

*Preconception Risk Assessment in Patients
with Heart Disease*
CPP 2010

Samuel Siu MD SM

**Gunton Professor and Chair of Cardiology, Schulich School
of Medicine and Dentistry, University of Western Ontario**

**Adjunct Professor of Medicine, Obstetrics, and Gynecology,
University of Toronto**



Disclosure

Conflict of interest: None

Unlabeled or investigational use: None

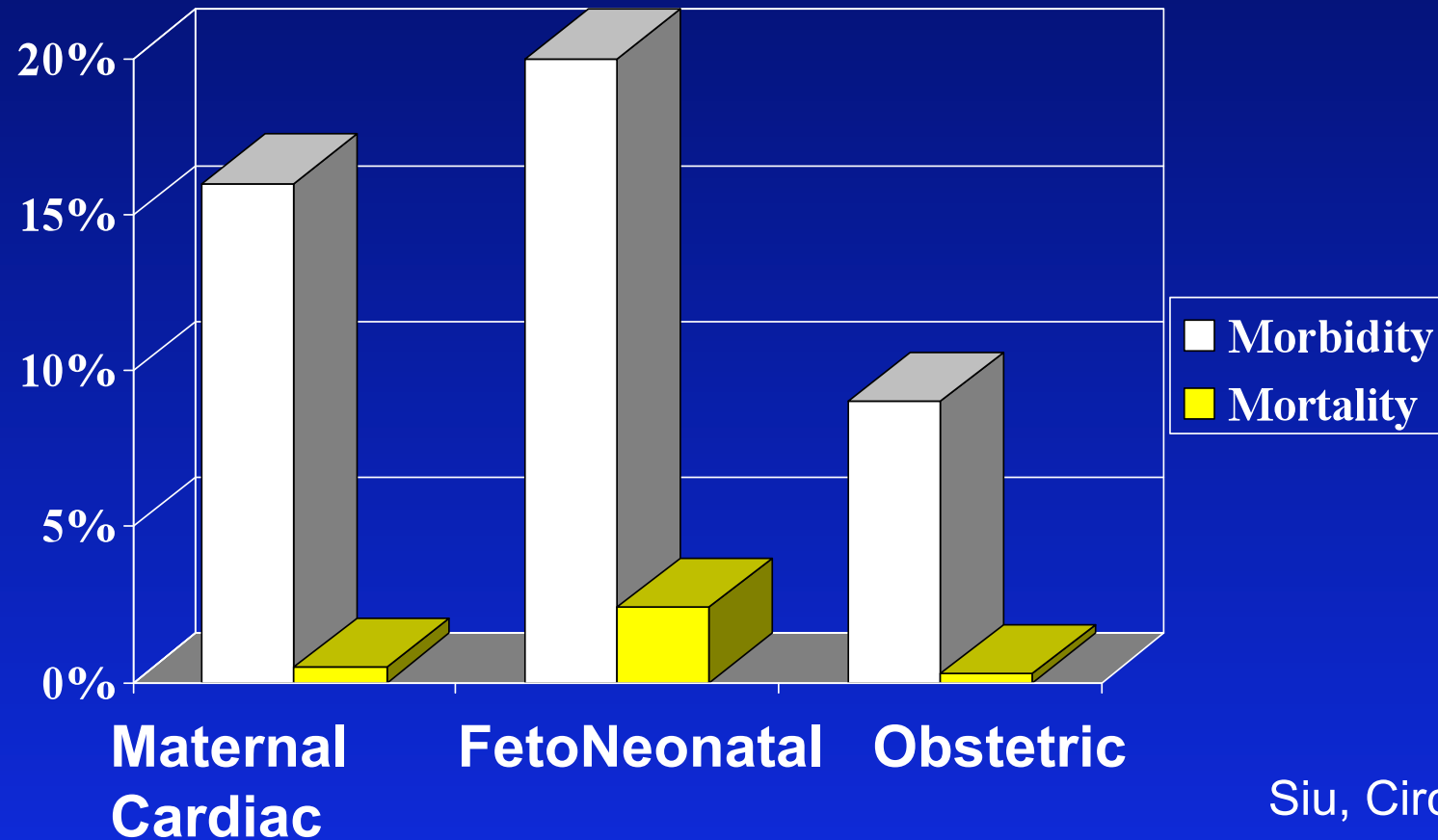
Pregnant Women with Heart Disease

Preconception Assessment

- Risk to the mother
 - *Cardiac*
 - *Obstetric*
- Risk to the fetus
 - *Fetoneonatal*
 - *Recurrence risk of CHD*
- Post pregnancy long term outcome
- Recommendations
 - *Preconception*
 - *Antepartum*
 - *Peripartum*

Assessing Maternal Risk: Low Maternal Mortality

CARPREG: 617 Pregnancies, 68% with CHD

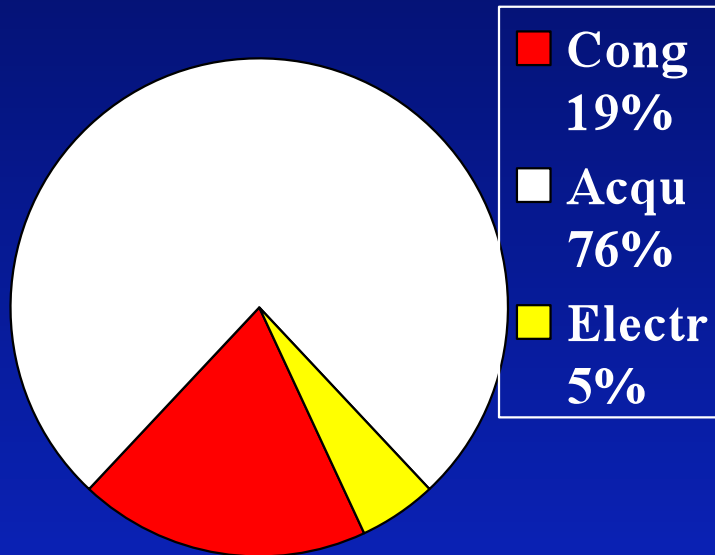


Siu, Circ 2001

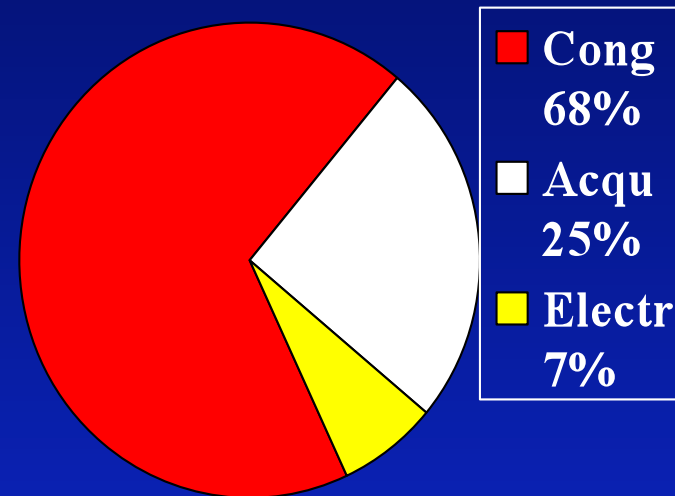
Assessing Maternal Cardiac Risk

- *Risk stratification:*
 - Lesion specific
 - Risk index
 - Combination of Lesion specific and Risk index
- *History, physical exam, 12 lead ECG, transthoracic echo*

Spectrum of Maternal Cardiac Lesions



Brazil
n=1000 (89-99)
Avila, Clin Card 2003



Canada
n=851 (86-98)
Siu, Circ 97, 01

High Risk Heart Lesions

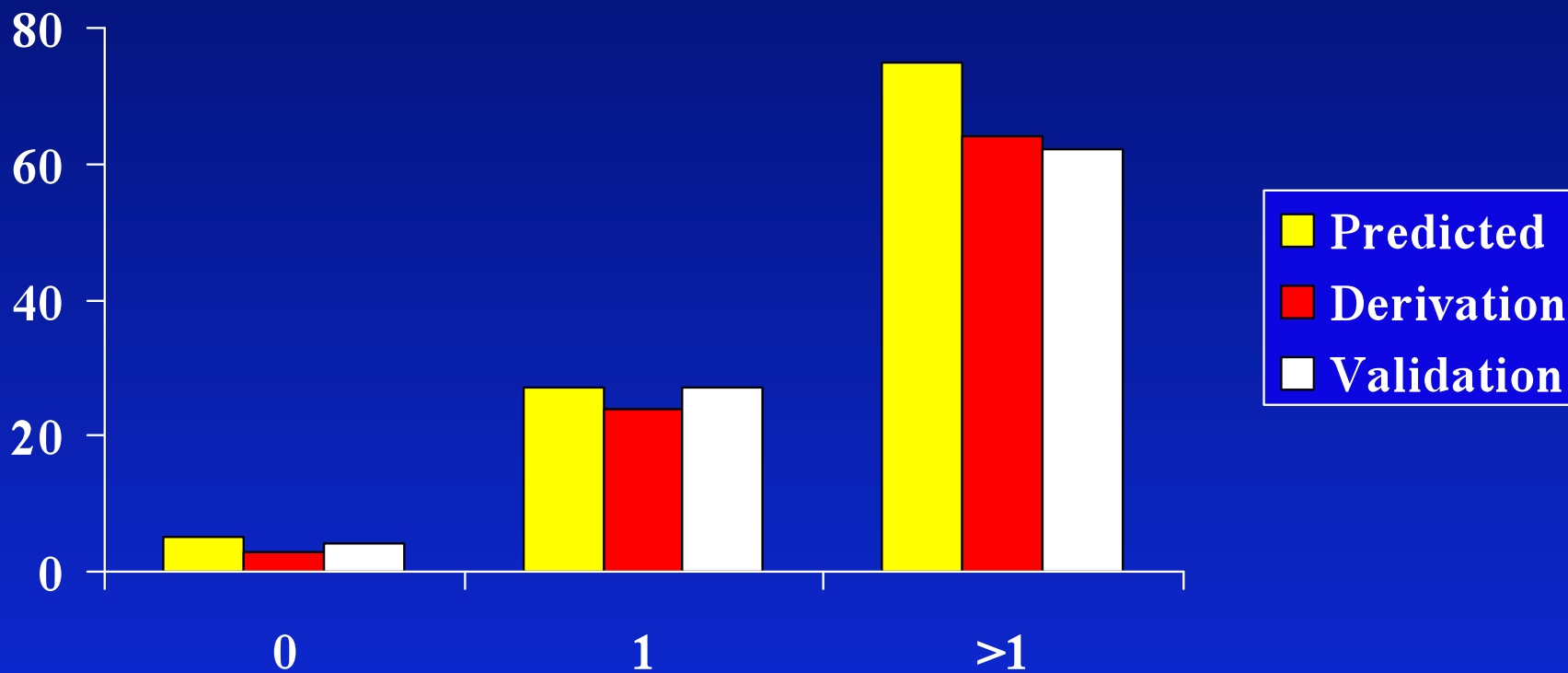
- Marfan syndrome with aortopathy
- Eisenmenger syndrome
- Mechanical valve
- Peripartum cardiomyopathy with residual LV dysfunction
- Acute coronary syndrome during pregnancy

Assessing Maternal Cardiac Risk

- *Risk stratification:*
 - Lesion specific
 - **Risk index**
 - Combination of Lesion specific and Risk index
- *History, physical exam, 12 lead ECG, transthoracic echo*

Canadian Multi-Centre Prospective Study of 599 Pregnancies Risk of Cardiac Complication (CHF, ARR, Stroke, or Death)

Frequency Events (% Pregnancies)



Number of Predictors

Siu, Circ 2001

Antepartum Predictors of Cardiac Events

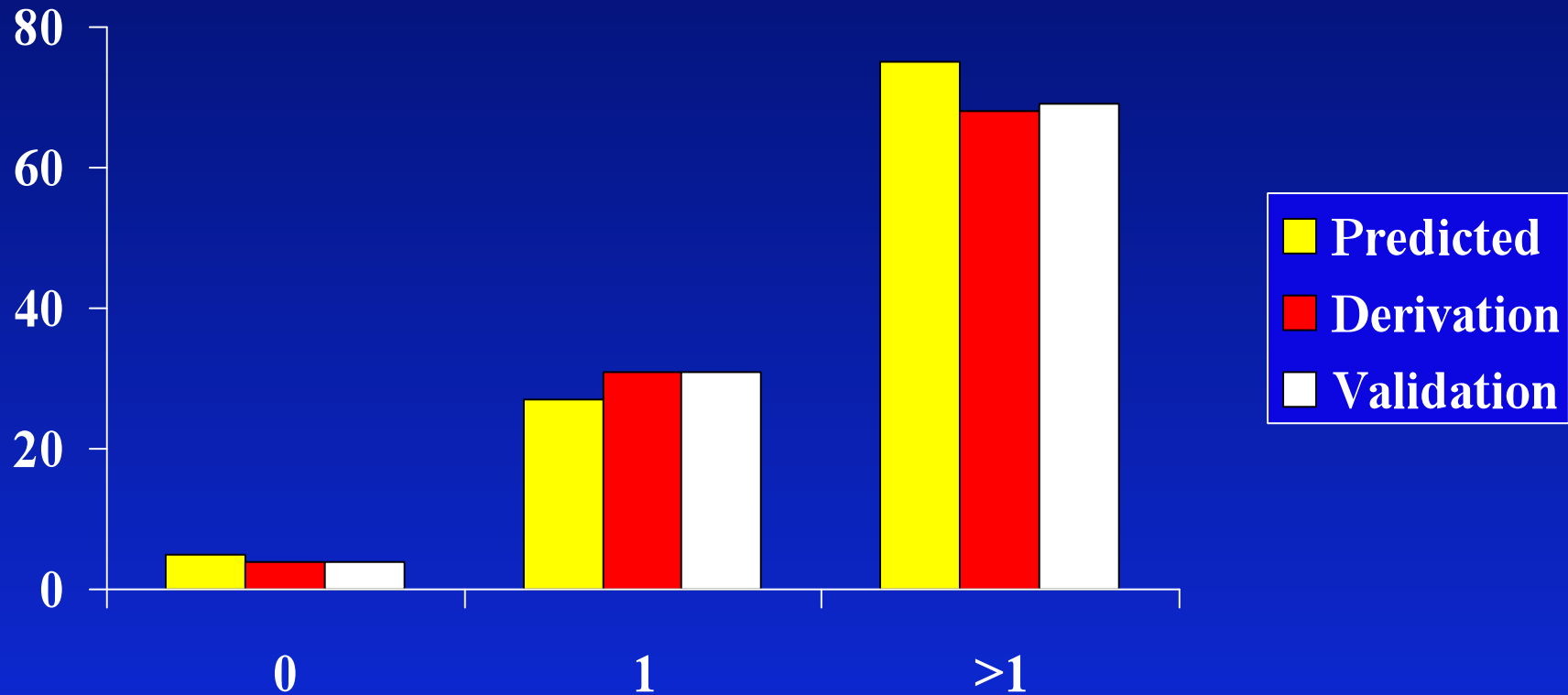
- *Arrhythmia, TIA, CVA, or CHF prior to pregnancy*
- *NYHA > 2 or cyanosis*
- *Left heart obstruction (MVA < 2 cm², AVA < 1.5 cm², LVOT gradient > 30 mmHg by echo)*
- *Systemic ventricular EF < 40% by echo*

**Cardiac Point Score = Total number of predictors
(presence = 1, absence = 0)**

Cardiac Point Score: Lowest = 0 Highest = 4

Primary and Secondary (NYHA 3-4 or urgent intervention) Events

Risk (% Pregnancies)

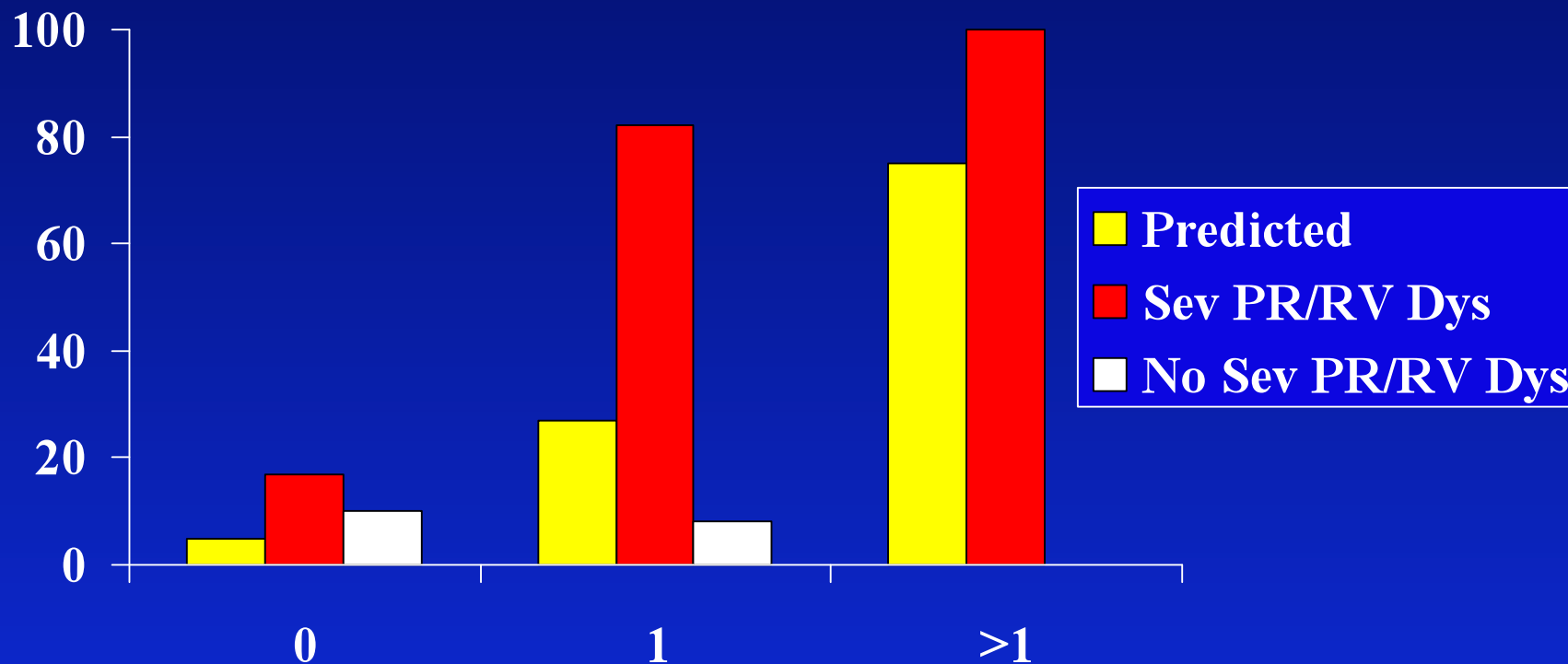


Number of Predictors

Siu, Circ 2001

Boston Retrospective Study of 90 Pregnancies In Women with CHD

Frequency Events (% Pregnancies)



Number of Predictors

Khairy, Circ 2006

*Predictors of maternal cardiac complications
("newly" identified predictors in bold)*

<i>Variable</i>	<i>Odds ratio</i>	<i>p</i>
<i>History of arrhythmias</i>	4.3	0.0011
<i>Other (cardiac) medication before pregnancy</i>	4.2	<0.0001
<i>NYHA functional class</i>	2.2	0.0298
<i>LVOT obstruction</i>	12.9	<0.0001
<i>Systemic AV valve regurgitation (moderate/severe)</i>	2.0	0.0427
<i>Pulmonary AV valve regurgitation (moderate/severe)</i>	2.3	0.0287
<i>Mechanical valve prosthesis</i>	74.7	0.014
<i>Cyanotic heart disease</i>	3.0	<0.0001

LVOT=Left ventricular outflow tract

Drenthen W et al. European Society of Cardiology Congress 2007

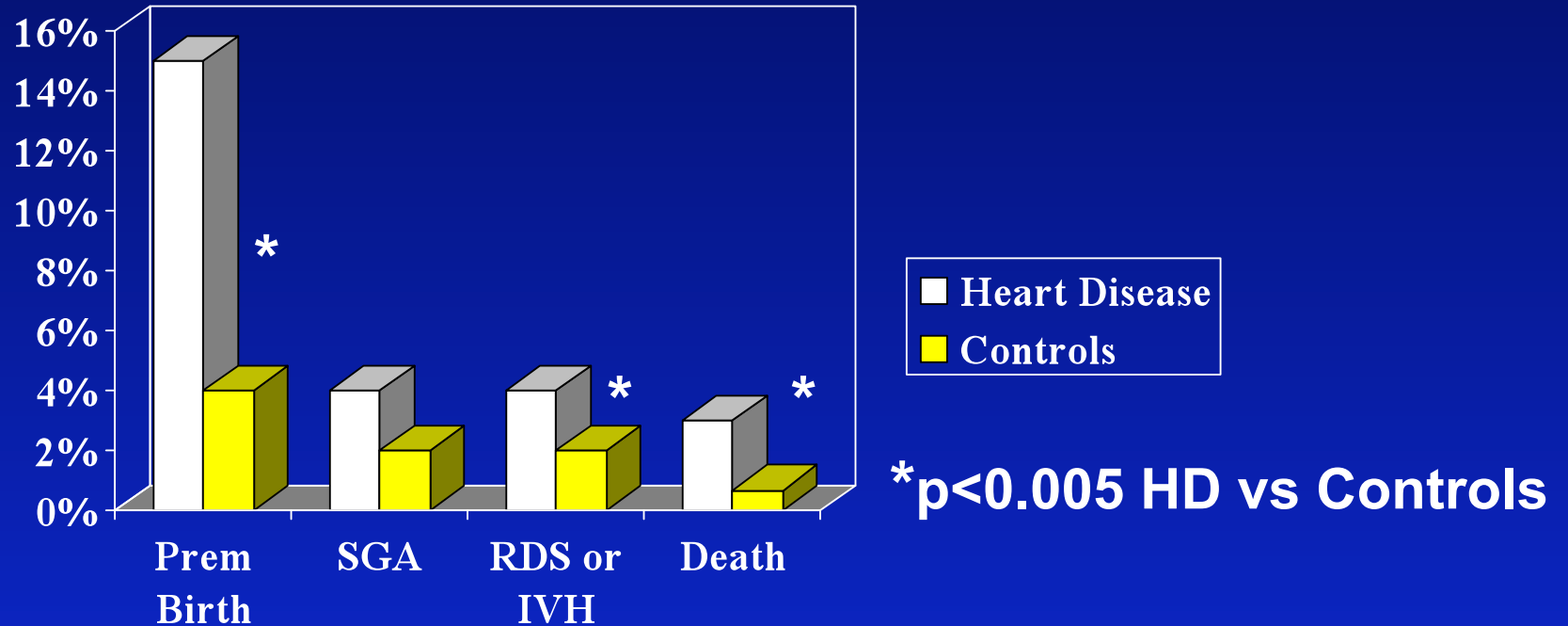
Putting It Together

- **Global assessment using risk index (mild, intermediate, high)**
 - *Choose from 1 prospective and 2 retrospective indices*
- **Known lesion-specific risk**
 - *Eisenmenger, Marfan with aortic involvement, mechanical valves, etc*
 - *Assume intermediate risk if incomplete or absent data*
- **Discordance between global and lesion specific assessment**
 - *Assume higher risk category*

***“More than the Heart”
Risk of Obstetric Complications***

- Gestational hypertension
- Preterm labour
- Intrauterine growth restriction
- Postpartum hemorrhage

Fetoneonatal Events in Completed Pregnancies



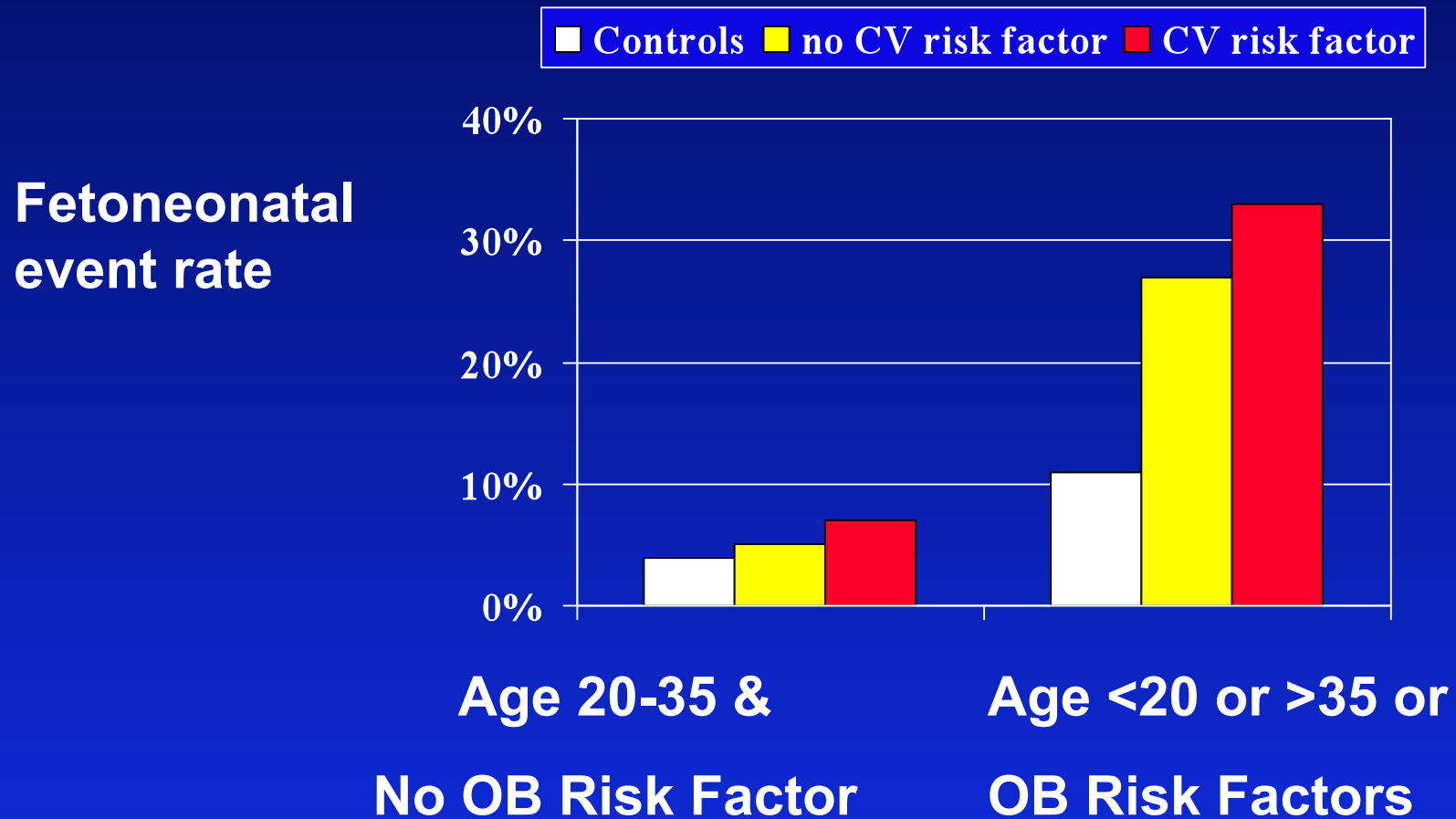
Odds Ratio for any neonatal event: HD vs controls

Unadjusted: 2.8 (1.7-4.5)

Adjusted: 2.6 (1.5-4.6)

Siu, Circ 2002

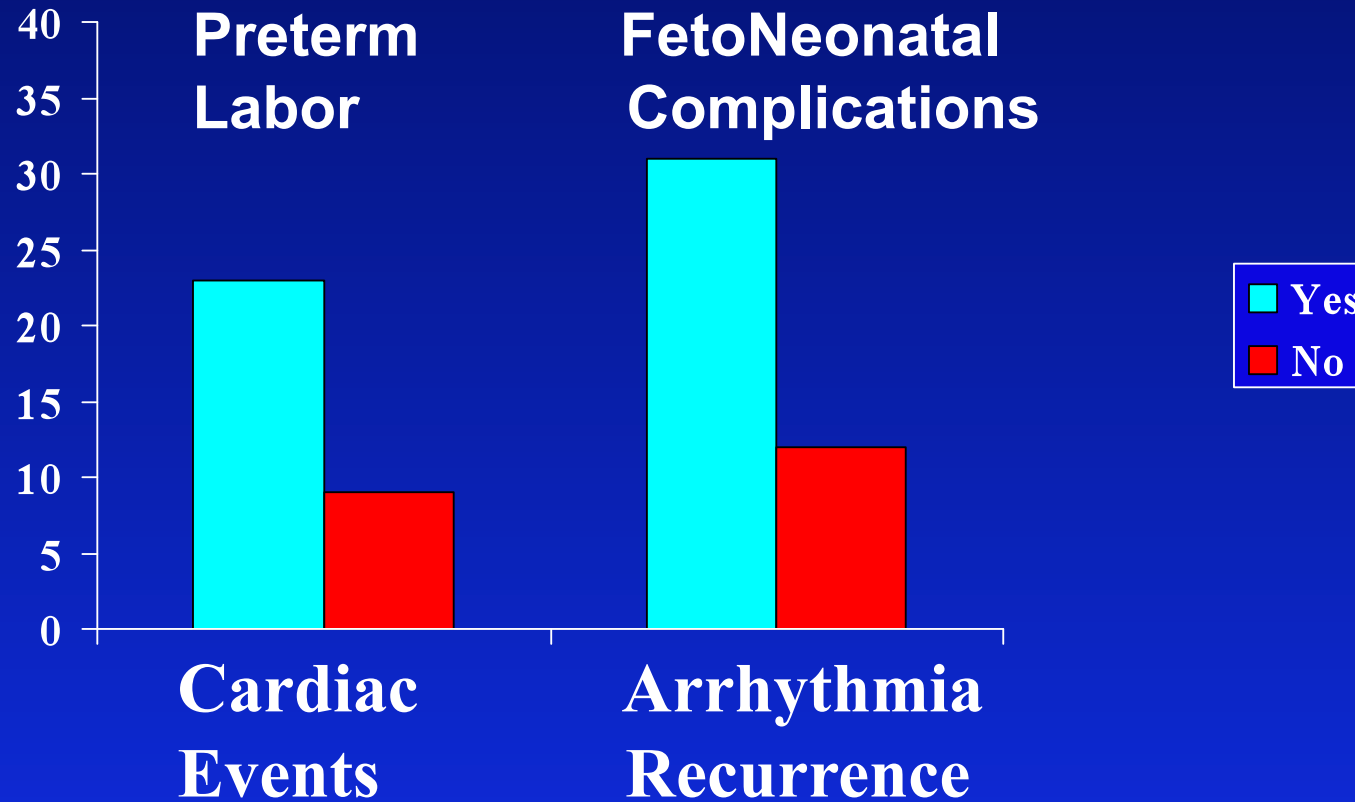
Interactions between Cardiac and Obstetric Risk Factors



Siu, Circ 2002

Maternal Antepartum Events Impacts on Obstetrical and FetoNeonatal Outcomes

% Pregnancies



**Cardiac
Events**

Siu, 1997

**Arrhythmia
Recurrence**

Silversides, 2006

Recurrence risk of congenital heart disease

- Background rate of 0.5% per 100 livebirths in general population
- Parent with CHD, risk increase to at least 5-10%
- Higher recurrence rates in patients with autosomal dominant (Marfan, HCM, Catch 22) or familial disorders
- Family history crucial
- Genetic consultation invaluable

Incremental Diagnostic Yield of Pediatric Cardiac Assessment After Fetal Echocardiography in 276 Offspring of Women with Congenital Heart Disease (Thangaroopan, Pediatrics 2008)

	Abnormal Pediatric Cardiac Assessment	Normal Pediatric Cardiac Assessment
Abnormal Fetal Echocardiography	*4	6
Normal Fetal Echocardiography	† 35	231

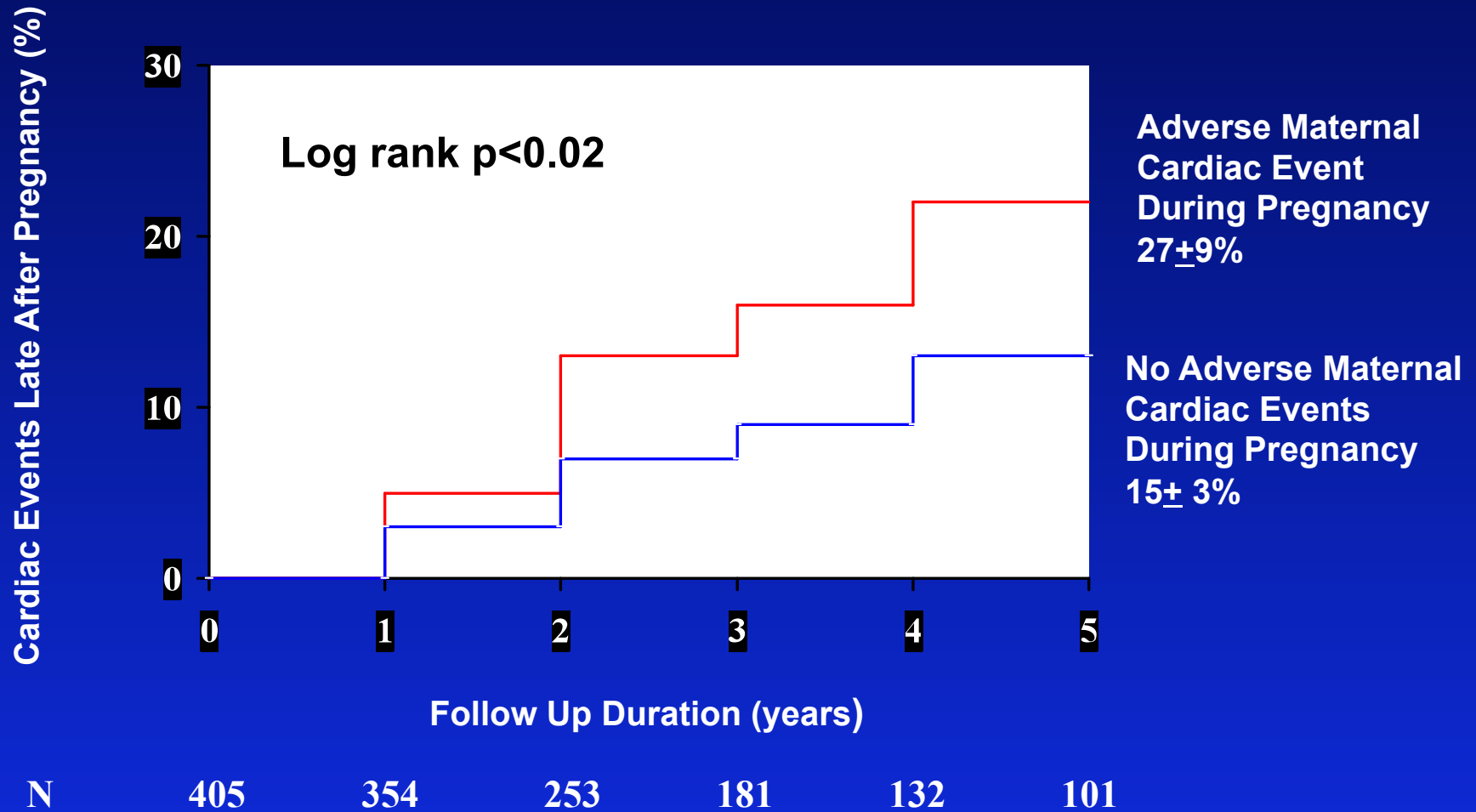
* Presence of congenital heart disease confirmed on pediatric echocardiography in all

† Presence of congenital heart disease confirmed in 18/35 infants (7%) by pediatric echocardiography

Pregnancy May Alter “Natural” History

- Mustard (Guedes, JACC 2004)
- Aortic Stenosis (Tzemos, AHJ 2009)
- Dilated cardiomyopathy (Grewal, JACC 2010)

Pregnancy Complications Affects Long Term Outcomes In Women with CHD



Balint, AHA 2009

Acknowledgement

- Past and Present Co-investigators
 - Toronto: **J Colman, C Silversides, R Wald, M Sermer,**
 - London: B Dias, L Bergin, R Gagnon, R Natale
 - McMaster: O Salehian, E Gordon
 - Ottawa: L Beauchesne, K Chan
 - Kingston: H. Kafka
 - Members of the Canadian Adult Congenital Heart network, **G. Webb**
- Research Coordinator
 - **J. Mason**
- Research echocardiograph from *Mrs. Josephine Rogers*
- Bridge funding: **UHN/MSH Division of Cardiology**

- Peer reviewed Operating and Infrastructure Awards
 - **PSI**
 - **MRC**
 - **CIHR**
 - **HSF**
 - **CFI**

Pregnant Women with Heart Disease

Preconception Assessment

- Risk to the mother
 - *Cardiac*
 - *Obstetric*
- Risk to the fetus
 - *Fetoneonatal*
 - *Recurrence risk of CHD*
- Post pregnancy long term outcome
- Recommendations
 - *Preconception*
 - *Antepartum*
 - *Peripartum*