

# THE METABOLIC SYNDROME AN EVOLVING EPIDEMIC

implications for subsequent  
diabetes &  
cardiovascular outcomes

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# existing definitions

- **WHO 'working' definition**

1st Diabetic Med 1998, revised WHO 1999

- **EGIR** (European Group for the study of Insulin Resistance)

Balkau, Charles & EGIR Group, Diabetic Medicine, 1999

- **NCEP-ATP III**

(National Cholesterol Education Program Adult Treatment Panel III)

Expert Panel, JAMA, 2001

- **ACE** (American College of Endocrinology)

Endocrine Practice 2003, 9 (Suppl 2)

- **IDF** (International Diabetes Federation)

[http://www.idf.org/webdata/docs/IDF\\_Metasyndrome\\_definition.pdf](http://www.idf.org/webdata/docs/IDF_Metasyndrome_definition.pdf),  
August 2005

The metabolic syndrome:  
time for a critical appraisal.

Joint statement from  
the American Diabetes Association and  
the European Association for the Study of  
Diabetes.

Kahn R, Buse J, Ferrannini E, Stern M.

Diabetologia 2005 Aug 4, Epub ahead of print  
Diabetes Care 28:2289, 2005

Eleven blind Buddhist monks examine an elephant but fail to agree upon a definition.



Illustration  
of old fable by  
Japanese artist  
Hokusai  
Katsushika  
(1760-1849)

implications for subsequent  
diabetes and cardiovascular  
outcomes

# NCEP-ATP III definition

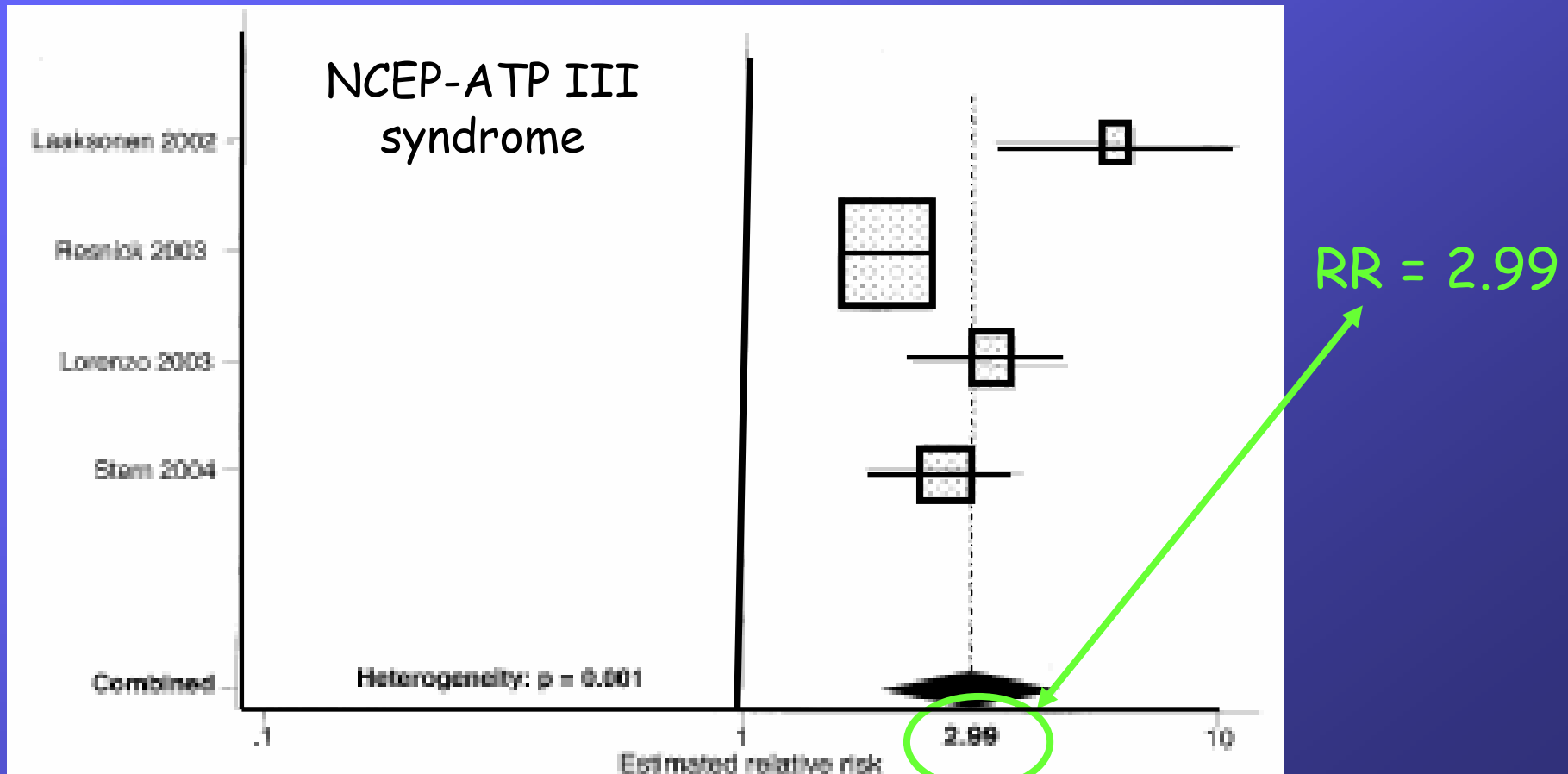
National Cholesterol Education Program  
Adult Treatment Panel III

At least three of:

- impaired fasting glucose  
(fasting plasma glucose  $\geq$  6.1 mmol/l)
- raised arterial pressure ( $\geq$  130/85 mmHg)
- high triglycerides ( $\geq$  2.0 mmol/l)
- low HDL-cholesterol ( $<$  1.04/1.29 mmol/l M/W)
- abdominal adiposity  
(waist circumference  $>$  102/88 cm M/W)

implications for subsequent  
diabetes

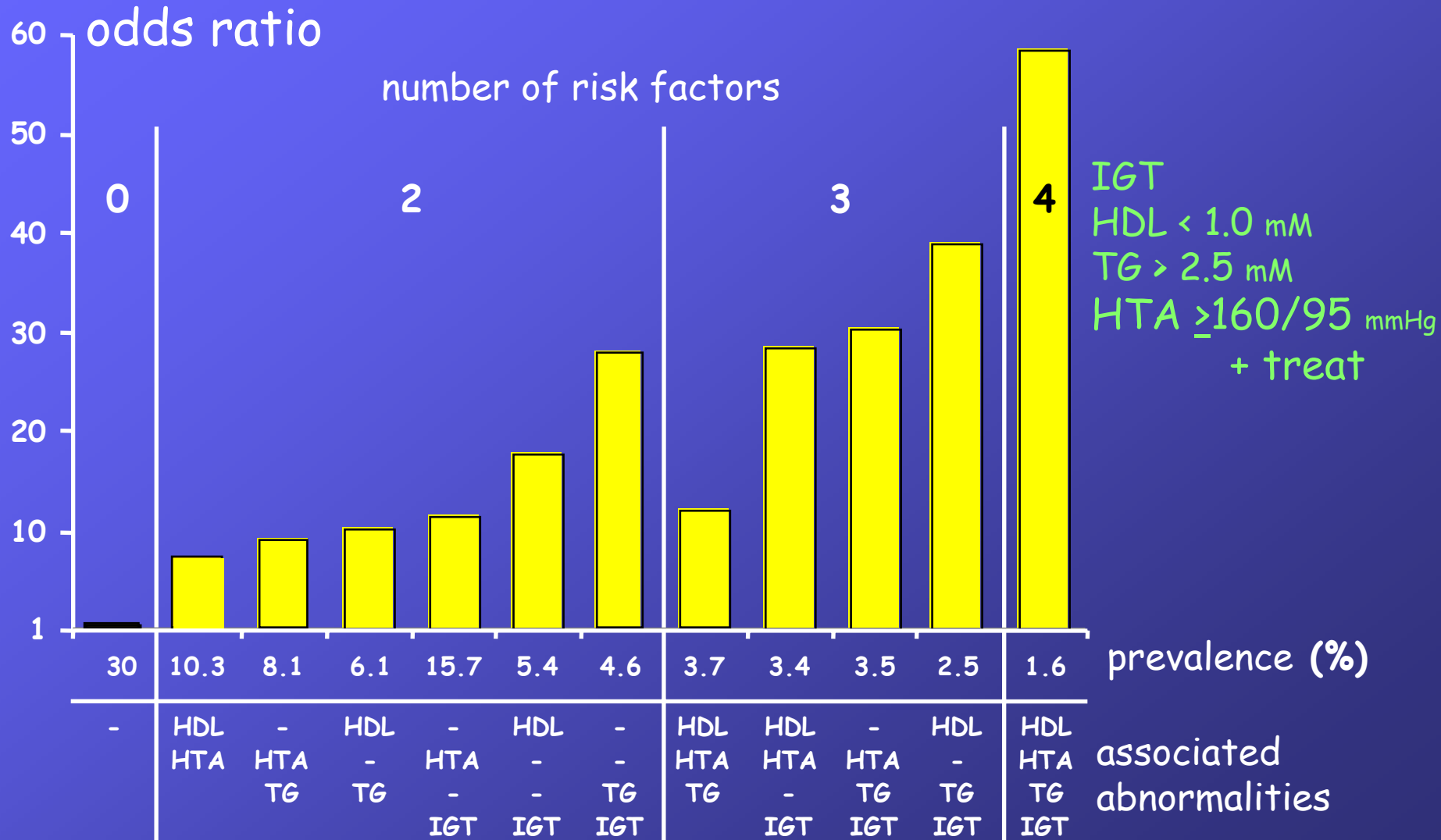
# meta-analysis, incident diabetes



is the syndrome a better  
predictor of diabetes than  
glucose ?

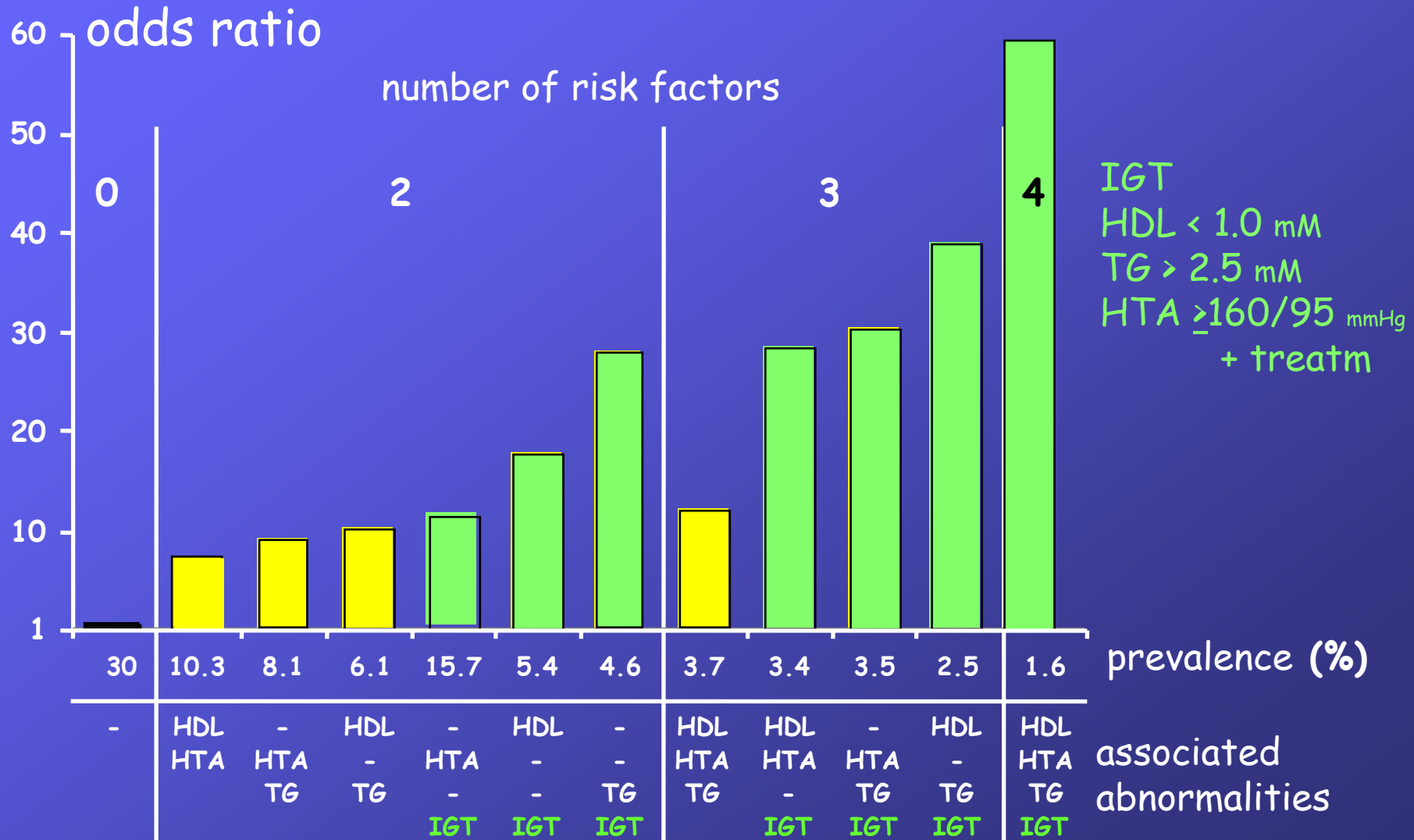
# incident diabetes

892 subjects, 65-74 years, followed 3.5 years, Finland



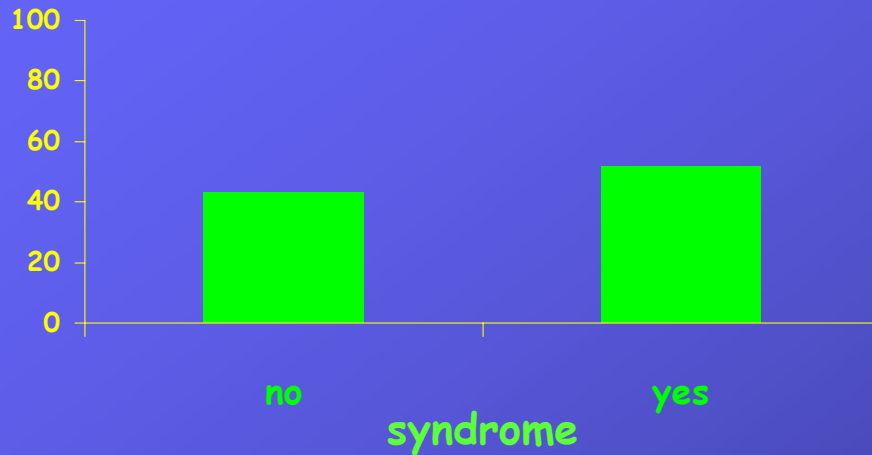
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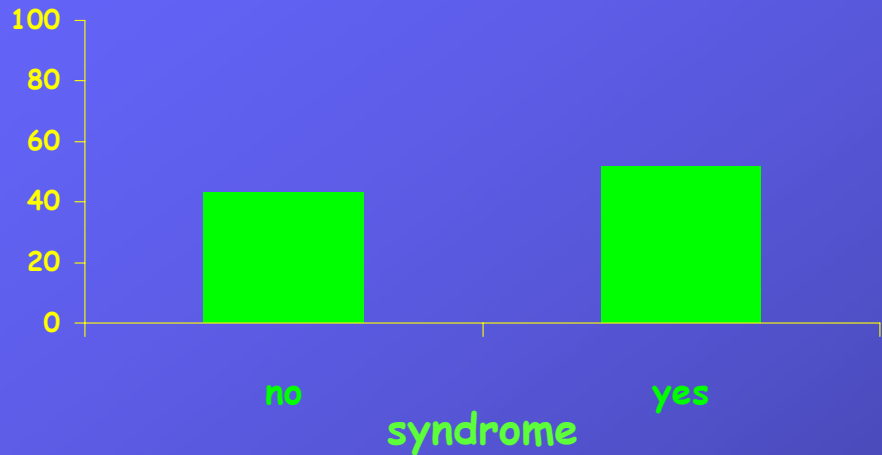
890 Pima Indians followed 4 years, syndrome prevalence 31%



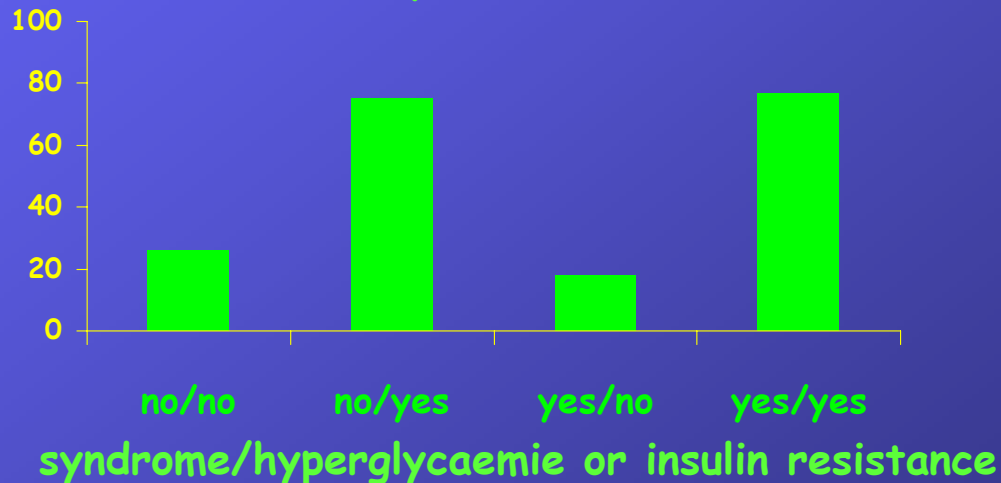
NCEP-ATP III  
syndrome criteria

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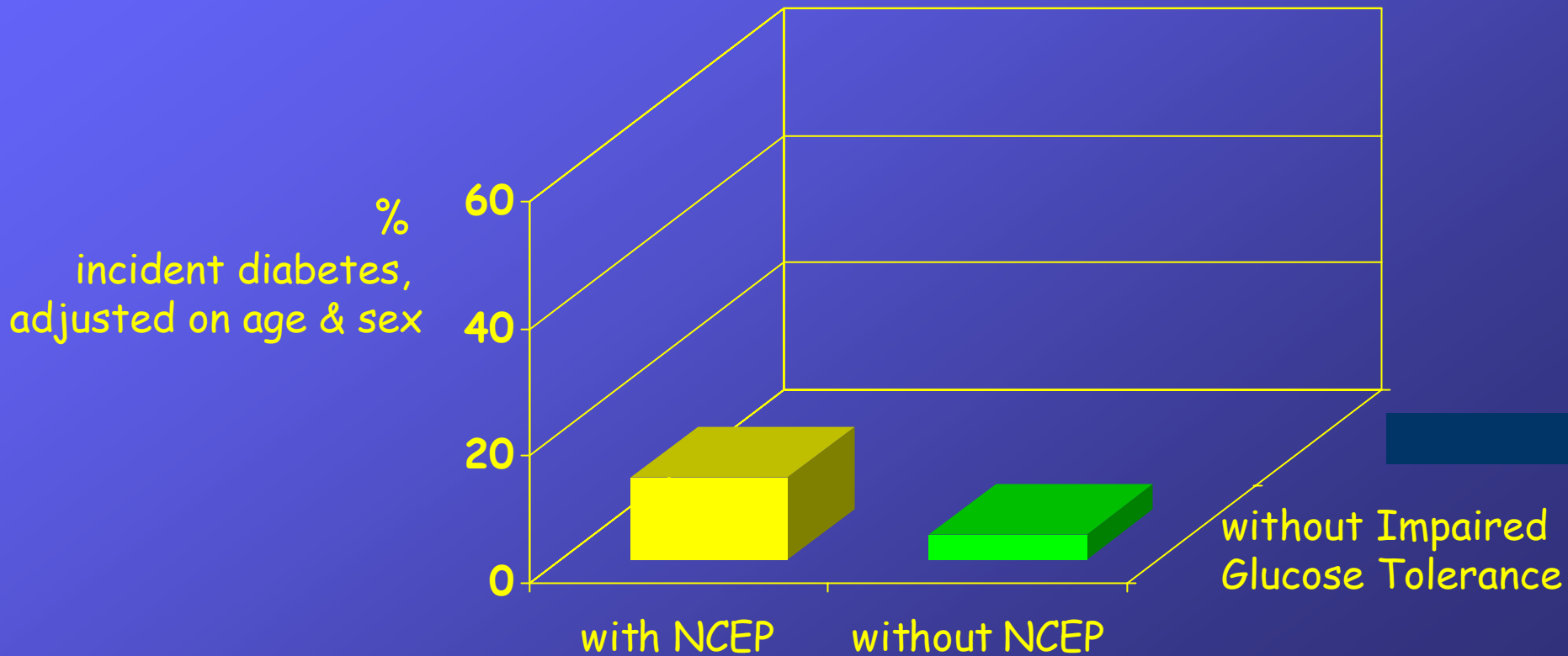


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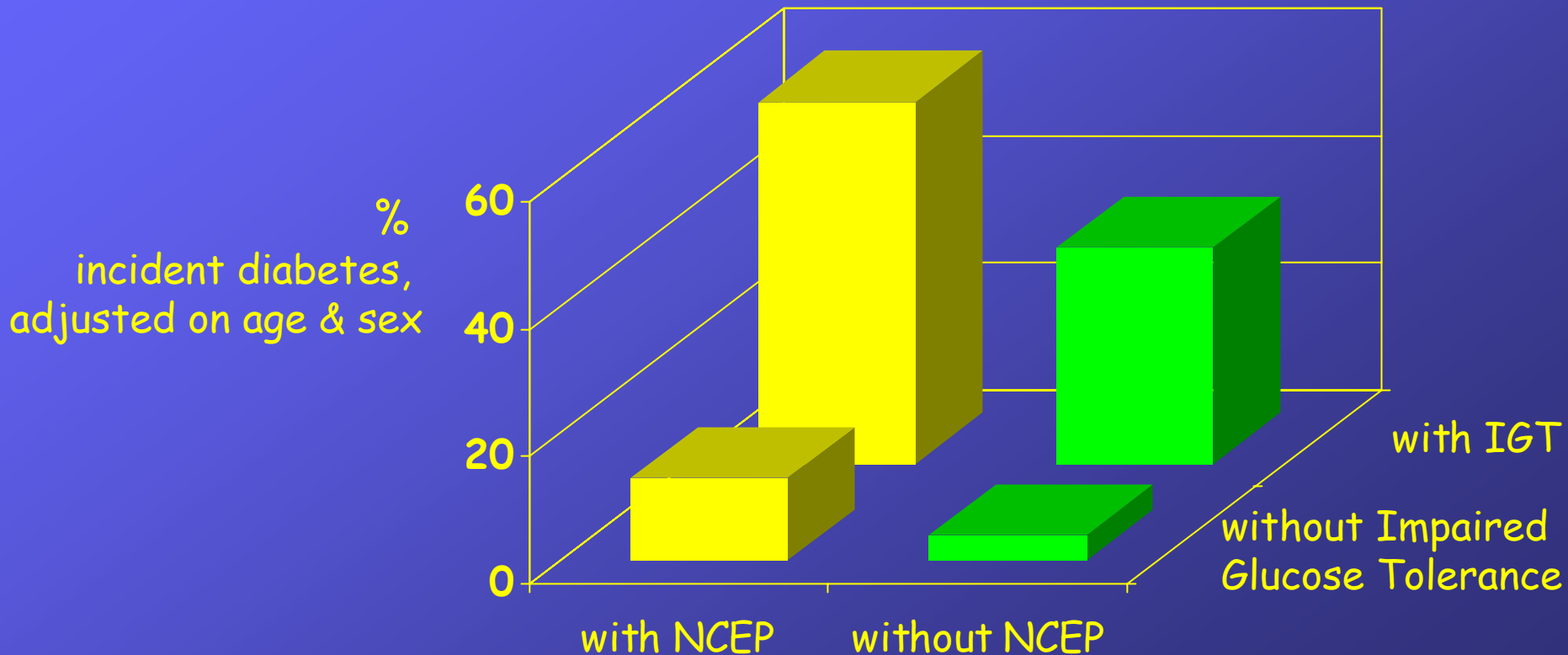
# incident diabetes

1734 subjects from San Antonio Heart Study, followed 8 yrs



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# summary / comments

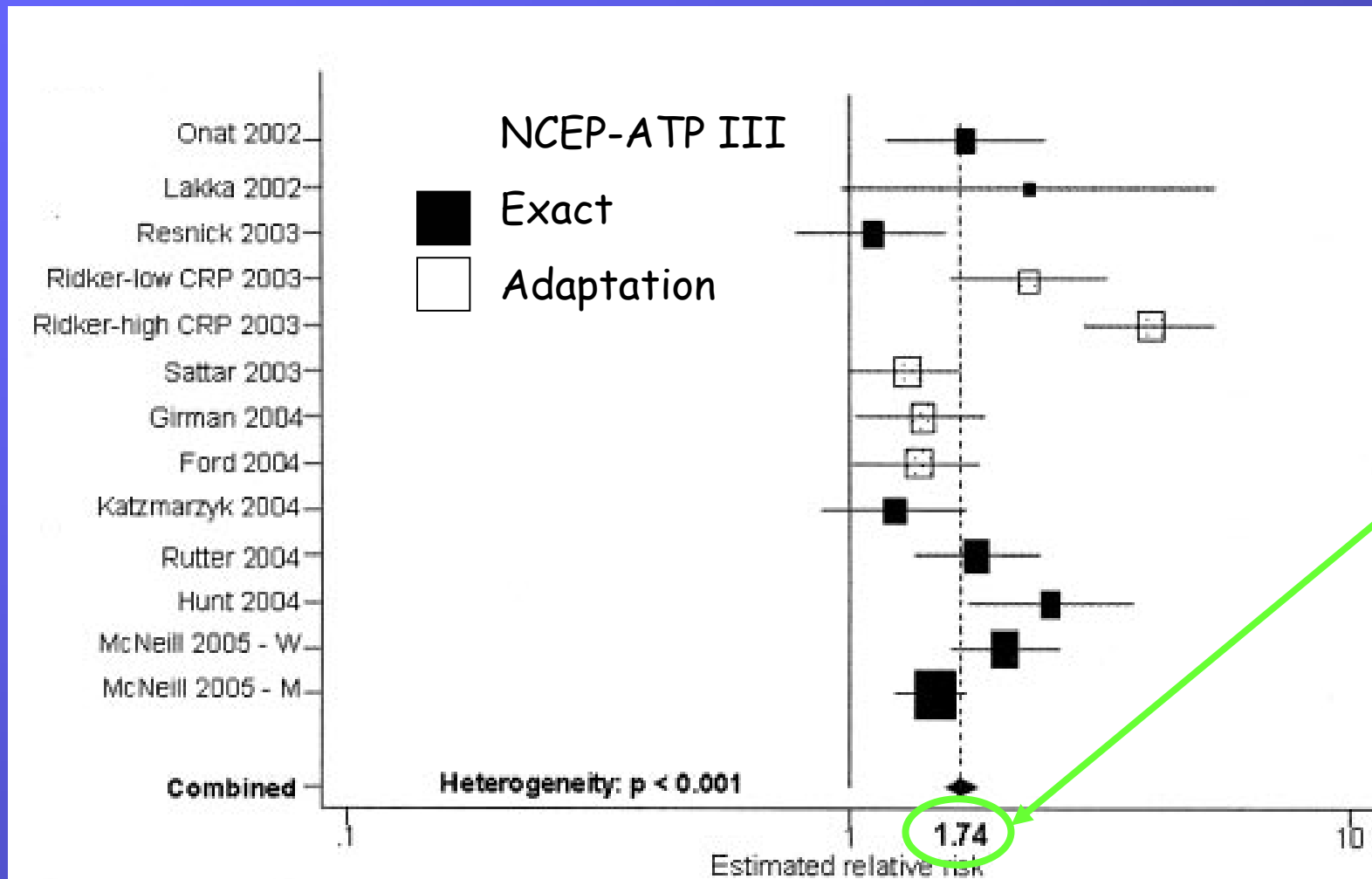
- the NCEP-ATP III defined syndrome predicts incident diabetes
- relative risk of  $\sim 3$

but

- baseline glucose is a better predictor of diabetes

implications for subsequent  
cardiovascular disease

# meta-analysis, incident CVD

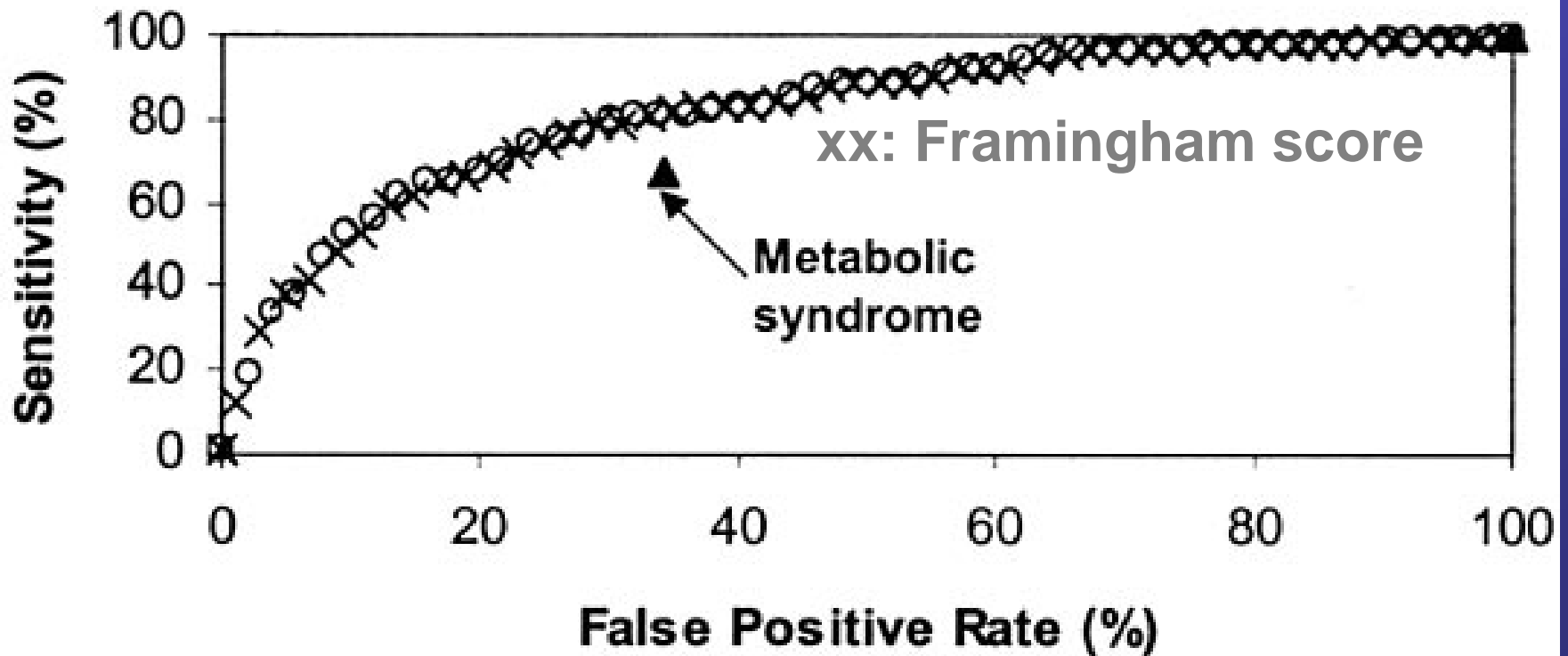


RR = 1.74

is the syndrome a better predictor of cardiovascular disease than a cardiovascular risk score ?

# CVD: ROC curves

2758 subjects, San Antonio Heart Study, 25-64 yrs,  
followed 7.5 yrs



# CVD odds ratios

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## univariate

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metabolic  
syndrome

4.0 (2.8-5.6)

(presence vs absence)

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Framingham  
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(2 unit increase)

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# CVD odds ratios

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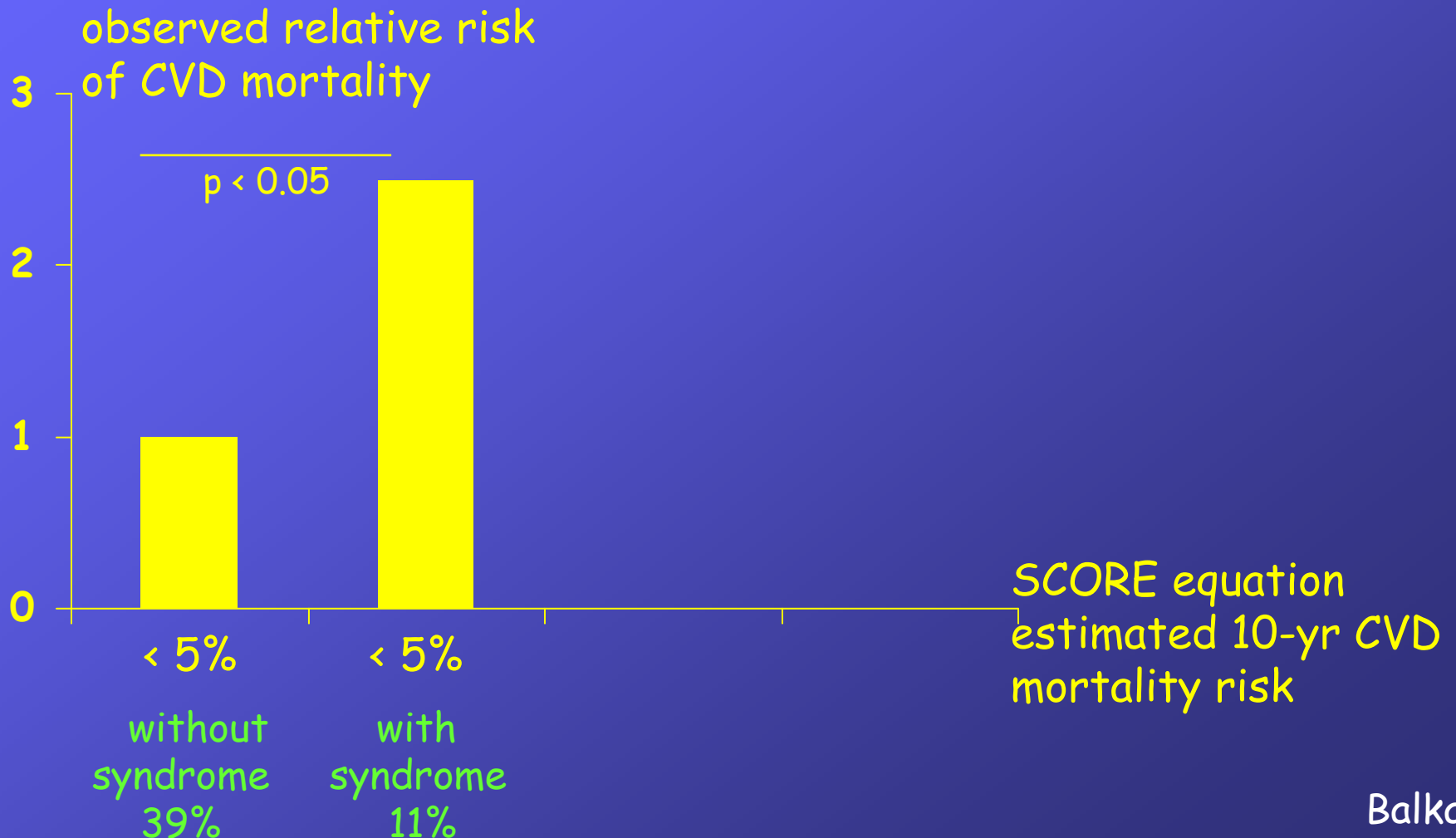
	univariate	multivariate
metabolic syndrome	4.0 (2.8-5.6)	1.1 (0.7-1.8)
(presence vs absence)		
Framingham risk score	9.7 (6.7-14.1)	9.1 (5.9-13.8)
(2 unit increase)		

is the syndrome a better predictor than a cardiovascular risk score ?

does it identify additional subjects at risk of CVD ?

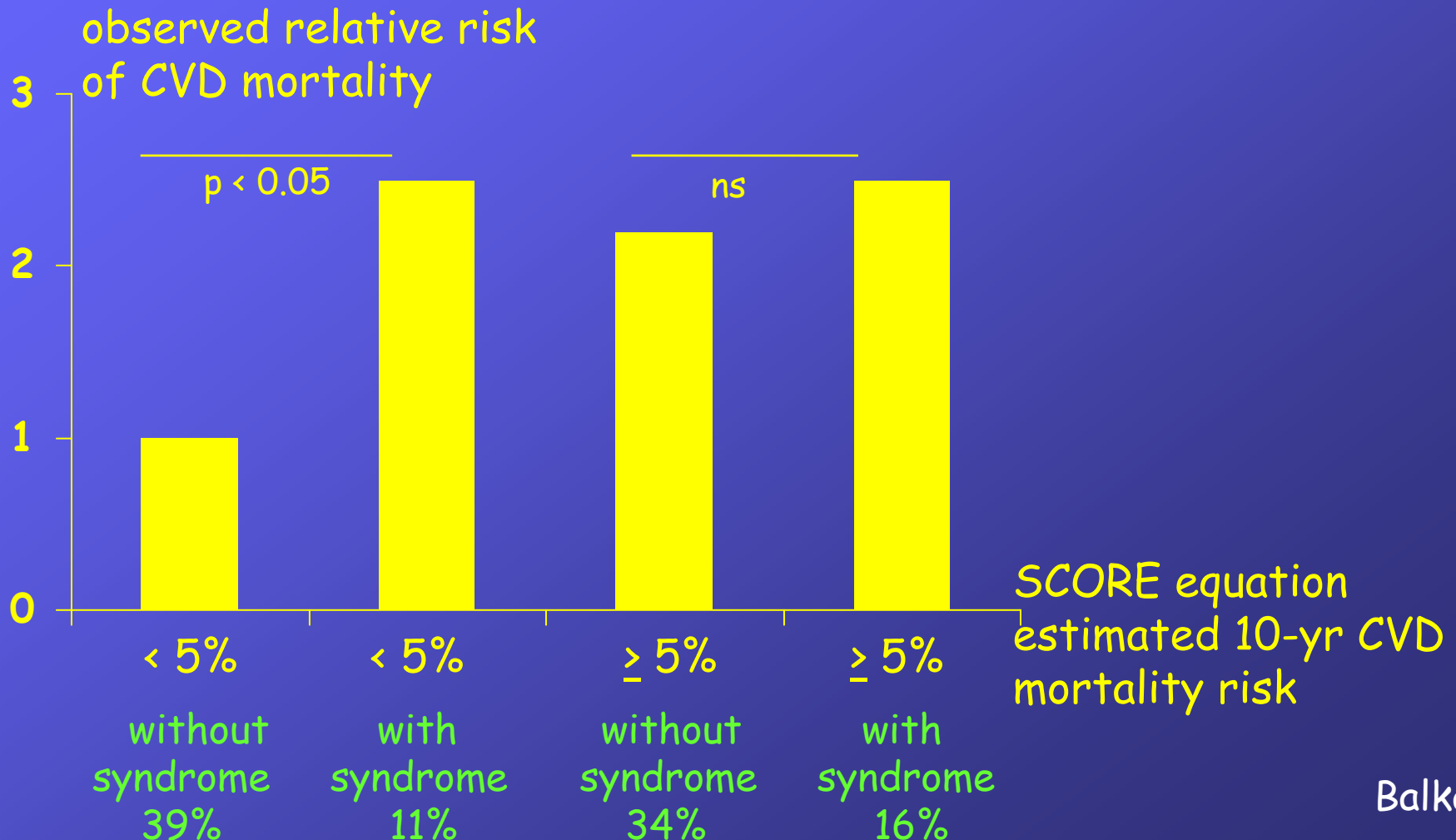
# CVD mortality - men

2790 non diabetic men, DECODE study, 50-69 years, followed 10 years



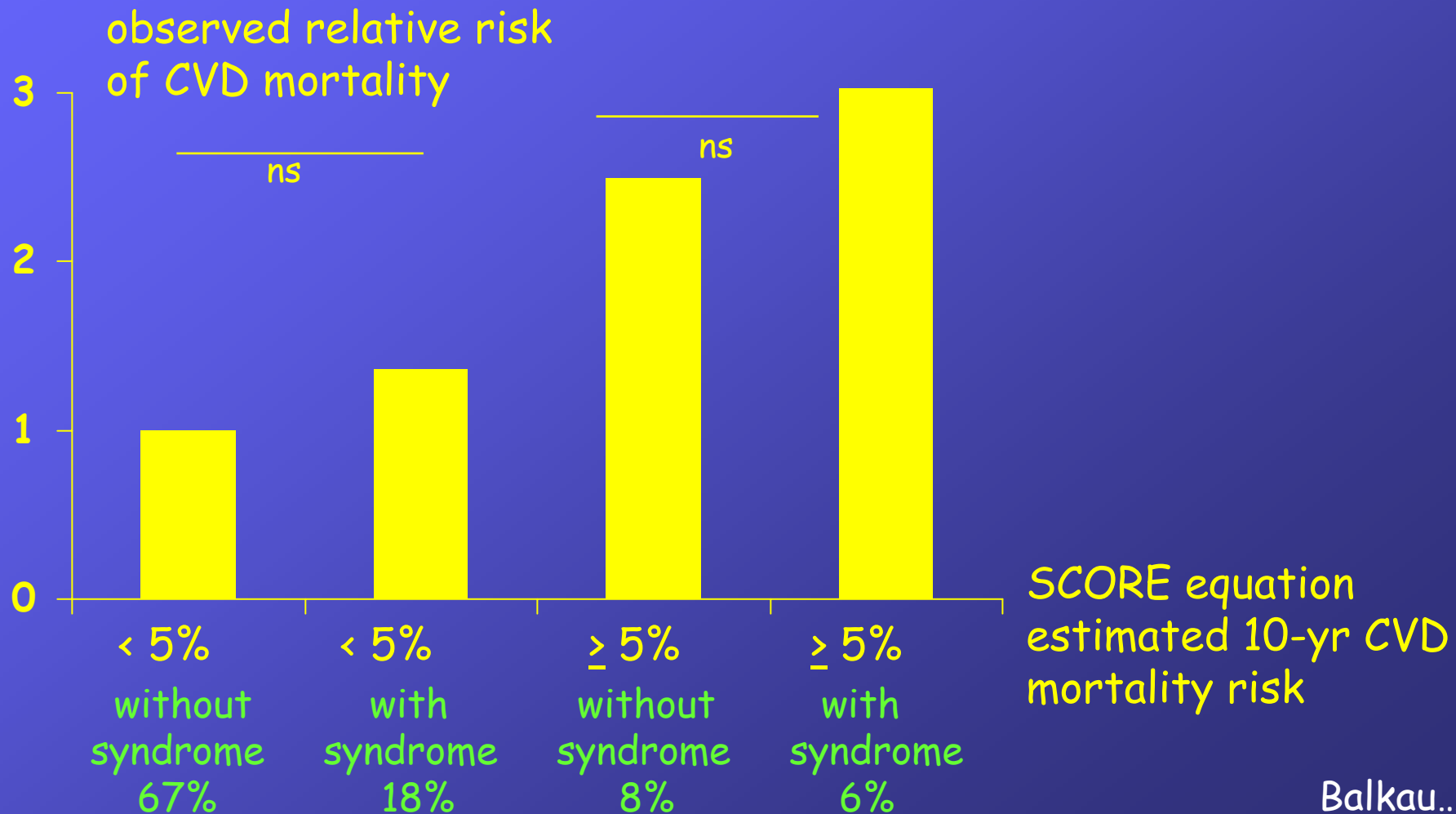
# CVD mortality - men

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# CVD mortality - women

3324 non diabetic women, DECODE study, 50-69 years followed 10 years



# relative risk\* of CVD mortality in low risk subjects

	without abnormality	with abnormality	
		men	women
waist > 102/88 cm	1	2.2*	2.3

\*adjusted on age, study

\* p < 0,05 ; \*\* p < 0,01 ; \*\*\* p < 0,001

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waist + SBP/DBP	1	3.5***	1.3

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# summary / comments

- men
  - with a **low** predicted CVD mortality risk (SCORE) & the NCEP-ATP III syndrome have equivalent CVD mortality to those with a higher mortality risk
  - with a **high** predicted CVD mortality risk, syndrome not predictive
- women
  - syndrome is not predictive for women with low or high predicted CVD risk

a large waist circumference is associated with a high risk of fatal CVD

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better than cardiovascular mortality  $RR=1.7$
- glucose is a better predictor of diabetes than the syndrome
- a CVD risk score is a better predictor of CVD than the syndrome
- the syndrome does identify men at CVD risk - but waist circumference does almost as well, waist and blood pressure better