



Platelet Volume & Cardiovascular Disease

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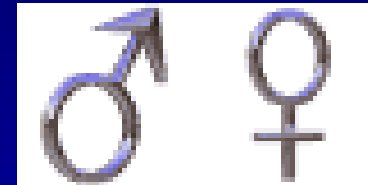
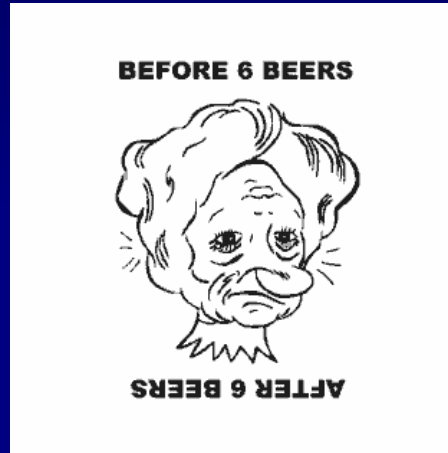


Background

- Coronary artery disease is the most common cause of death worldwide
- It is the top three most common cause of death in our country
- Huge burden of health care cost each year

Risk factors of atherosclerosis

- Age
- Sex
- Family history
- Smoking
- Dyslipidaemia
- Hypertension
- Diabetes
- Obesity
- Stress
- Lack of exercise
- Inflammation



Despite no risk factors

- Many people still develop cardiovascular events
- Need of new prognostic markers for better risk stratification

Pathophysiology Atherosclerosis

Foam Cells

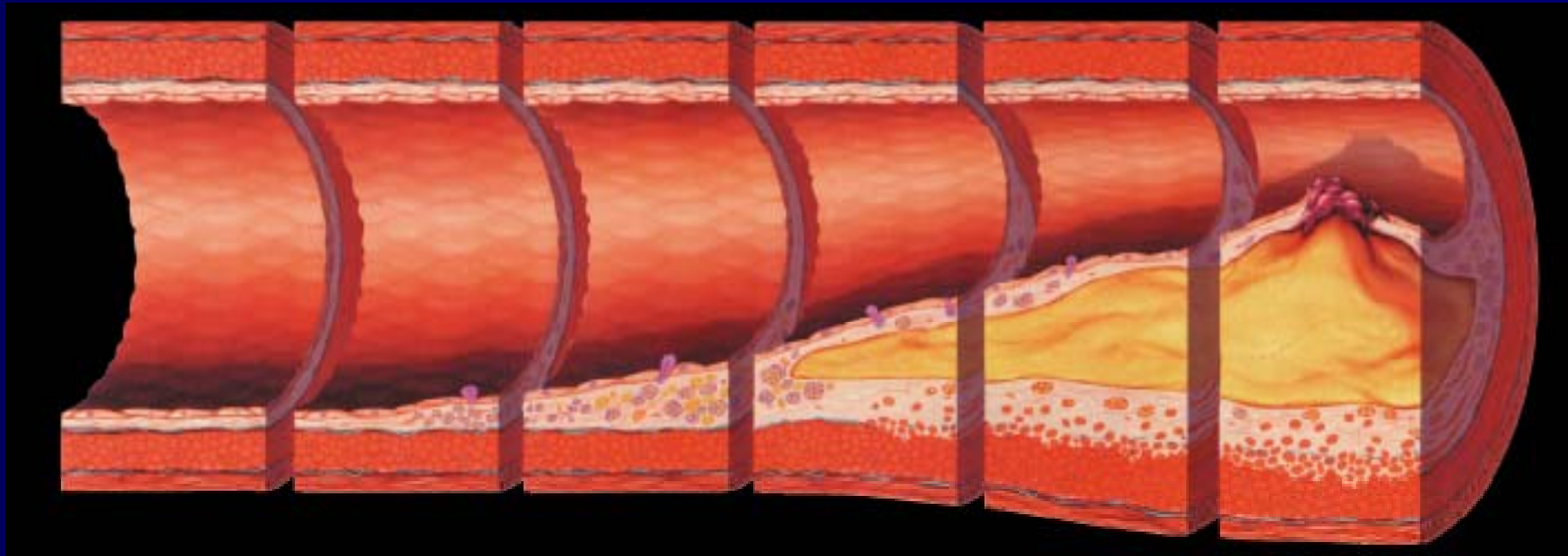
Fatty Streak

Intermediate Lesion

Atheroma

Fibrous Plaque

Complicated Lesion/
Rupture



Endothelial Dysfunction

From First
Decade

From Third
Decade

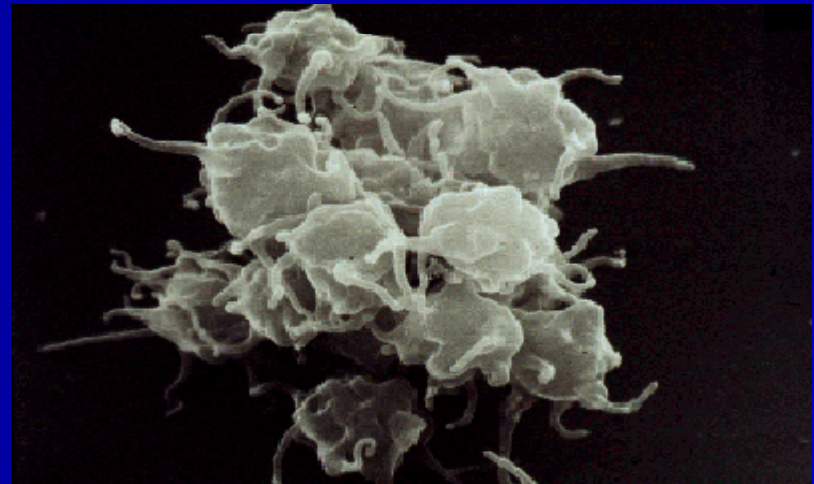
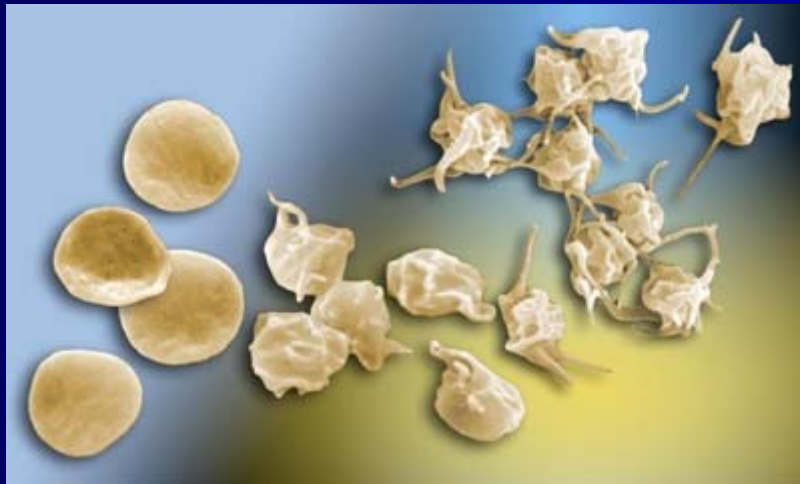
From Fourth
Decade

Adapted from Pepine CJ. *Am J Cardiol.* 1998;82(suppl 104).



Platelets

- Thrombocytes
- 2-3 microns
- Help in homeostasis



Platelets

- Play an important role in pathophysiology of acute cardiovascular event
- May be associated with development and progression of atherosclerosis

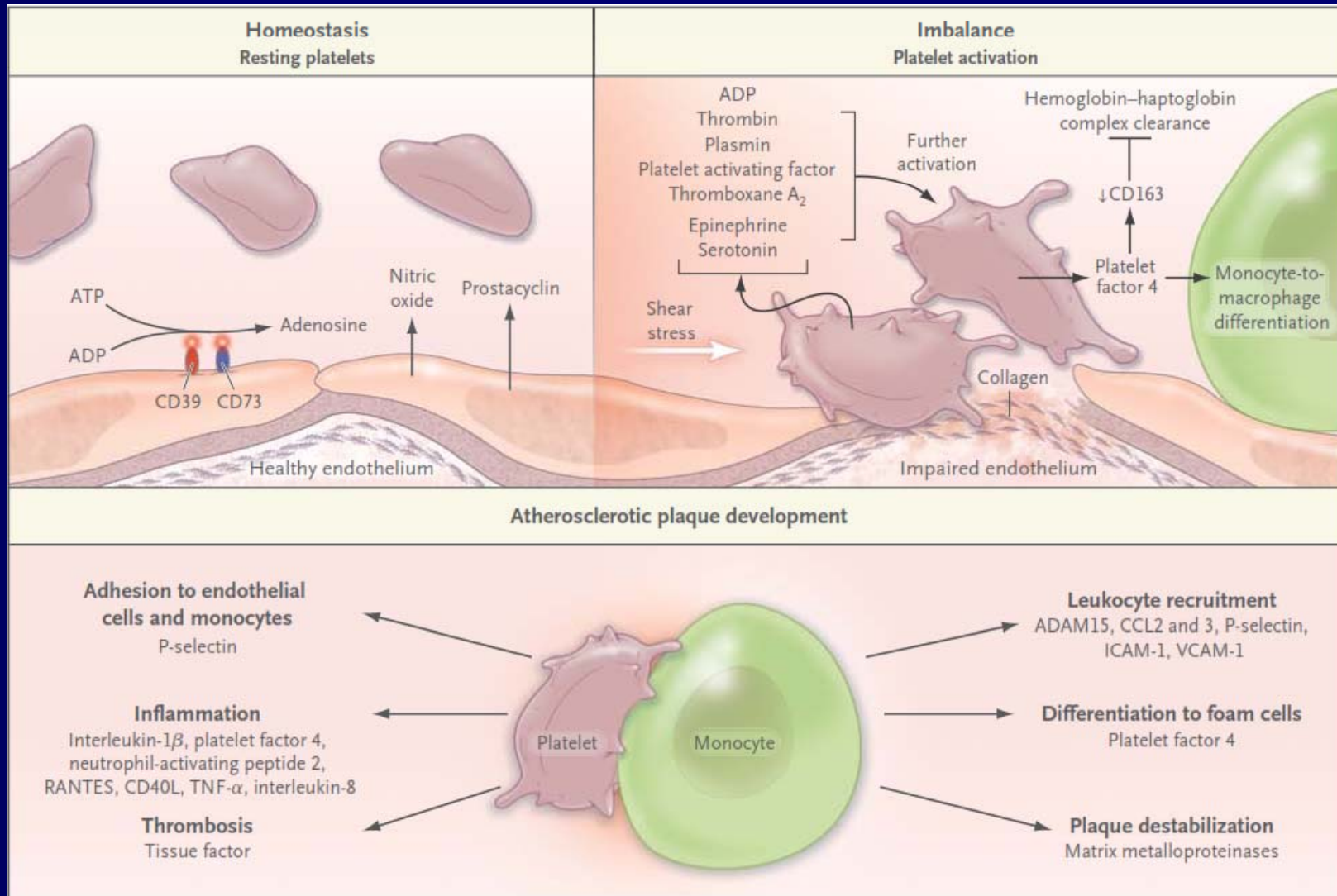
REVIEW ARTICLE

MECHANISMS OF DISEASE

The Hemostatic System as a Modulator of Atherosclerosis

Julian Ilcheff Borissoff, M.D., Henri M.H. Spronk, Ph.D.,
and Hugo ten Cate, M.D., Ph.D.

Platelets in atherogenesis



Platelets

- Platelets and coagulation system are important determinants of atherogenesis and atherothrombosis from experimental data
- Lack of clinical evidence of a role for the hemostatic system in atherosclerosis progression

Platelets

- Inflammation is closely linked to coagulation
- Bidirectional cross-talk between the two system has been established in atherosclerosis

Platelets

- Platelets create interface between hemostasis, innate immunity, inflammation, atherosclerosis

Platelets

- Platelet function test
 - Associated with risk of future cardiovascular event in CAD
- Expensive, complicated, not widely available



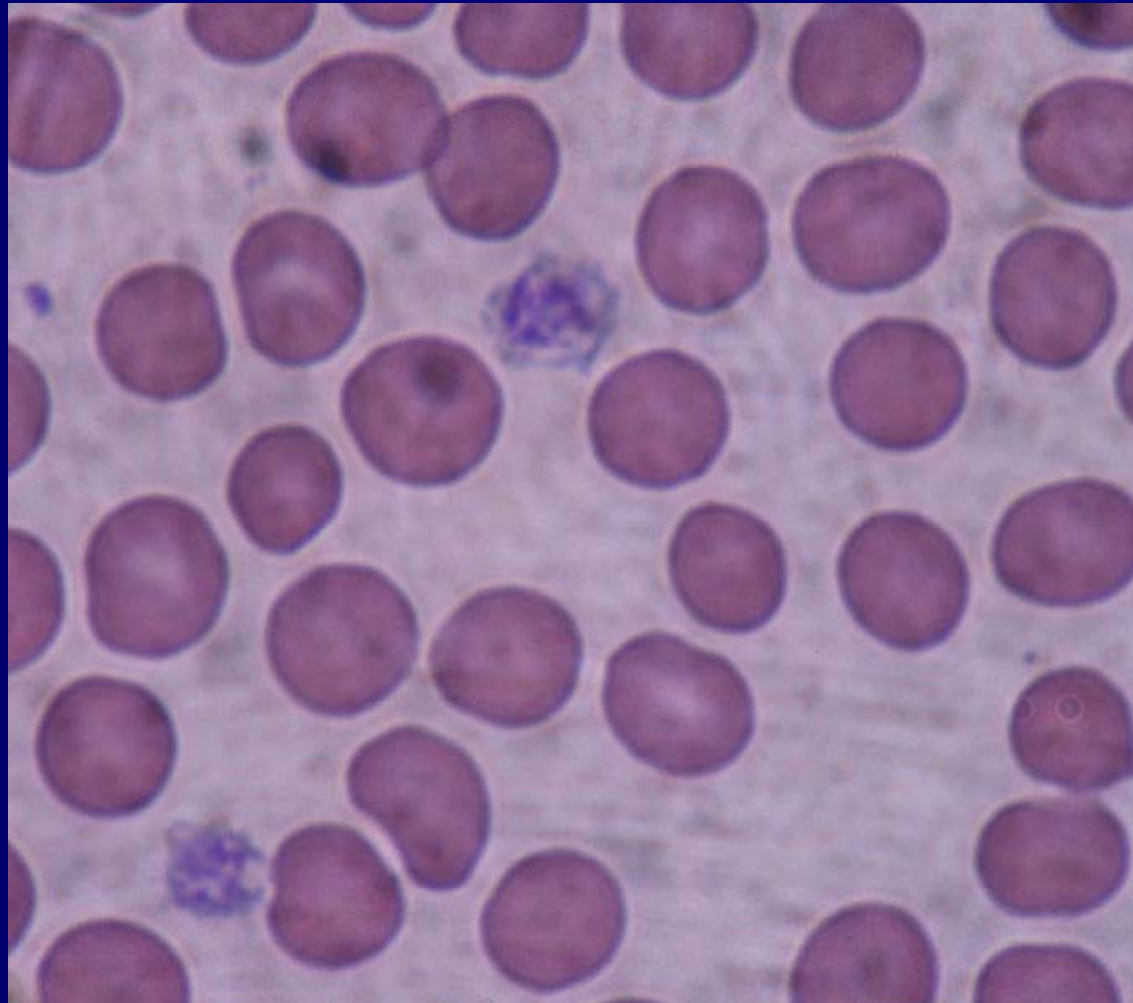
The novel markers for CVD



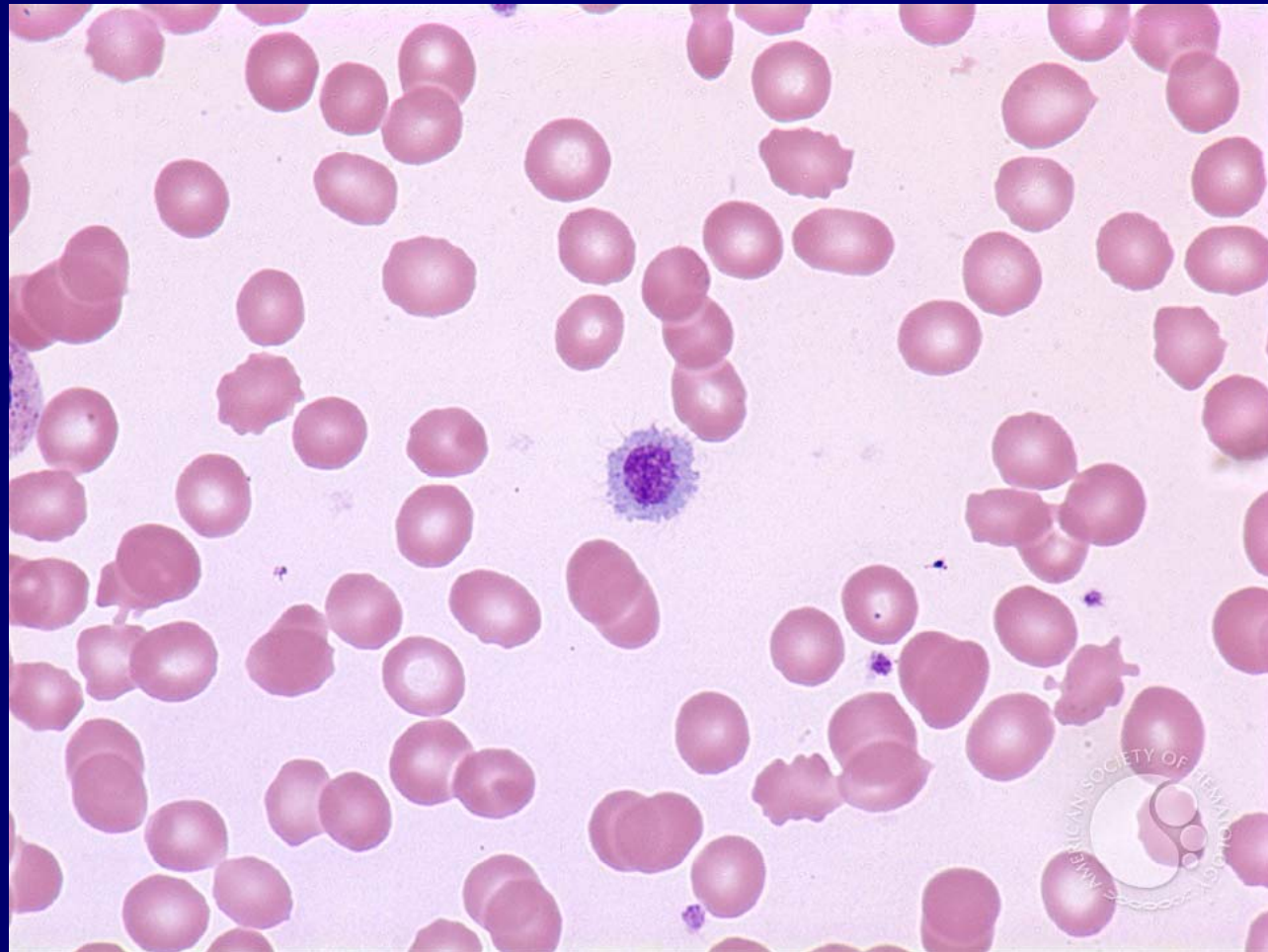
Platelet volume

- The young platelets are larger and have higher homeostatic property.
- It might be useful as a predictor of future cardiovascular disease/events

Large platelet



Large platelet



Mean platelet volume

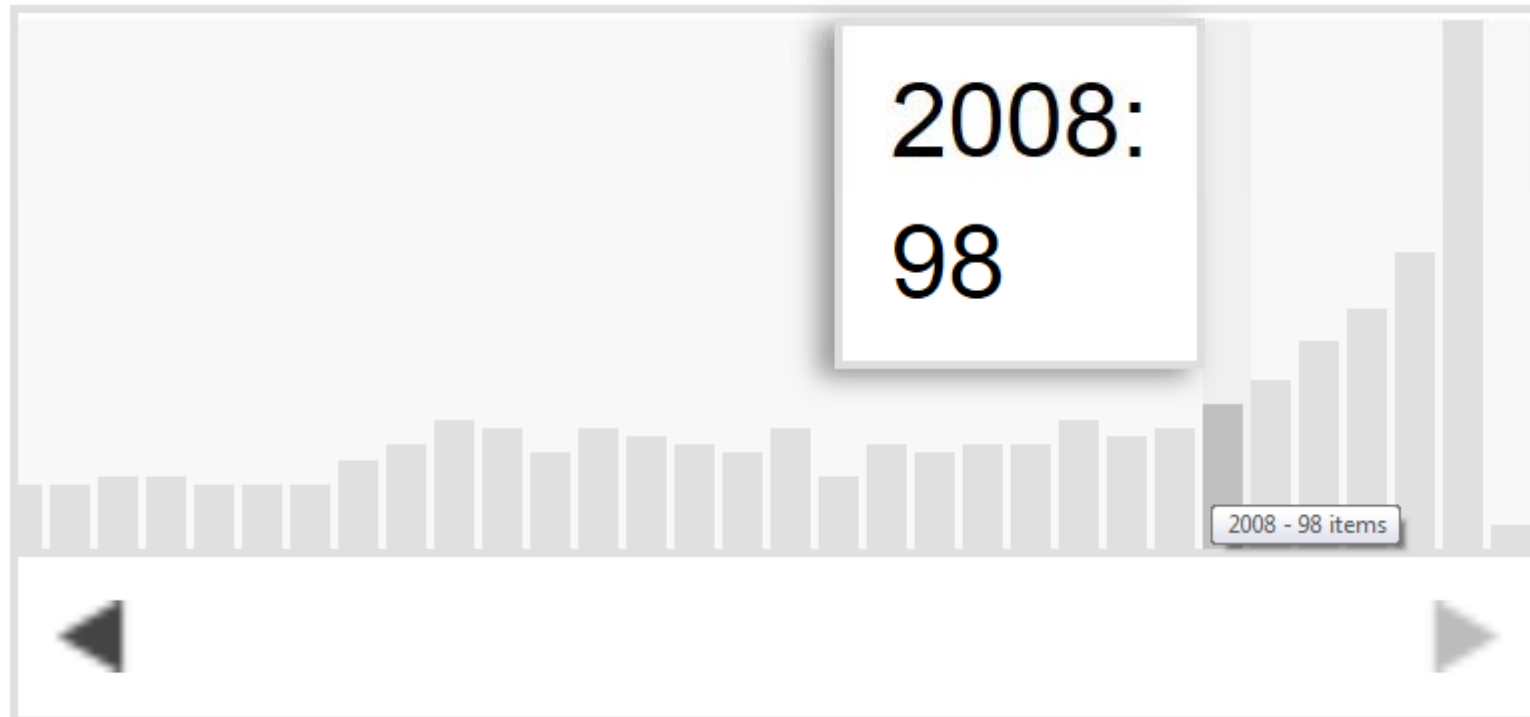
- Parameter of platelet size
- Correlate with platelet function
- Simple, cheap, widely available

CBC report

Test Name	Accession	Specimen	Physician	Collected	Received	PL
CBC with Differential	H073240390	Blood	ABEL, DAVID E	11/20/2007 16:39	11/20/2007 16:40	RO
	Result				Units	Reference
White Blood Cell Count	4.50				10E3/uL	4.00-11.00
Red Blood Cell Count	4.25				10E6/uL	3.80-5.20
Hemoglobin	11.3 L				g/dL	11.6-15.5
Hematocrit	33.9 L				%	35.0-46.0
MCV	79.0 L				fL	80.0-100.0
MCH	26.0 L				pg	27.0-34.0
MCHC	31.8 L				g/dL	32.0-35.5
Platelet Count	110 L				10E3/uL	150-400
RDW CV	11.0				%	11.0-16.0
Mean Platelet Volume	7.9 L				fL	8.0-13.0

Review of literature: MPV

Results by year



[Download CSV](#)

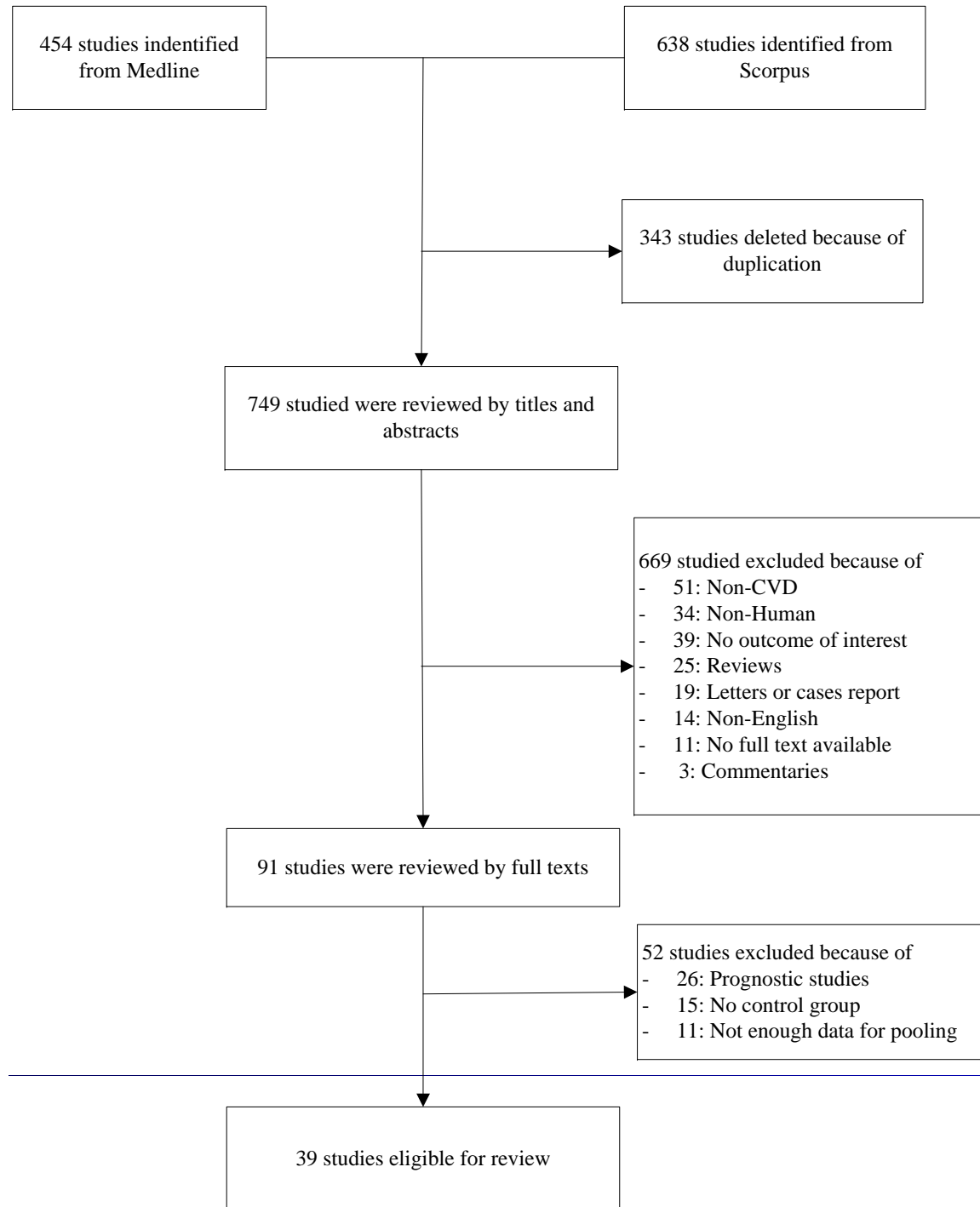
Systematic review and meta-analysis

Search terms

MEDLINE	SCOPUS (title-Abs-Key)		
"platelet volume"	1,402	"platelet volume"	2,976
"Cardiovascular Diseases"[Mesh]	1,764,187		
"cardiovascular disease"	1,830,086	"cardiovascular disease"	497,520
cardiovascular disease	1,830,086	cardiovascular disease*	1,131,751
"Myocardial Infarction"[Mesh]	138,981		
"myocardial infarction"	179,269	"myocardial infarction"	456,982
"Coronary Restenosis"[Mesh]	5,807		
restenos*	18,900	restenos*	55,618
re-stenos*	475	re-stenos*	960
"Death"[Mesh]	109,208		
death	541,539	death	1,636,919
mortality	777,169	mortality	1,579,506
"Heart Failure"[Mesh]	79,883	"heart failure"	342,228
"Ventricular Function, Left"[Mesh]	24,752	"left ventricular function"	65,638
"ejection fraction"	38,461	"ejection fraction"	83,616
"coronary flow"	8,260	"coronary flow"	21,749
"coronary blood flow"	6,098	"coronary blood flow"	18,090
((((((((#29) OR #28) OR #27) OR #26) OR #25) OR #24) OR #23) OR #22) OR #21) OR #20) OR #18) OR #15) OR #12) OR #9) OR #7) OR #4) AND #2	454	("platelet volume") AND (((("cardiovascular disease") OR (cardiovascular disease*) OR ("myocardial infarction") OR (restenos*) OR (re- stenos*) OR (death)) OR ((mortality) OR ("heart failure") OR ("left ventricular function") OR ("ejection fraction") OR ("coronary flow") OR ("coronary blood flow"))))	638

Number as searched on 12 March 2013

Meta-analysis



39 Eligible studies for reviews

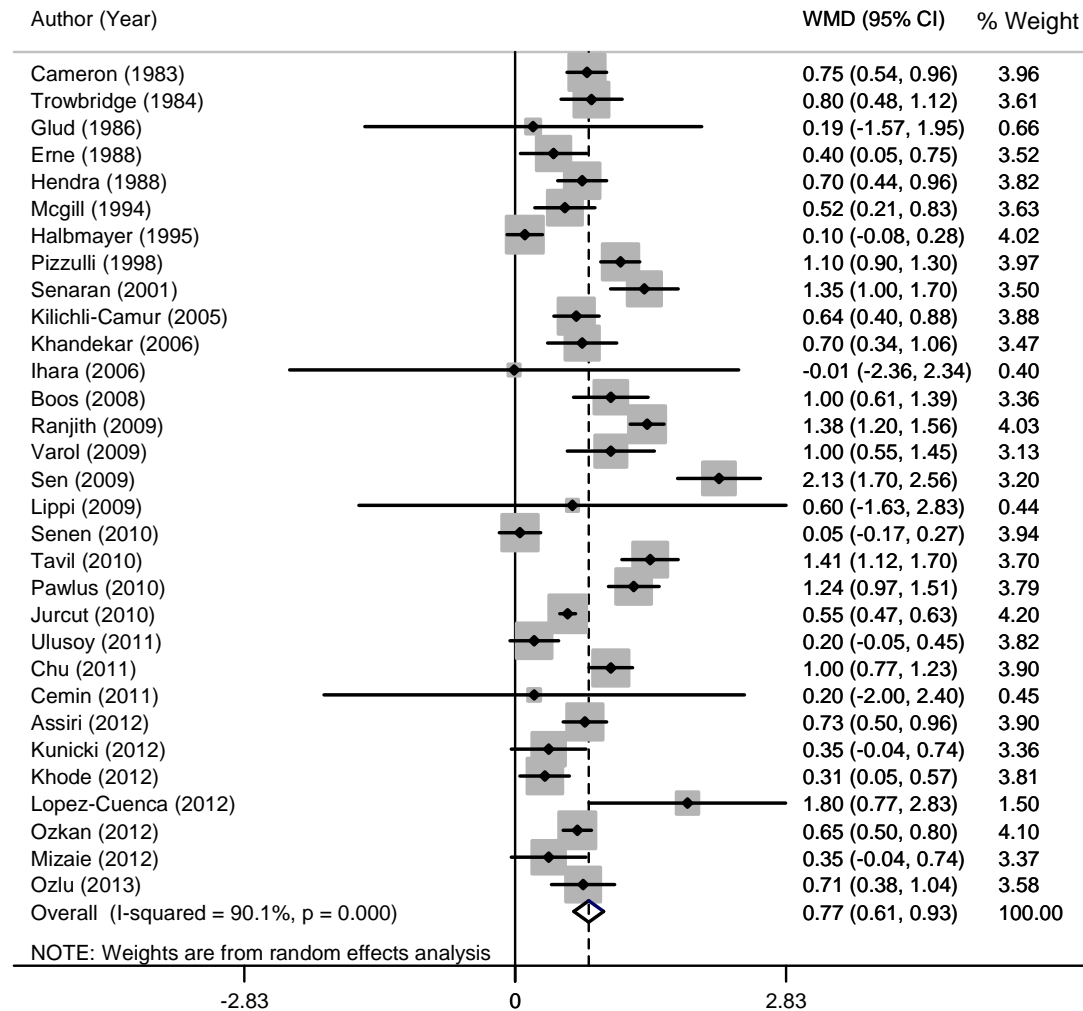
31 Studies comparing mean difference in MPV between CAD and control

6 Studies reporting mean difference in MPV between Slow vs. normal coronary flow

8 Studies reporting OR of CAD in High vs. low MPV

CAD vs. control (31 studies)

Pooled mean diff MPV= 0.77 (0.61,0.93)

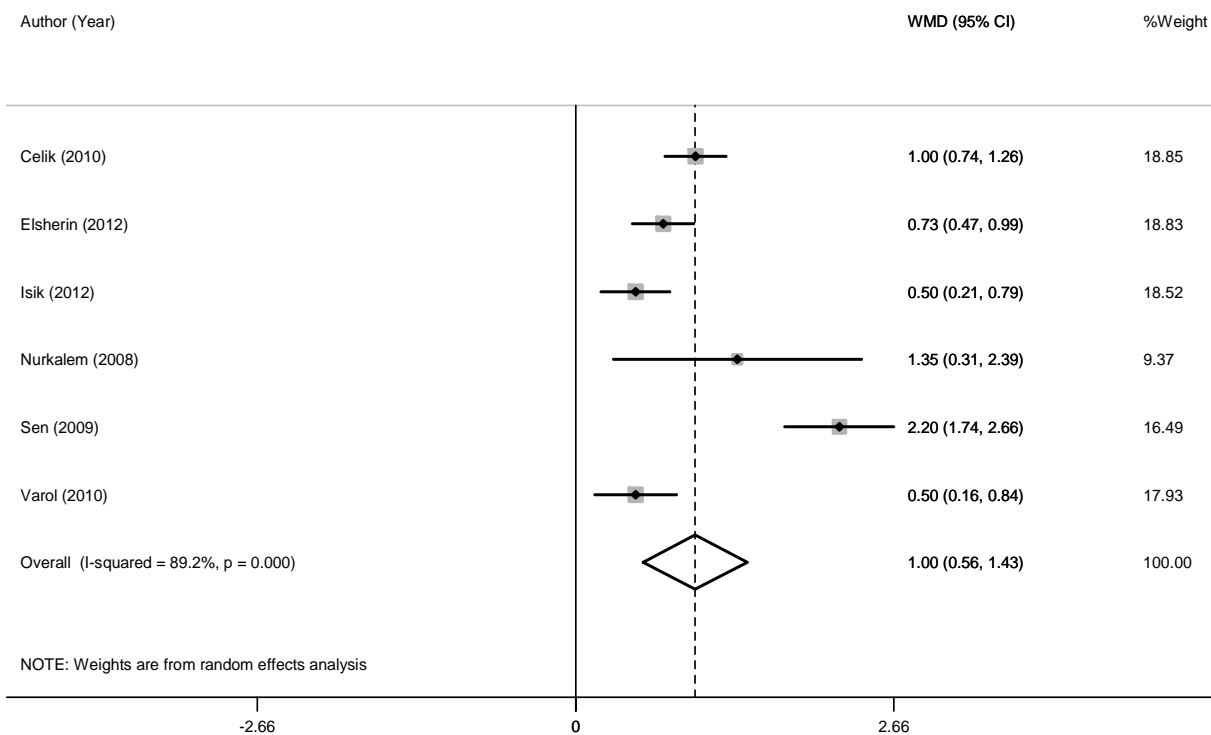


Subgroup analysis

	Number of study	Number of case	Number of control	Mean difference in MPV	95% CI
CSA	6	851	816	0.46	(0.11, 0.81)
CS	9	1,238	703	0.68	(0.33, 1.03)
CSA+CS	15	2,089	1,519	0.59	(0.35,0.82)
MI	18	1,783	3,541	0.89	(0.71, 1.06)
NSTEMI	4	526	227	0.829	(-0.014,1.671)
UA	8	476	523	0.92	(0.57, 1.27)
ACS	24	3,147	6,386	0.91	(0.71, 1.12)
CAD	31	5,236	7,049	0.77	0.61,0.93
Slow flow	6	336	297	0.998	0.564,1.431

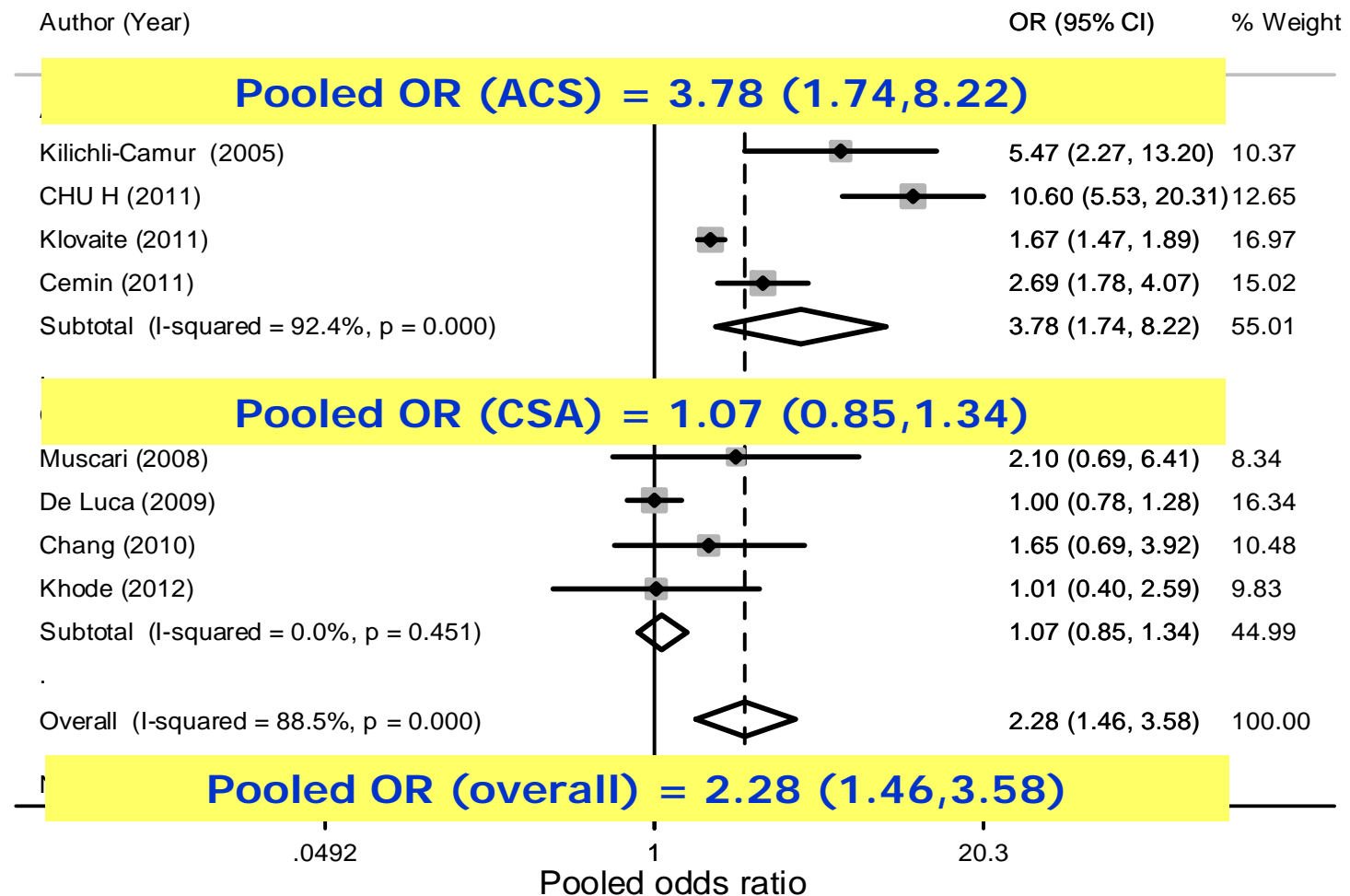
Slow coronary flow vs. normal coronary flow

Pooled mean diff MPV= 1.0 (0.56,1.43)



Pooled OR

A. Pooled odds ratio according to types of case



MPV and CVD: Filling the gap (of knowledge)



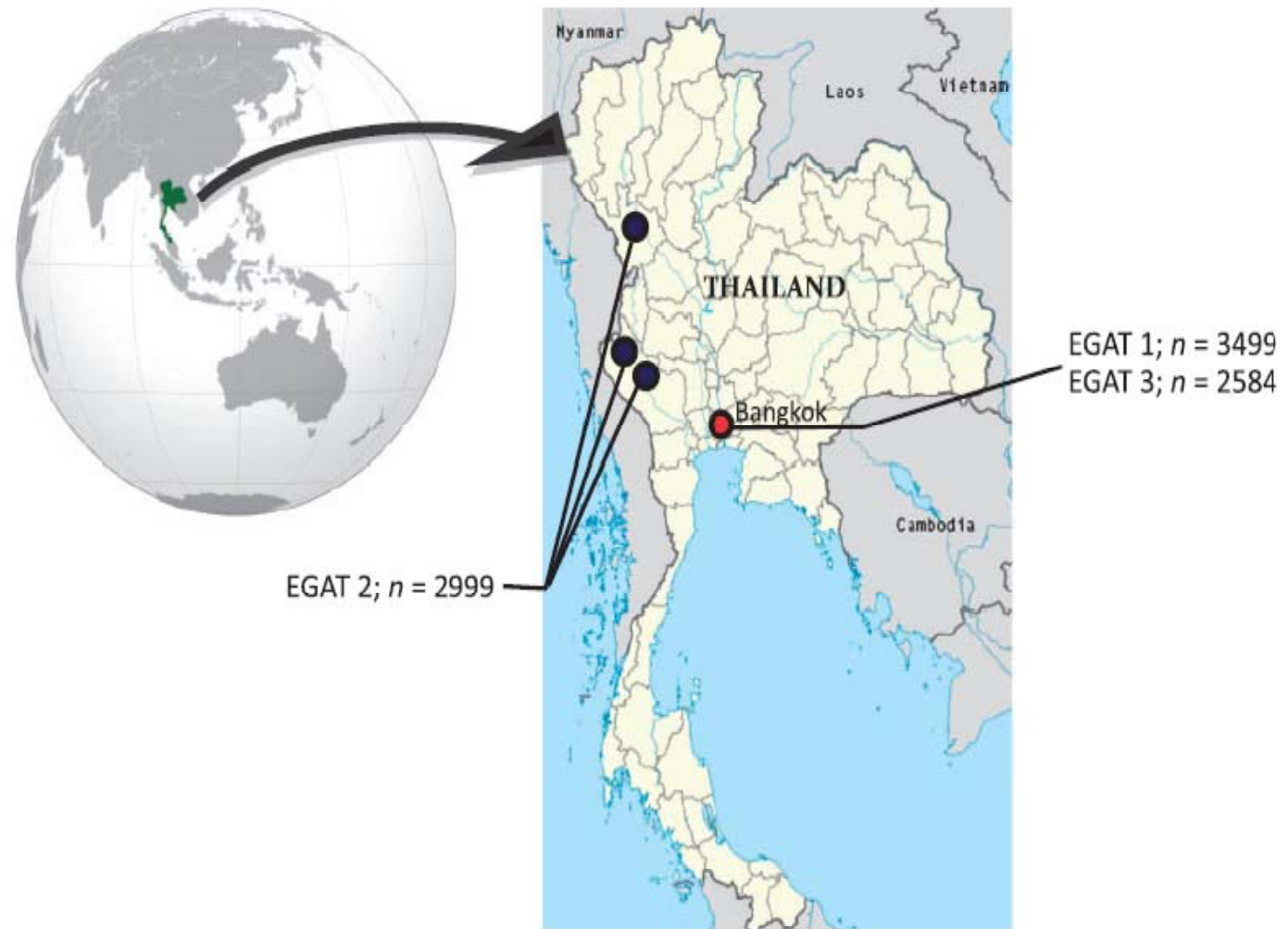


Figure 1 Map showing study sites and number of participants in EGAT cohorts

Study design

- Use data from prospective cohort of EGAT

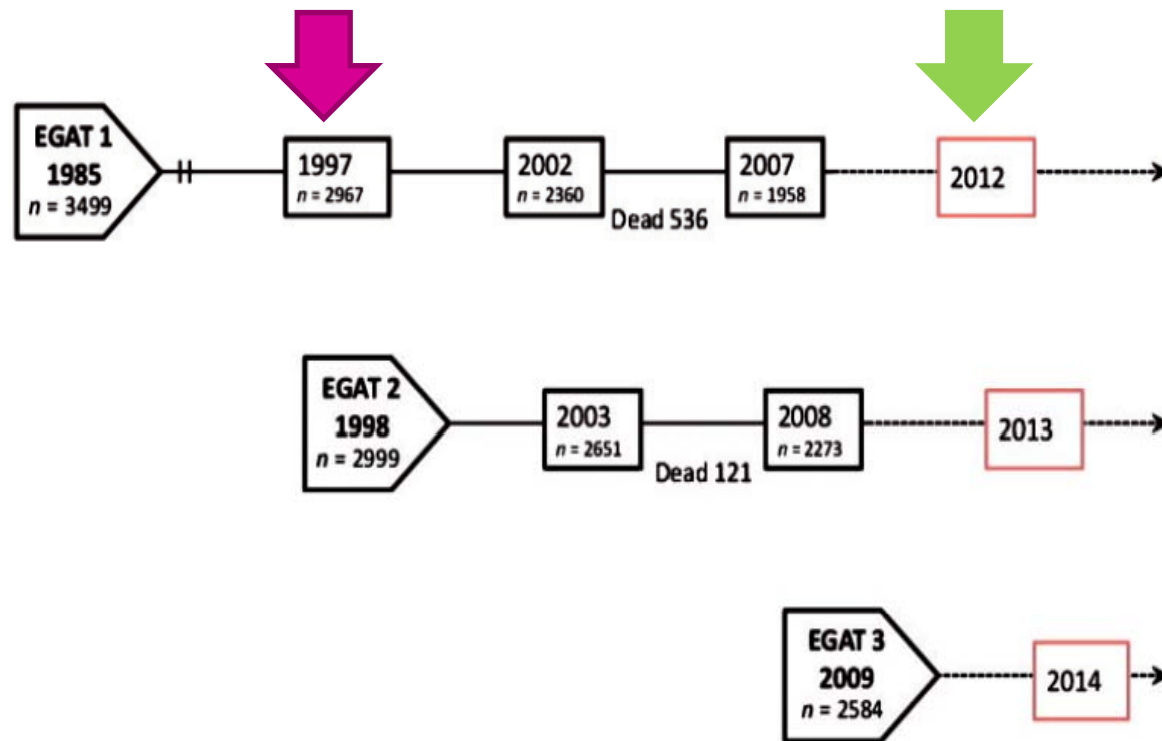


Figure 2 Overview of EGAT cohorts. Each box represents a survey of an EGAT cohort between 1985 and 2009, plus the current projections. Deaths are up to the last resurvey for EGAT 1 and EGAT 2. *n* is the number of people who were surveyed at each time

Strength: good prospective cohort

- Decent number of subjects
- Detailed and thorough measurement of co-morbidities and other biomarkers
- High rate of follow up
- Long duration of follow up
- Prospective and pre-specified outcomes measurements

Primary endpoints

- Composite endpoints of death, MI, stroke, heart failure, PCI, CABG, hospitalization from CVD

Secondary endpoints

- Each component of primary endpoint
 - Total mortality
 - CV death
 - MI
 - Stroke
 - CHF
 - Revascularization

Statistical Analysis

- Time to event analysis

Outcome ascertainment

- EGAT network connection
- National Statistical Office
- Ministry of Interior

- Telephone interview and review of all medical records for patients with hospital admission

Thank you