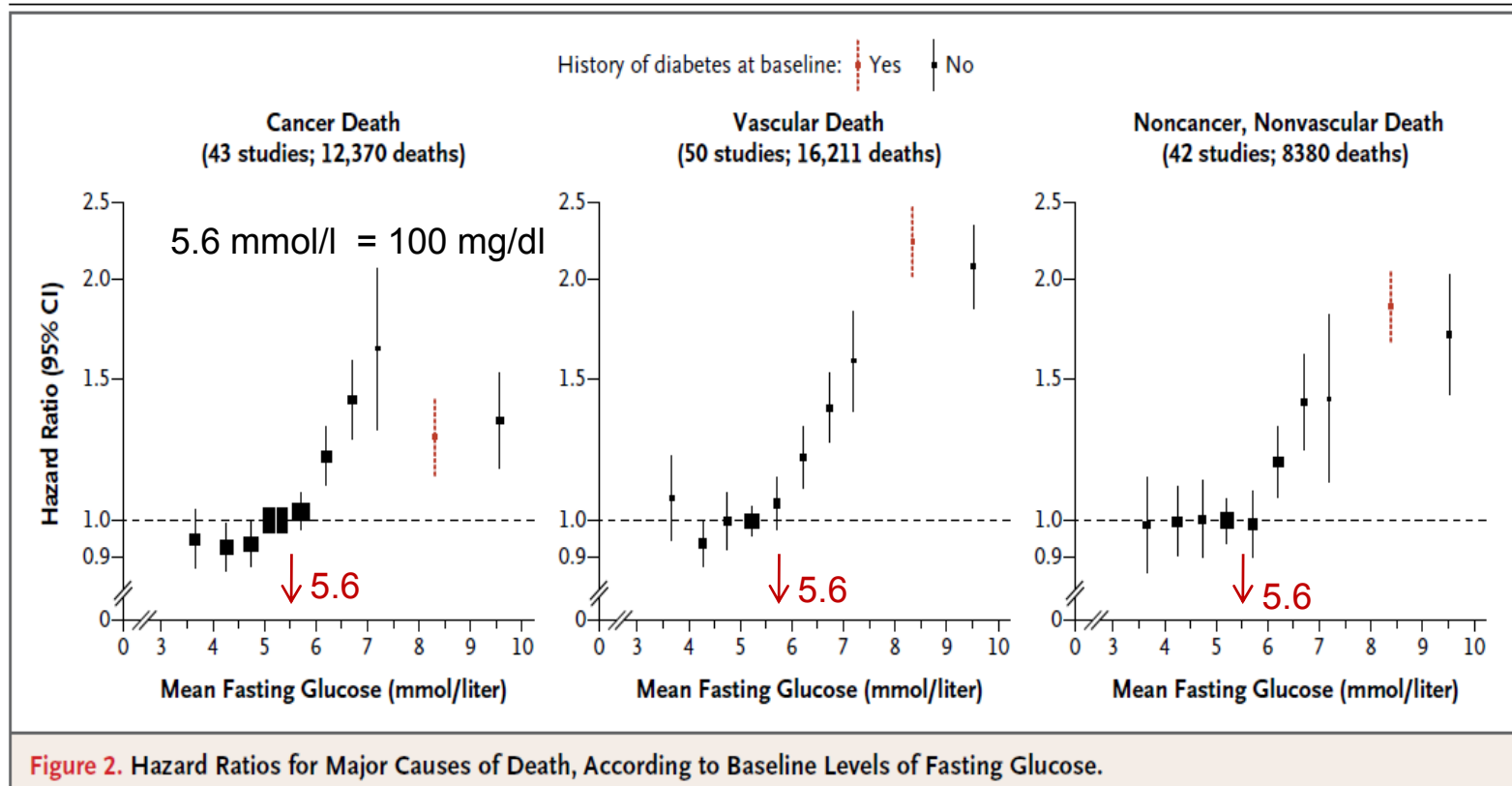


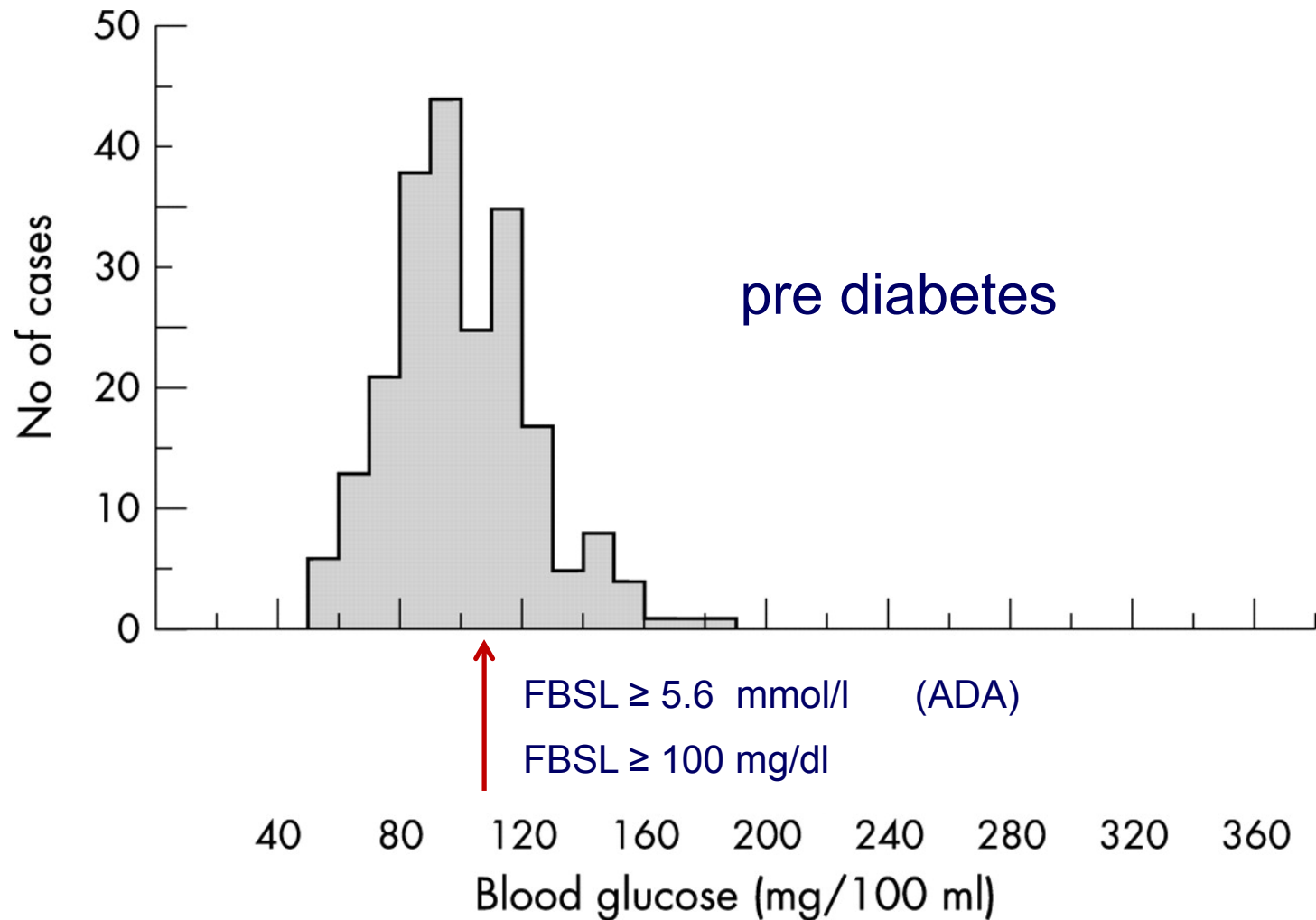
Figure 4: Hazard ratios (HRs) for coronary heart disease and ischaemic stroke by baseline fasting blood glucose concentration

fasting glucose & death

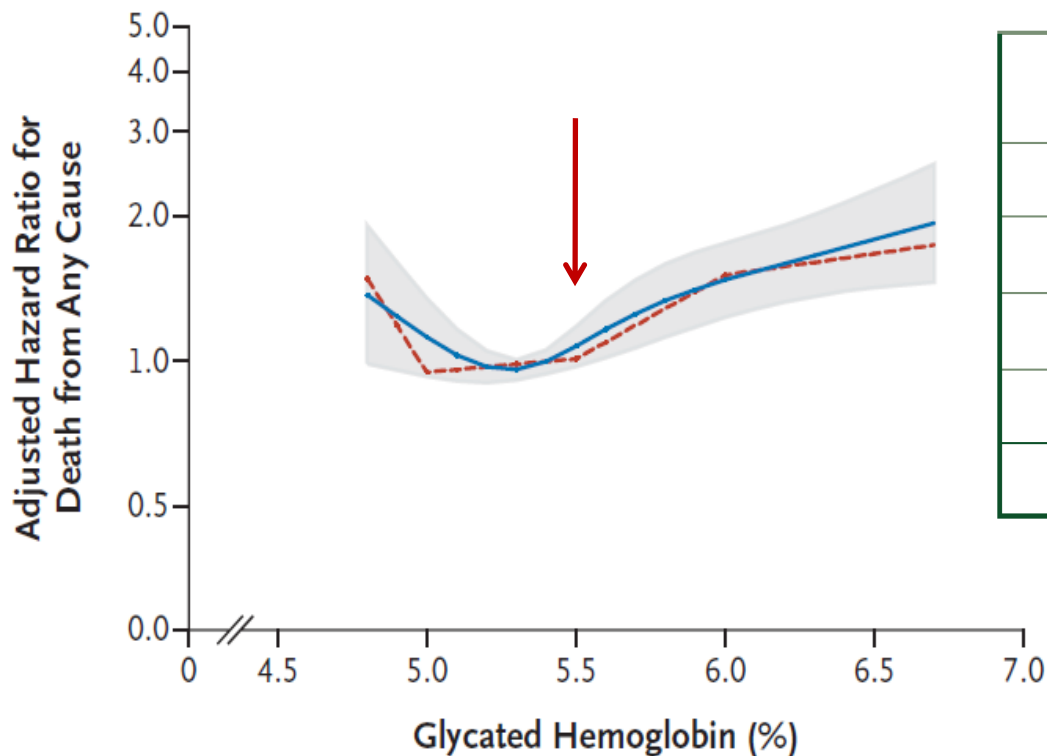


FBSL > 5.6 mmol/l or > 100 mg/dl associated with excess mortality

distribution of blood sugar in populations



all cause mortality by HbA1c in non diabetics



HbA1-c at Baseline	All-Cause Mortality Hazard Ratio
$\leq 5.0\%$	1.48
5.0-5.4%	1.00
5.5-5.9%	1.19
6.0-6.4%	1.61
$\geq 6.5\%$	1.71

pre diabetes – impaired fasting glucose

Table 2—*Categories of increased risk for diabetes**

FPG

5.6 - 6.9 mmol/l - ADA

6.1 - 6.9 mmol/l - WHO & NHMRC

A1C 5.7–6.4%

incident diabetes for HbA1c <6.5%

HbA1c > 6.0 = high risk

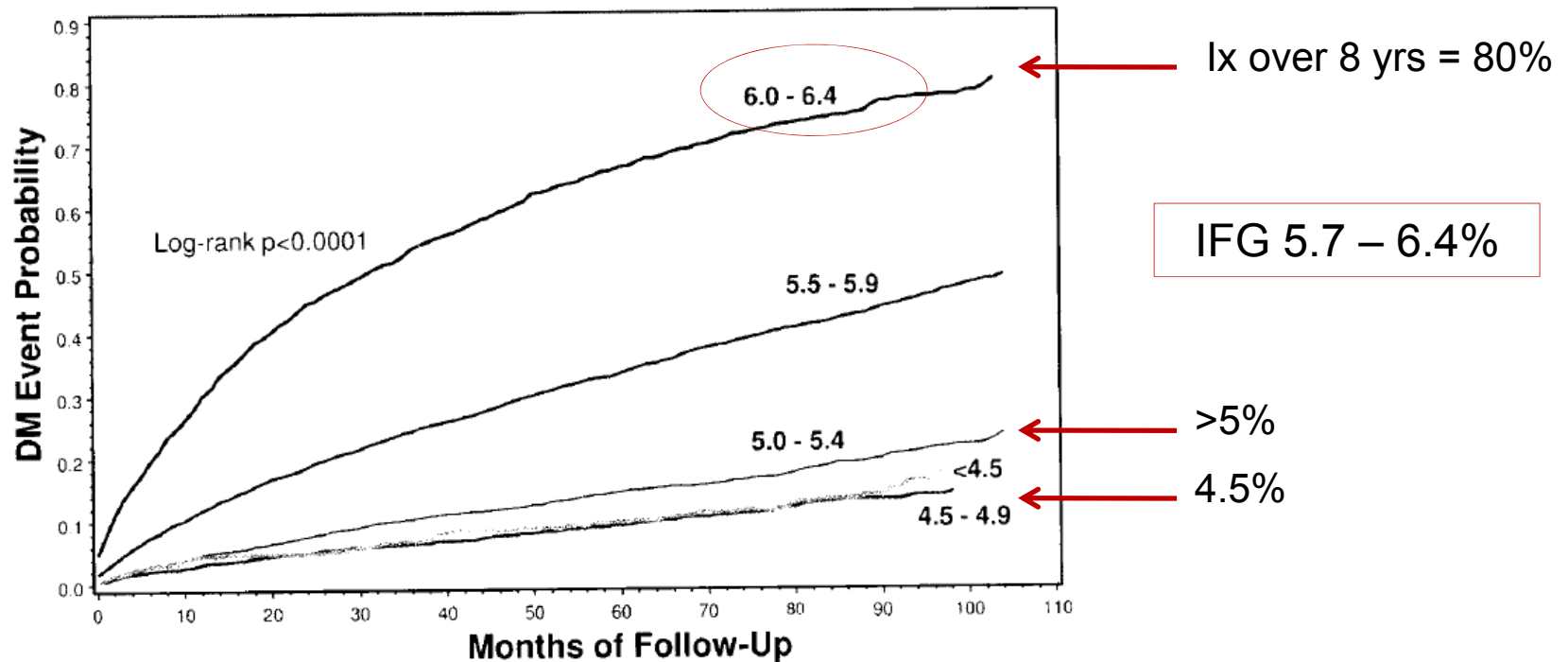


Figure 1—Plot of diabetes event probability against follow-up time, differentiated by baseline HbA_{1c}.

“two test” screen for diabetes

concordant

FPG	< 7.0	no diabetes
HbA1c	< 6.5	
FPG	≥ 7.0	diabetes confirmed
HbA1c	≥ 6.5	

disconcordant

FPG	≥ 7.0	
HbA1c	< 6.5	
FPG	< 7.0	
HbA1c	≥ 6.5	

repeat the abnormal test for discordant results

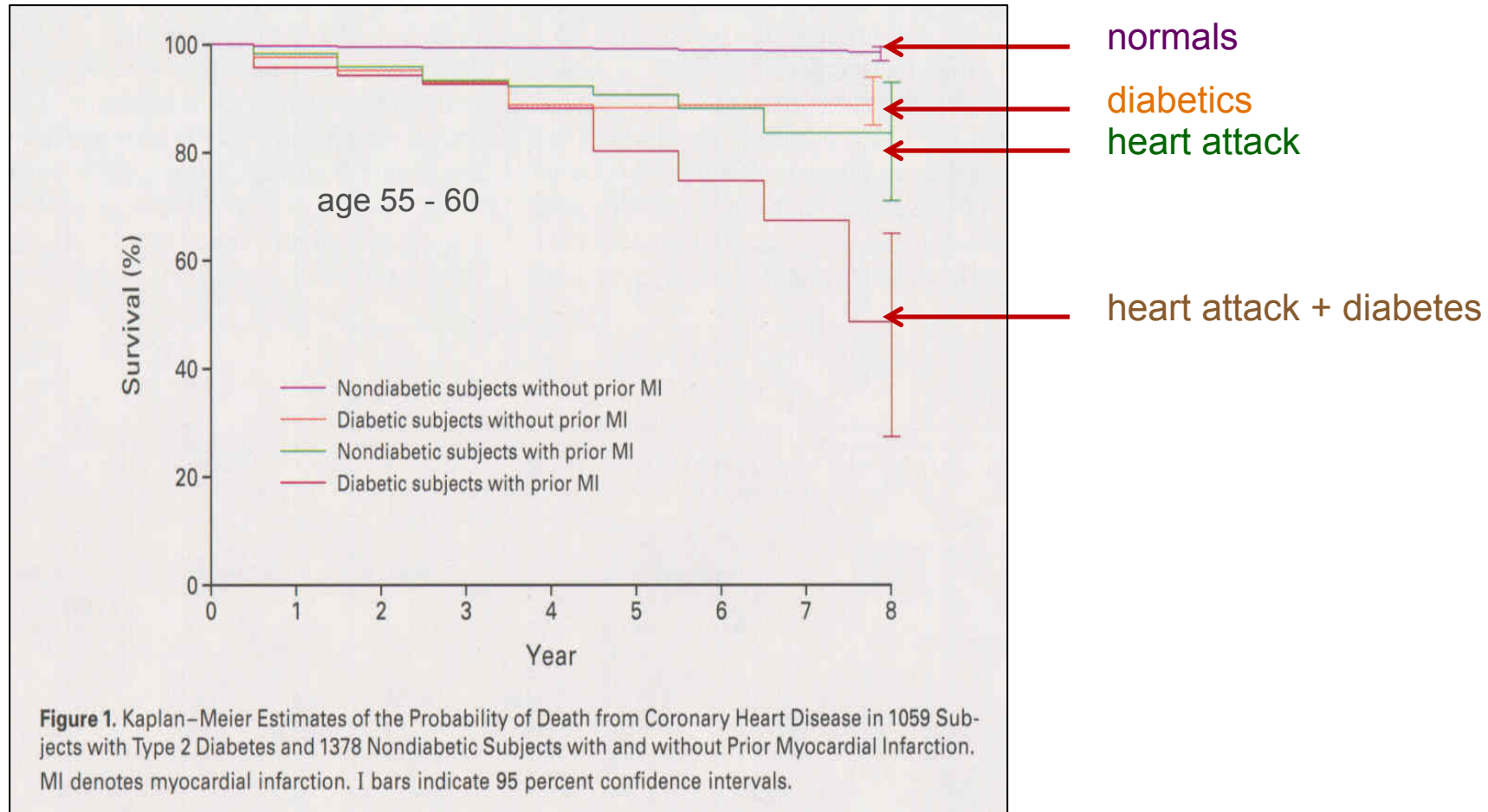
disconcordant

FPG	≥ 7.0	≥ 7.0	diabetes confirmed
HbA1c	< 6.5		
FPG	≥ 7.0	< 7.0	no diabetes
HbA1c	< 6.5		

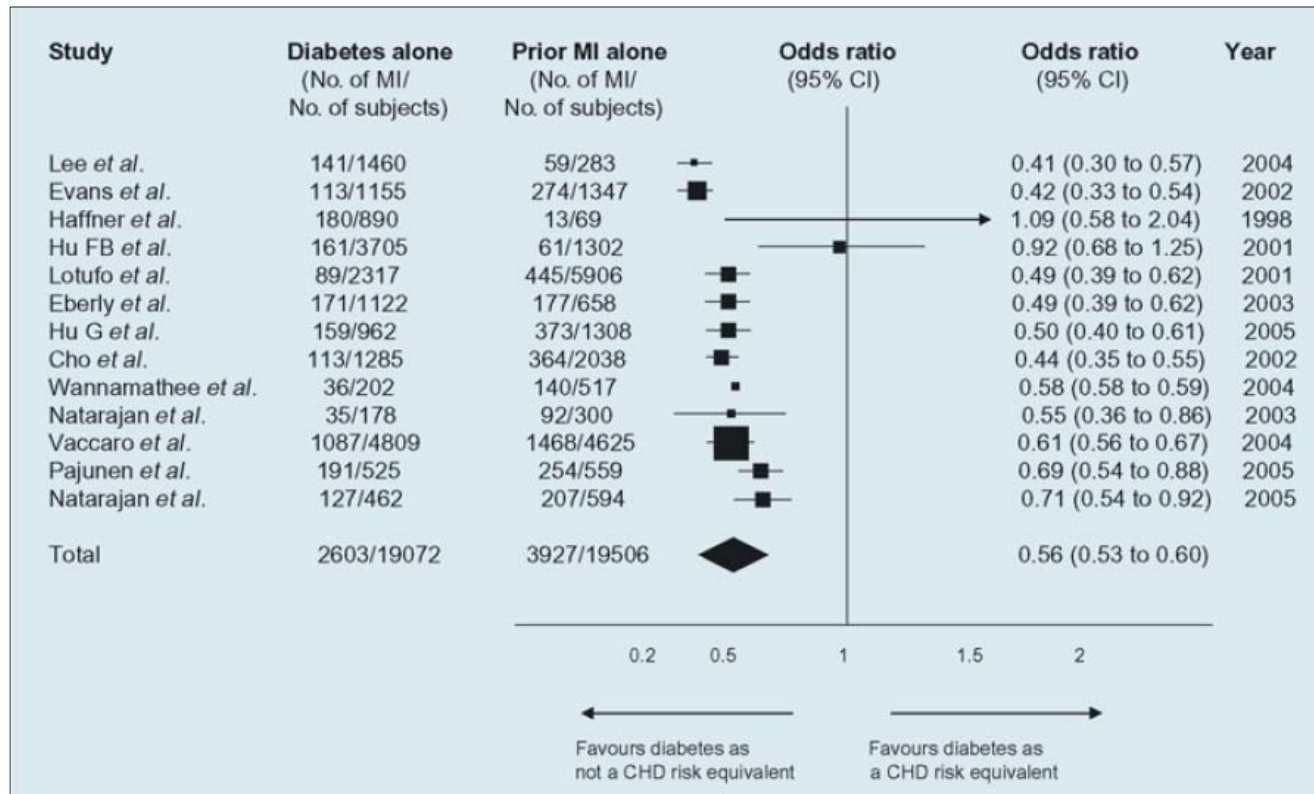
disconcordant

FPG	< 7.0		diabetes confirmed
HbA1c	≥ 6.5	≥ 6.5	
FPG	< 7.0		no diabetes
HbA1c	≥ 6.5	< 6.5	

diabetes **is** an MI equivalent for mortality



diabetes **is not** an MI equivalent for mortality



diabetic with no MI has 40% lower total CAD event risk than non diabetic with MI

type 2 diabetes & MI for all cause mortality

Event	No Prevalent Diabetes or Prior MI (n = 3197)	Men With Prevalent Diabetes With No Prior MI		Men With Prior MI With No Prevalent Diabetes (n = 368)
		Late Onset (n = 307)	Early Onset (n = 107)	
All-Cause Mortality (n = 1080)				
Rate (No. of events)	29.3 (784)	46.2 (108)	48.7 (41)	52.8 (147)
Age	1 [Reference]	1.51 (1.23-1.84)	2.10 (1.53-2.88)	1.65 (1.38-1.97)
Model 1 ^b	1 [Reference]	1.41 (1.15-1.73)	1.96 (1.42-2.72)	1.56 (1.30-1.88)
Model 2 ^c	1 [Reference]	1.39 (1.13-1.91)	1.85 (1.31-2.60)	1.56 (1.29-1.87)
Model 3 ^d	1 [Reference]	1.31 (1.06-1.62)	1.68 (1.19-2.38)	1.48 (1.22-1.78)

- only early onset DM age <60 with duration > 16 years is equivalent to MI for mortality
- mortality x3 lower for new diabetes diagnosed age 66 compared to MI age 66

- CHD event risk for DM diagnosed age > 60 duration 5 yrs is half
CHD event risk for DM diagnosed age < 60 duration 16 yrs

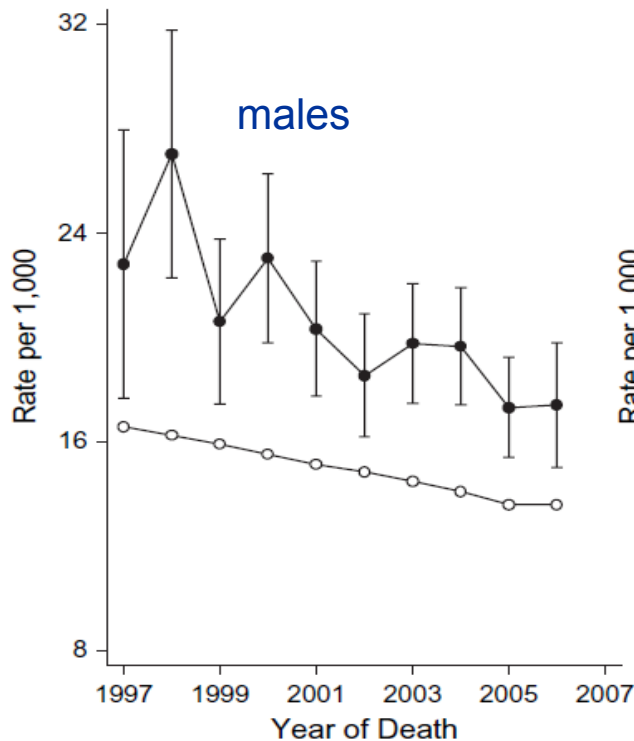
CVD & cause mortality per 100 patient years

CVD event risk and mortality by duration of diabetes

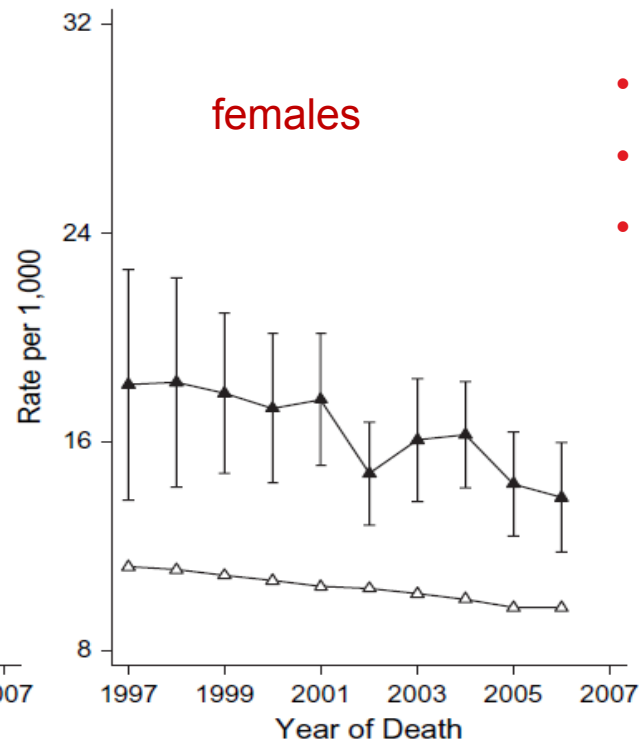
Table 3. Duration of Diabetes in 414 Diabetic Men Without Previous MI Aged 60-79 Years and Rates per 1000 Person-years and Adjusted HRs of Major CVD Events and All-Cause Mortality^a

	Duration of Diabetes Mellitus, y		
	0-1	2-7	≥8
CVD events			
Age-adjusted HR (95% CI)	1	1.14	1.39
Adjusted HR (95% CI) ^b	1	1.19	1.49
All-cause mortality			
R _i			
Age-adjusted HR (95% CI)	1	1.10	1.35
Adjusted HR (95% CI) ^b	1	1.10	1.39

relative mortality is falling in diabetes



SMR 1.38 SMR 1.27



SMR 1.62 SMR 1.44

- 48,579 new T2DM
- followed 10 years
- 6,635 deaths

how well are we doing with DM in insured lives

- 42,000 issued policies in diabetics
 - standard risk 25%
 - substandard risk 75%
- 495 deaths

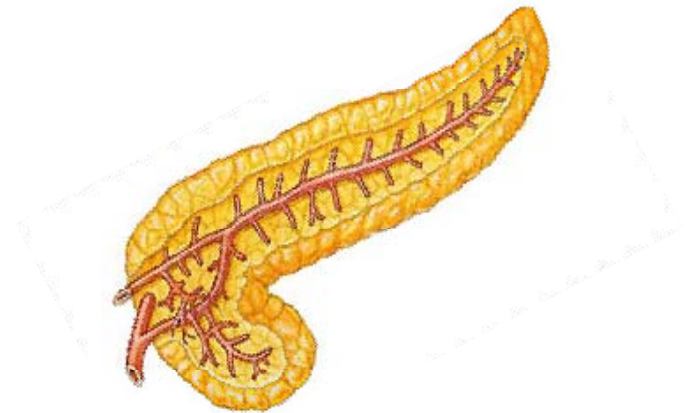
MR for all policies 171%

- MR substandard cases 187%
- MR standard cases 132% - significant
 - MR males 128% - not significant
 - MR females 139% - significant

type 2 diabetes

some new information

- what exactly is diabetes
- how is it defined
- how should it be diagnosed
- is diabetes the risk it used to be
- are all diabetics the same
- can we risk stratify
- is diabetes always substandard
- are our offers correct



diabetes update

Paul R Davis MB BS HONS FRACP

Medical Director RGA International - Sydney

2011



The security of experience. The power of innovation.

www.rgare.com

Trauma Insurance In Our Markets

What History Tells Us & What The Future May Bring

November 2011

Michael Renny Grad Cert Mgmt, ANZIIF (Snr Assoc) CIP

Technical Risk Consultant

RGA Reinsurance Company of Australia Limited

Technical Risk Services Team

Agenda

1. **Where we began**
2. Development & where we are today
3. Challenges
4. Statistics
5. What the future may bring

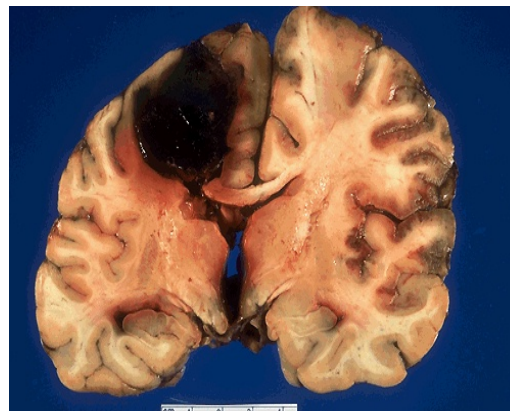


Happy Anniversary



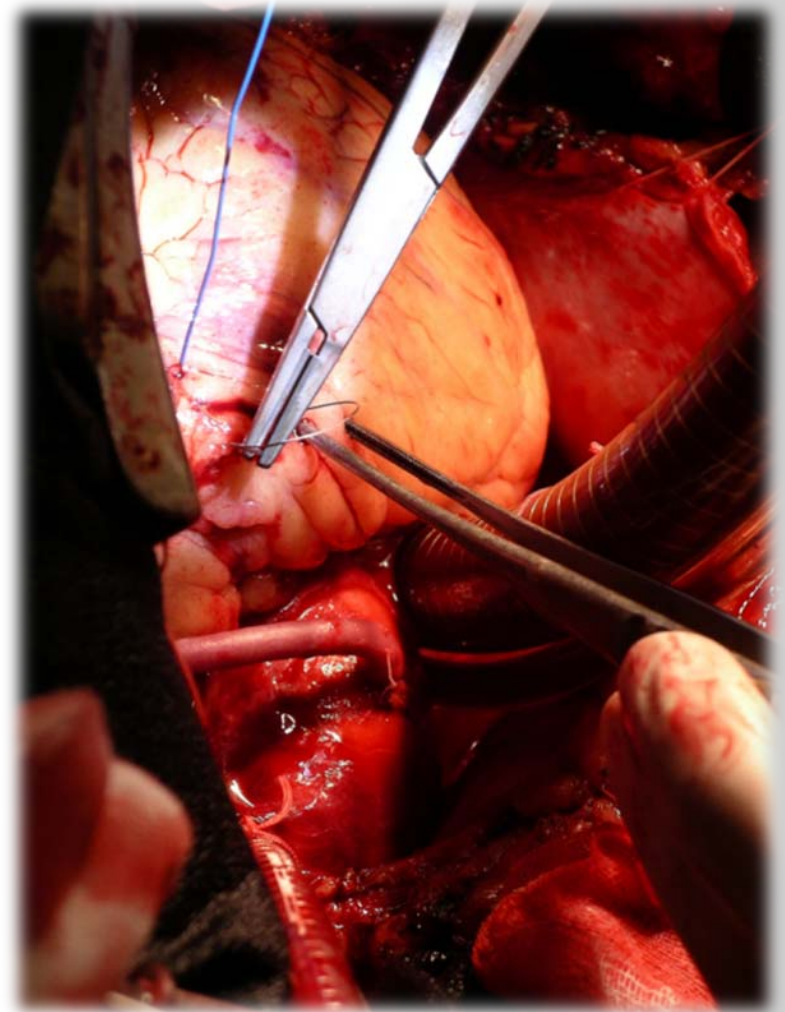
Where we began

- Originated in South Africa 1983
- Simple reason:
*“ We have saved their lives...
but taken their life savings.”*
Dr Marius Barnard
- Only covered the cost of treatment



Where we began

- **First trauma contract launched in Australia 1986**
- **Accelerated benefit only**
- **Big 4 Events**
 - **Cancer**
 - **Heart attack**
 - **Stroke**
 - **By-Pass**
- **Initial focus 'life threatening/changing'**



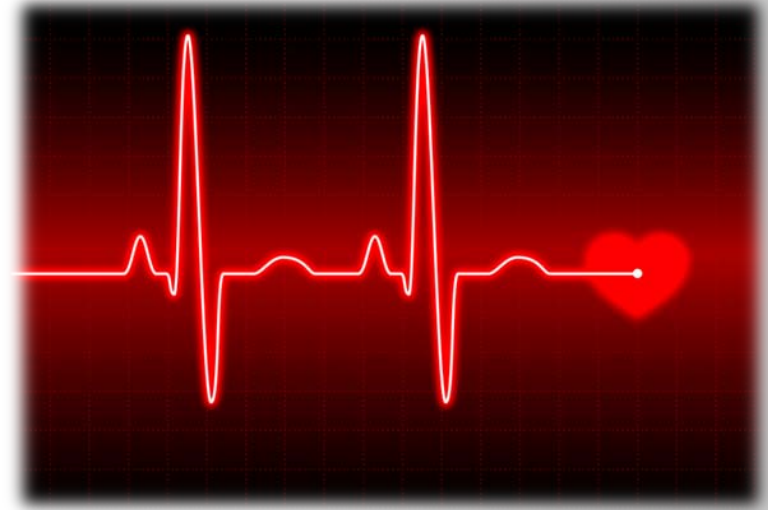
Development & where we are today

Trauma Events 2011

- heart attack
- heart surgery
- stroke
- major cancer
- end stage renal failure
- end stage lung disease
- end stage liver failure
- major organ transplant
- aplastic anaemia
- heart valve surgery
- surgery to aorta
- pulmonary hypertension
- major burns
- head trauma & coma
- paralysis
- lupus nephritis
- severe rheumatoid arthritis
- osteoporosis with fracture
- alzheimer's & dementia
- parkinson's disease
- motor neuron disease
- multiple sclerosis
- muscular dystrophy
- blindness
- deafness & loss of speech
- meningitis & encephalitis
- HIV
- benign brain tumour
- coronary angioplasty
- severe diabetes
- Etc etc

Development & where we are today

- **60+ Specified events**
 - Stand alone
 - Payment on diagnosis
 - Partial payments
 - Male & female specific benefits
 - Reinstatement options
 - Child trauma
 - Guaranteed Future Insurability
 - Severity based products
 - Extended expiry to older ages
 - Definitions simpler & consumer friendly
 - Definitions more open to challenge
 - Definitions more exposed to medical advances
 - Pass back benefits



Development & where we are today

1986



- Heart Attack, Stroke, CABG, Cancer
- Accelerated (not 100% acceleration)

2011

- > 60 impairments covered
- Stand alone and accelerated
- Gender specific
- Child trauma
- Guaranteed Future Insurability
- Buy back
- Reinstatement option
- Pass back benefits

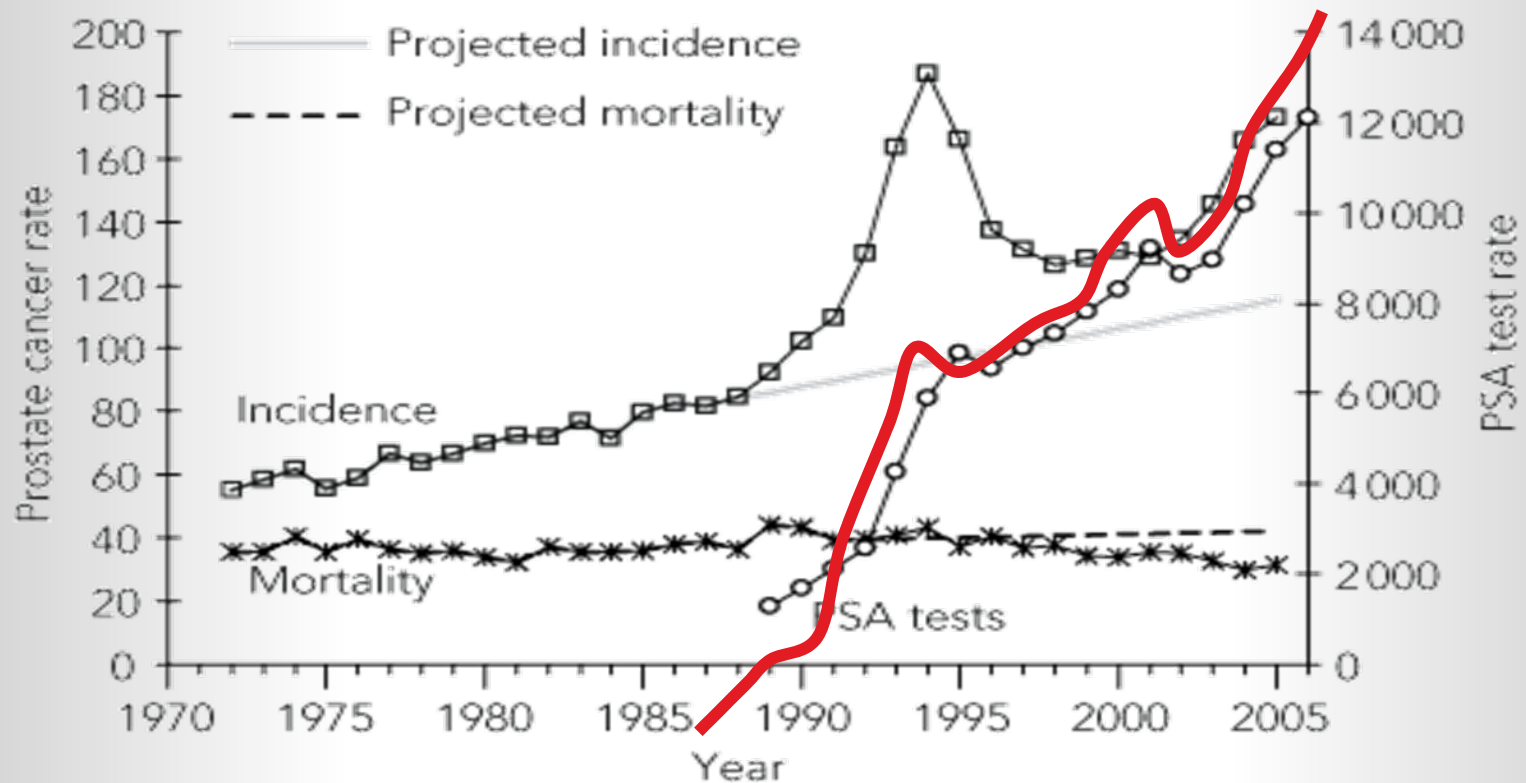
Challenges

- **Medical**
 - Diagnosing illness – advances
 - Genetic testing – accessibility
- **Speed & efficiency**
 - Overhaul of application question
 - Automated underwriting systems
 - Tele-underwriting and tele-claims
 - Greater sums insured with less evidence
- **Underwriting exclusions**
- **Overseas impacts**
 - Mobility of population



Challenges

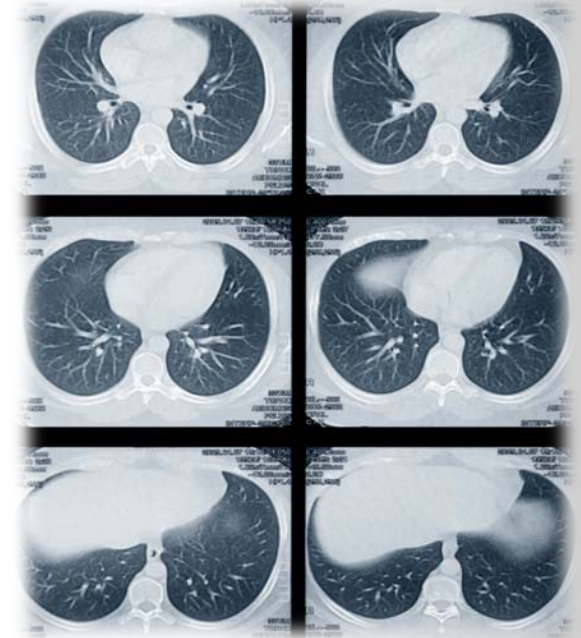
Impact of PSA screening in Australia



Smith DP et al, Med J Aust. 2008 Sep 15;189(6):315-8

Challenges

- **Medical**
 - Diagnosing illness – advances
 - Genetic testing – accessibility
- **Speed & efficiency**
 - Overhaul of application questions
 - Automated underwriting systems
 - Tele-underwriting and tele-claims
 - Greater sums insured with less evidence
- **Underwriting exclusions**
- **Overseas impacts**
 - Mobility of population

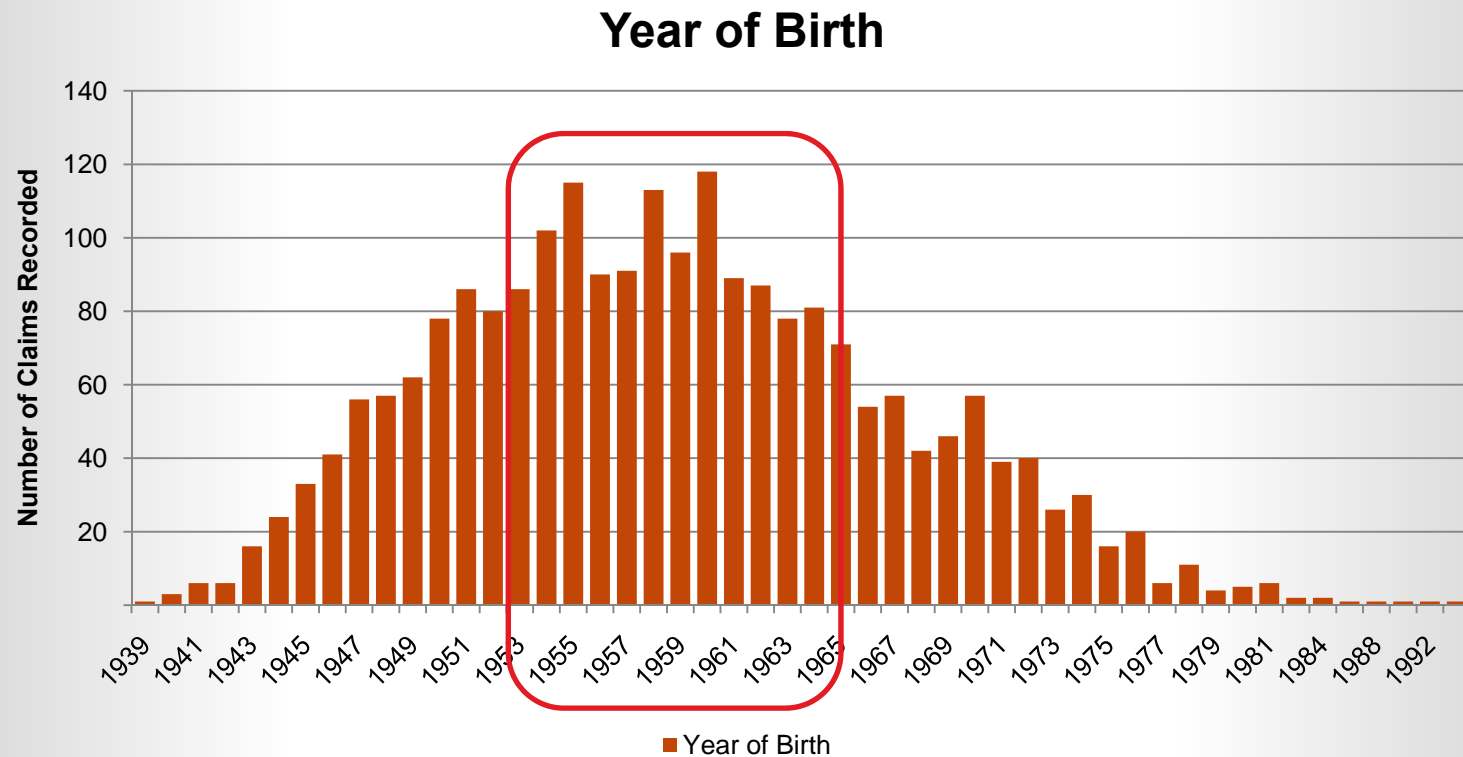


Statistics

RGA internal data

Statistics

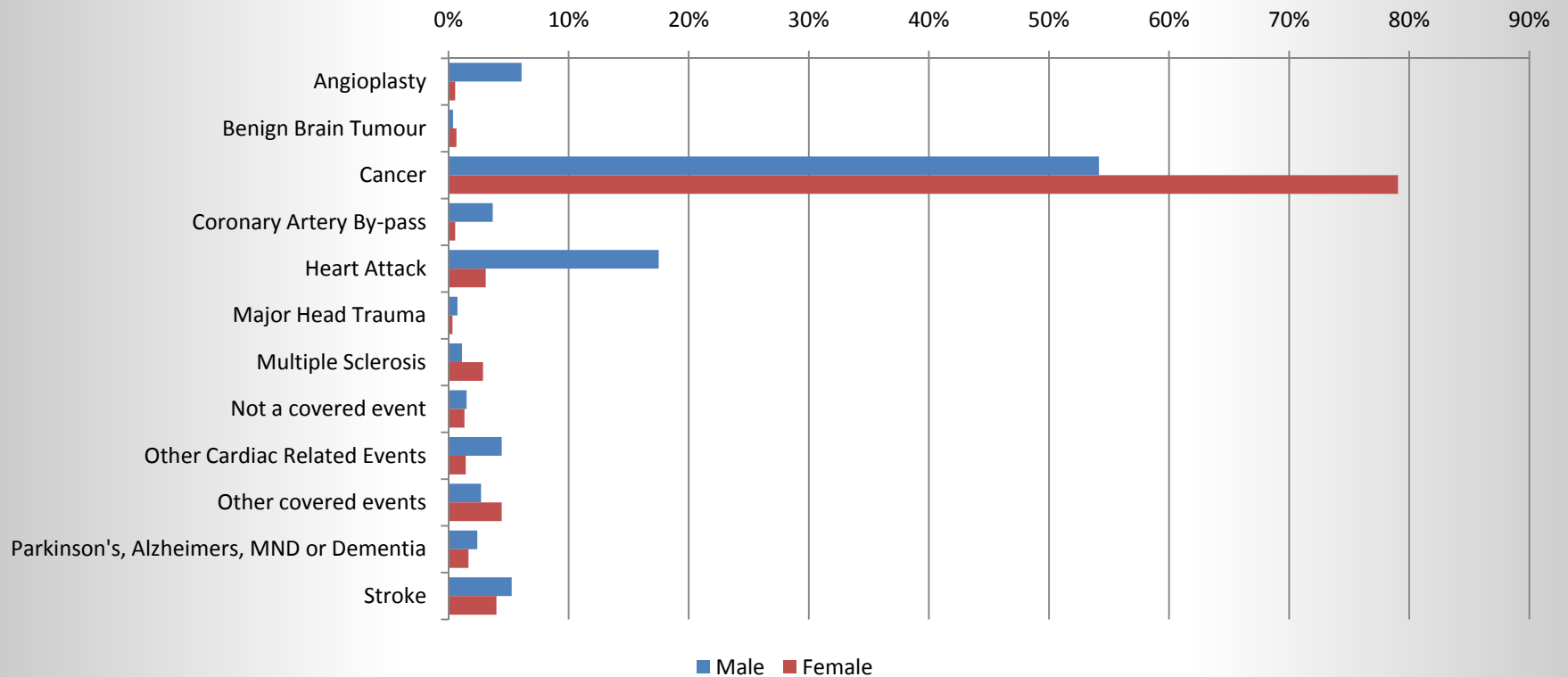
RGA internal data



Statistics

RGA internal data

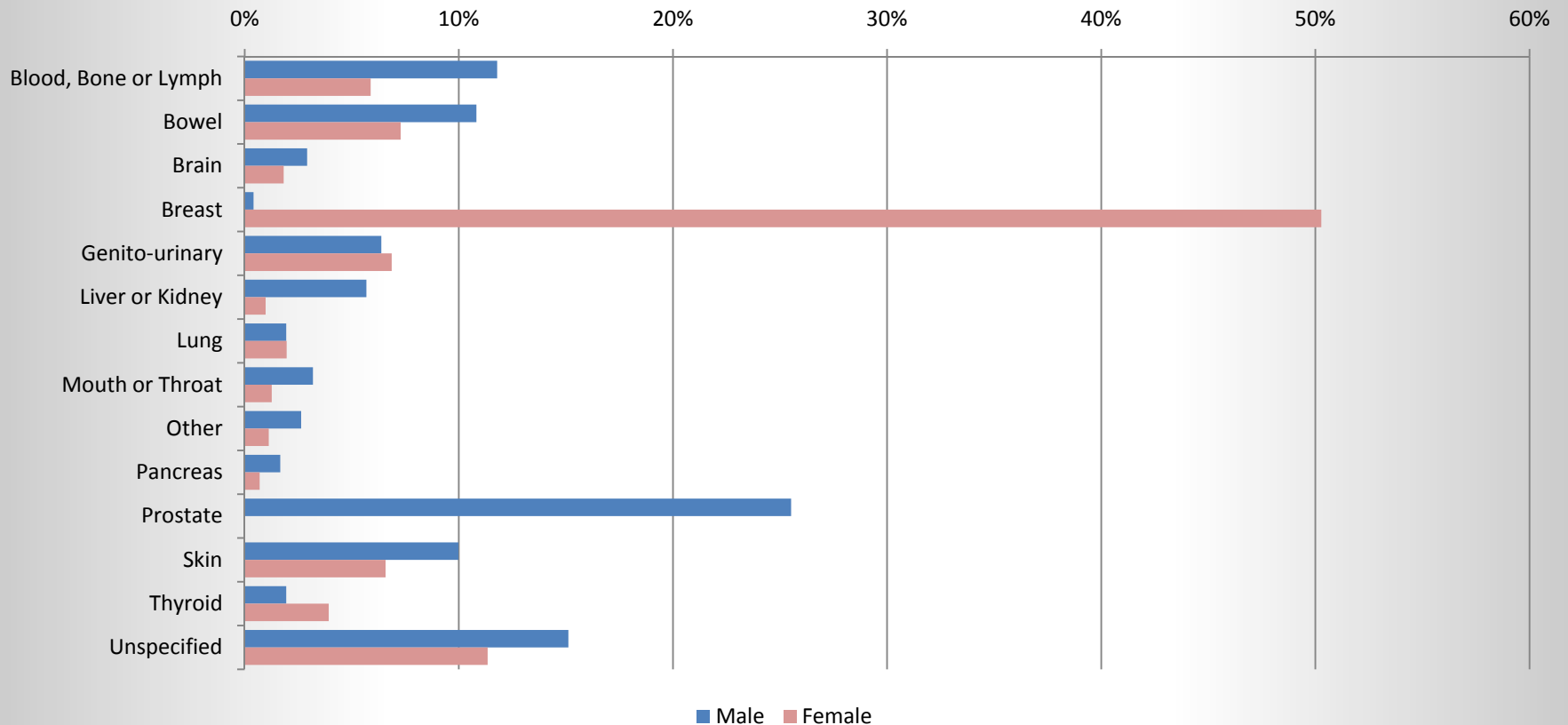
Primary Cause of Claim by Gender



Statistics

RGA internal data

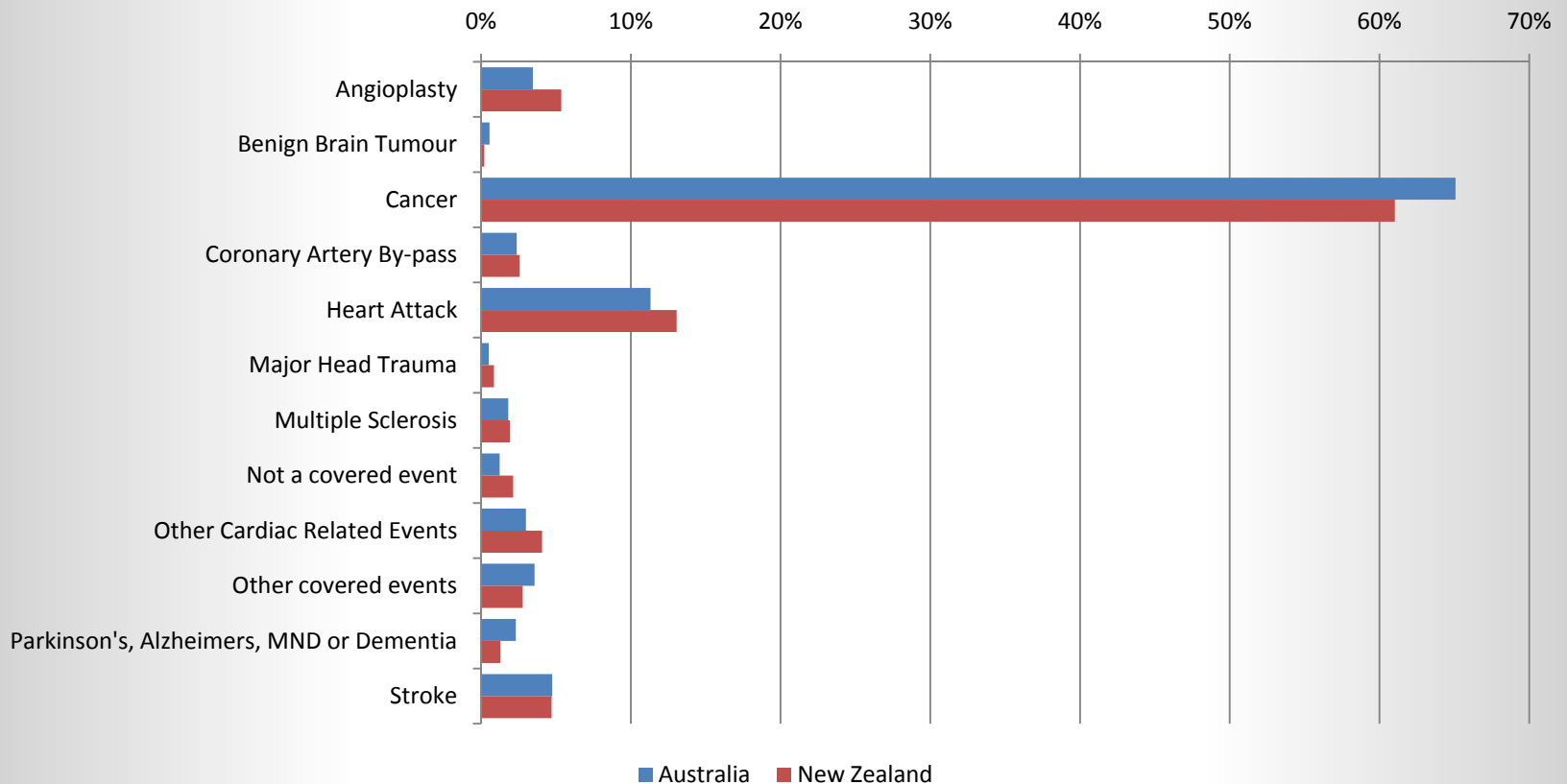
Cancer Claims by Gender



Statistics

RGA internal data

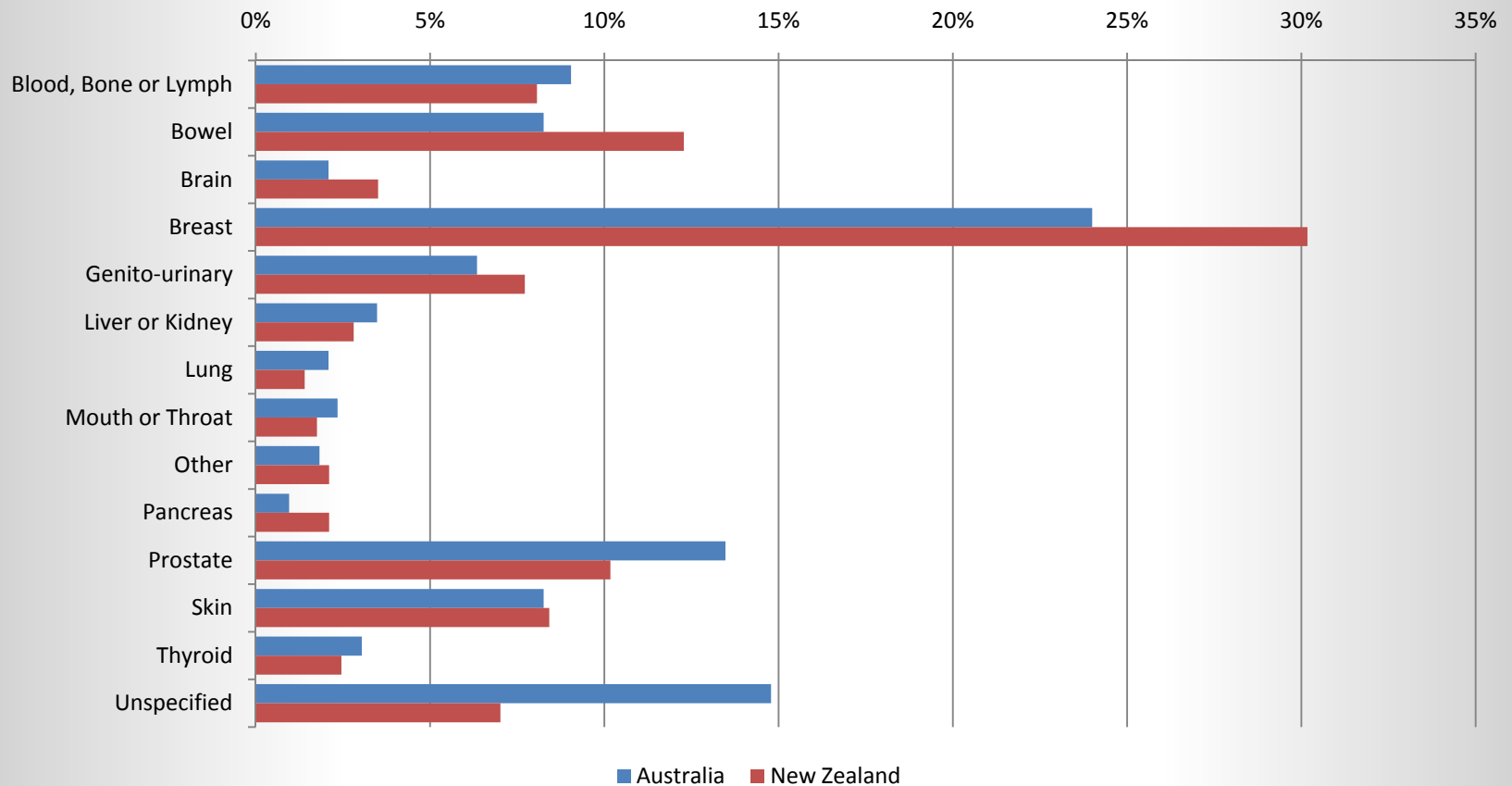
Primary Cause of Claim



Statistics

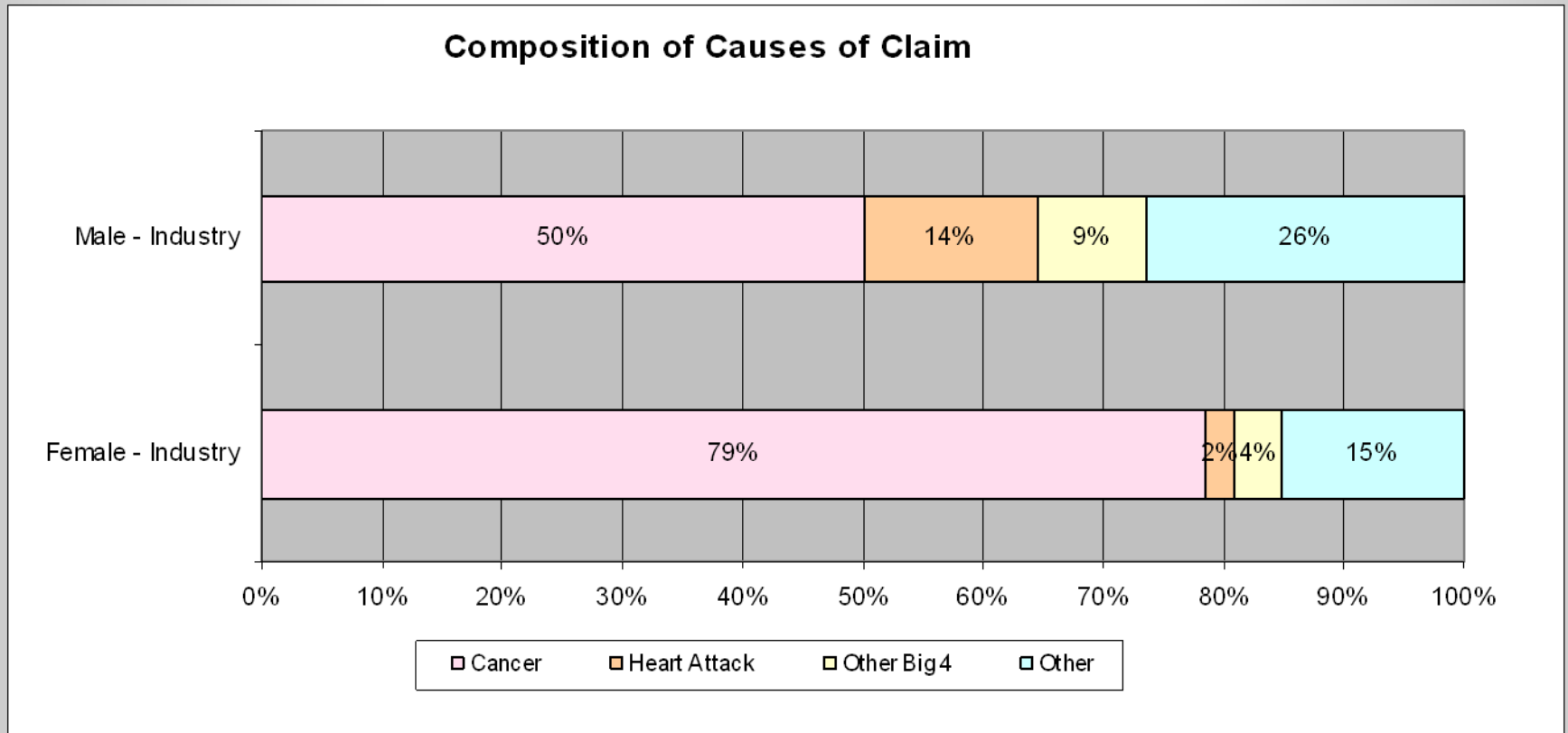
RGA internal data

Cancer Claims - By Type



Statistics

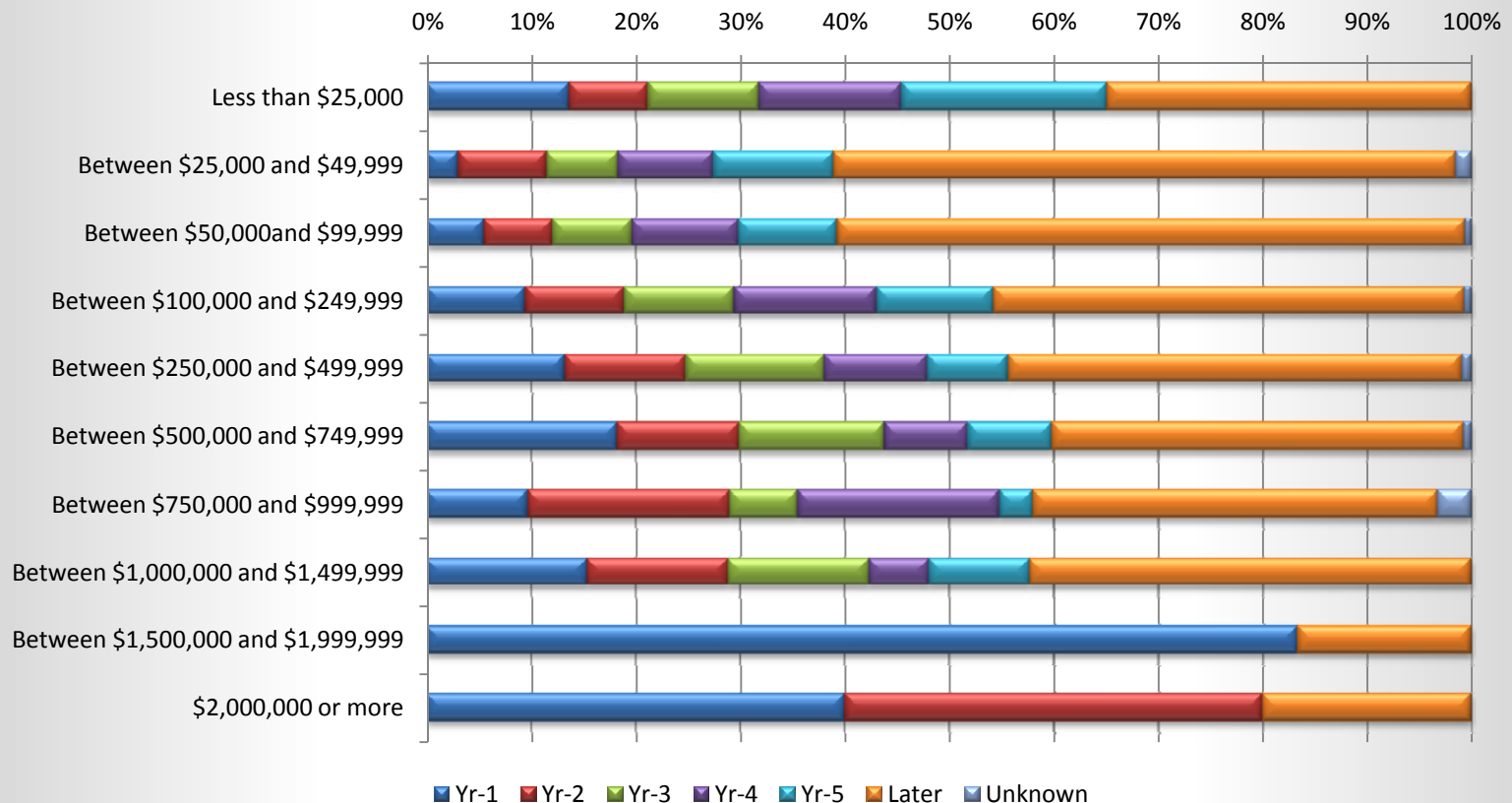
FSC – KPMG 2010 Mortality & Morbidity Experience Study



Statistics

RGA internal data

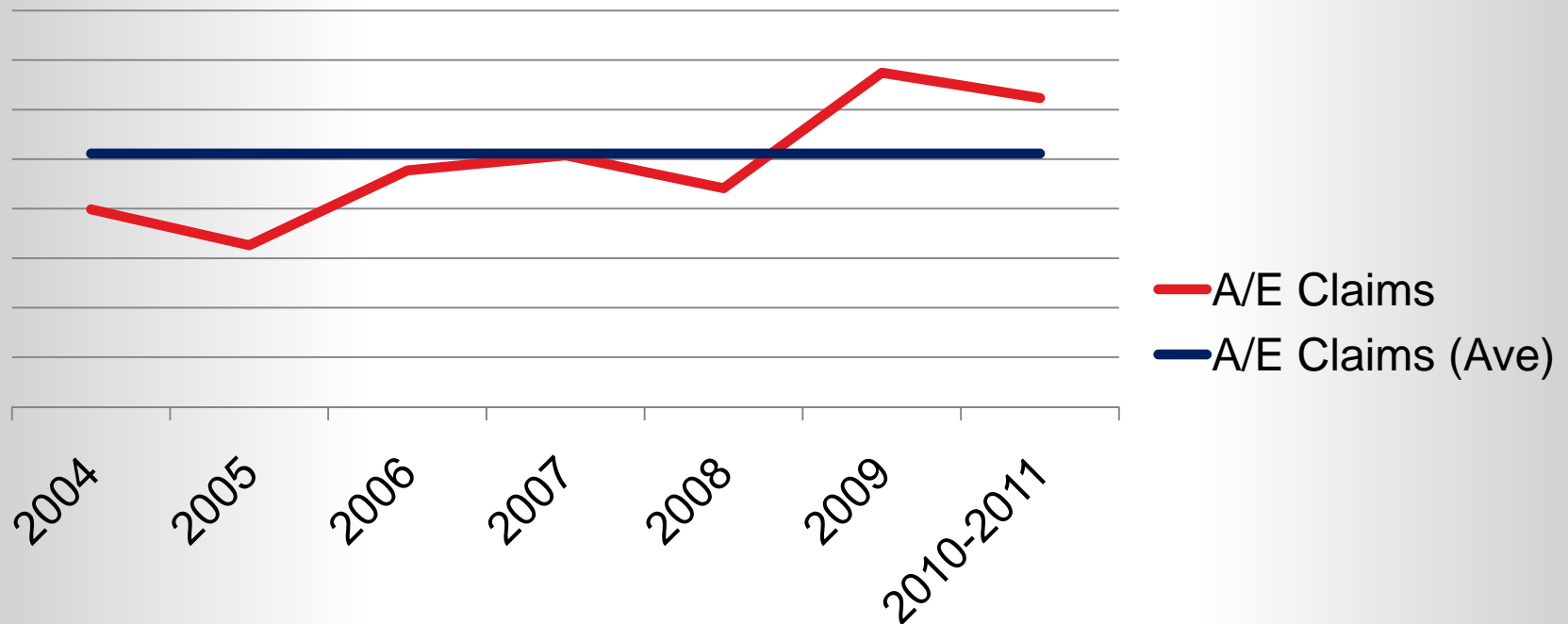
Sum Insured and Age of Policy



Statistics

RGA internal data

Critical Illness Experience by Calendar Year



What the future may bring

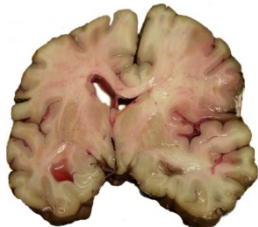
Product Design – Architectural equivalent of current Trauma Products



What the future may bring

Multipay Products

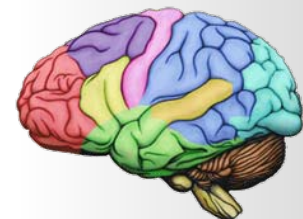
- heart attack
- CABG
- stroke
- valve surgery
- aorta surgery
- PPH



- cancer
- organ transplant
- lung failure
- liver failure
- renal failure
- aplastic anaemia
- SLE
- IBD



- paralysis
- multiple sclerosis
- motor neurone Δ
- dementia & AD
- Parkinson's Δ
- poliomyelitis
- head injury
- coma
- muscle dystrophy



What the future may bring

Severity based products

- Payouts are based on up to 6 levels of severity of the illness or disability
- Means earlier payouts
- Levels have been set to ensure that claims paid out appropriately reflect the impact that the illness has on the applicant's lifestyle

Severity level	How much?
A	Pays 100% of the benefit cover
B	Pays 75% of the benefit cover
C	Pays 50% of the benefit cover
D	Pays 25% of the benefit cover
E	Pays 15% of the benefit cover
F	Pays 10% of the benefit cover

Levels A-D available on the Primary Plan

All Levels available on the Comprehensive Plan

Summary



Questions



Trauma Insurance In Our Markets

What History Tells Us & What The Future May Bring

November 2011

Michael Renny Grad Cert Mgmt, ANZIIF (Snr Assoc) CIP

Technical Risk Consultant

RGA Reinsurance Company of Australia Limited

Technical Risk Services Team