Update of the Study to Avoid cardioVascular Events in British Columbia (SAVE BC)

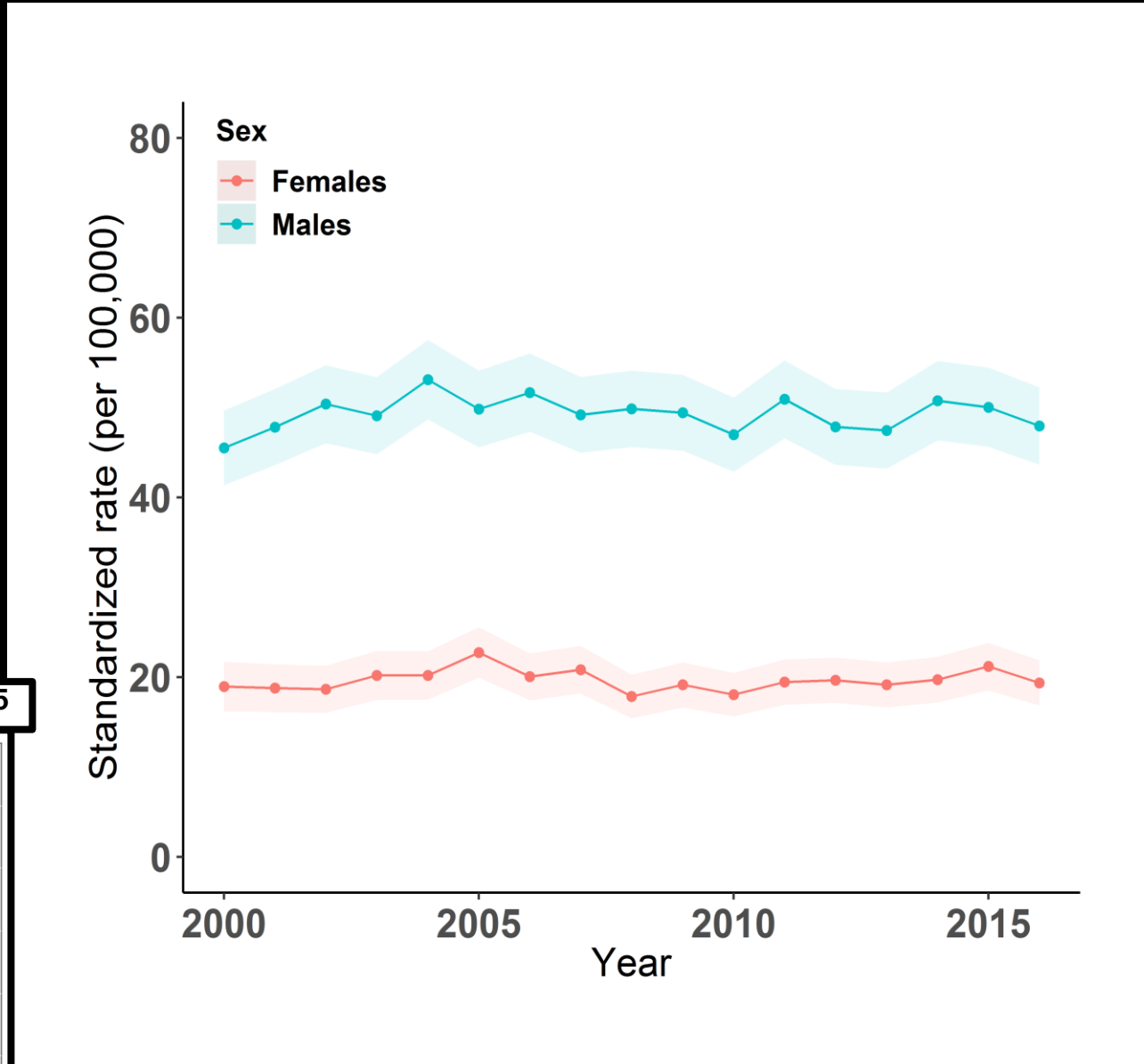Liam Brunham, MD, PhD, FRCPC, FACP, FNLA

Associate Professor,

Canada Research Chair in Precision Cardiovascular Disease Prevention
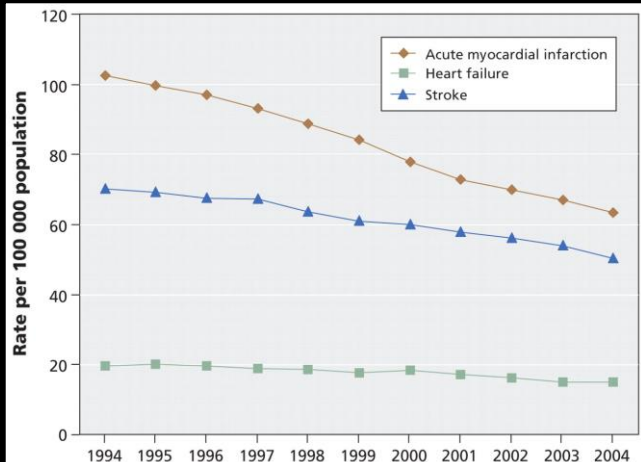
University of British Columbia

I am grateful to present today from the unceded shared territory of the Sk̲wx̲u7mesh Úxumixw (Squamish) and Səl̓ílwətaɬ (Tsleil-Waututh) *Nations.*

The incidence of premature CAD is stagnant

Jack V. Tu et al. CMAJ 2009;180:E118-E125

Vikulova D et al. *JAHA* 2019

Statin therapy is effective for preventing ASCVD

To what extent is statin therapy used among patients who go on to develop ASCVD in BC?

Methodologies

Administrative data set
PopData BC
MSP data set
Cardiac Services BC
Discharge abstract database
PharmaNet
Vital Events and Statistics

SAVE BC Data

Males <50 and Females <55 with coronary stenosis of ≥50% on invasive coronary angiography, or underwent coronary revascularization,and were recruited from a SAVE BC participating site from 2015 – present
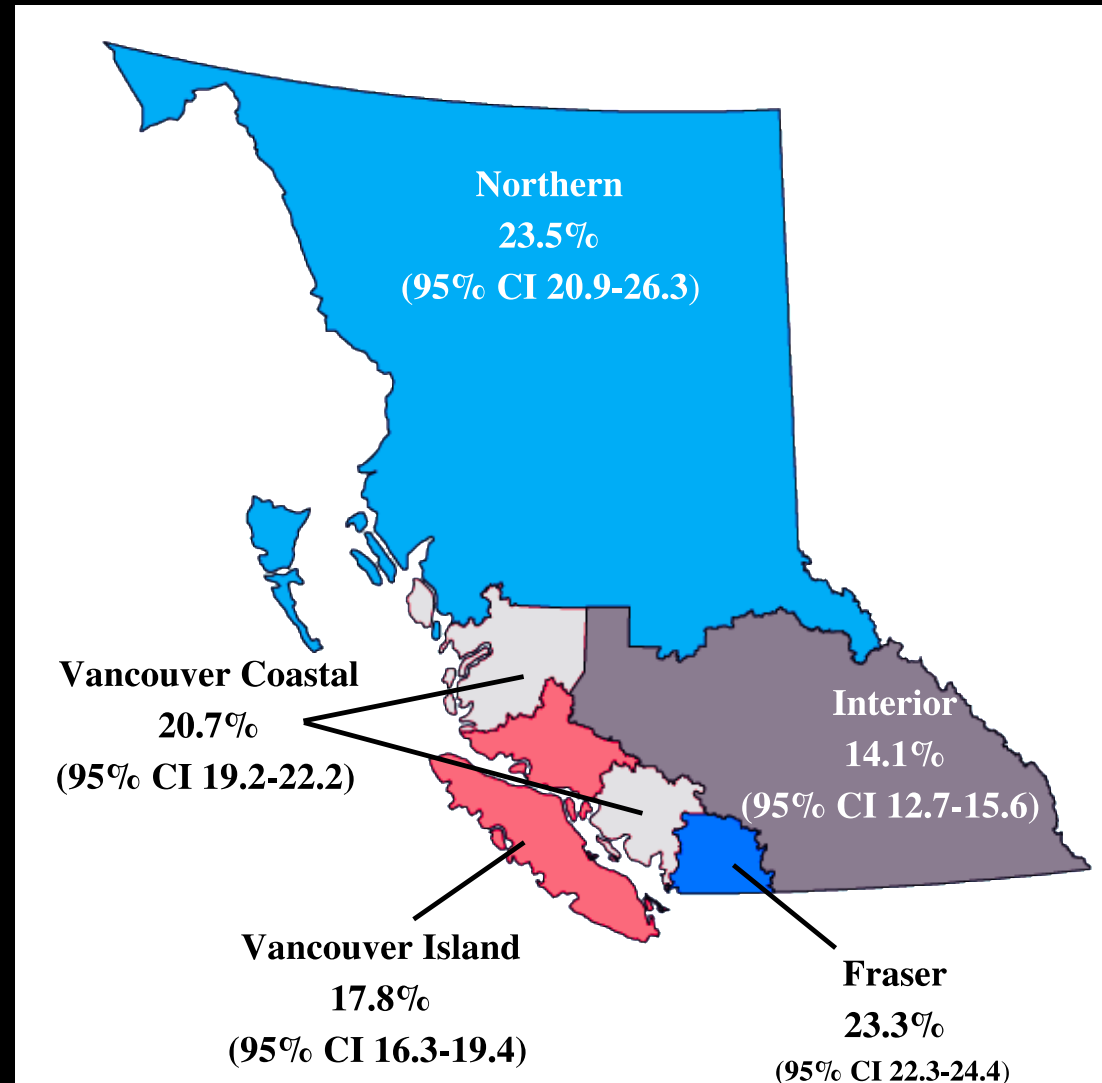N = 470

Males <50 and Females <55 with coronary stenosis of ≥50% on invasive coronary angiography, or underwent coronary revascularization, from January 1, 2000 – December 31, 2017
N = 11,455

Underuse of lipid-lowering therapy in patients who go on to develop premature coronary artery disease

11,445 patients with premature CAD, 2000 - 2017

Northern
23.5%
(95% CI 20.9-26.3)

Vancouver Coastal
20.7%
(95% CI 19.2-22.2)

Interior
14.1%
(95% CI 12.7-15.6)

Vancouver Island
17.8%
(95% CI 16.3-19.4)

Fraser
23.3%
(95% CI 22.3-24.4)

% of patients who received lipid lowering therapy 3 years – 3 months prior to presentation with premature CAD.

Vikulova et al. *JACC Advances* 2025

What are the reasons for underuse of statin therapy?

Hypothesis: young patients who go on to develop premature ASCVD may not interact with healthcare

Most patients who develop premature coronary artery disease are eligible for lipid screening and have interactions with health care

Vikulova et al. *JACC Advances* 2025
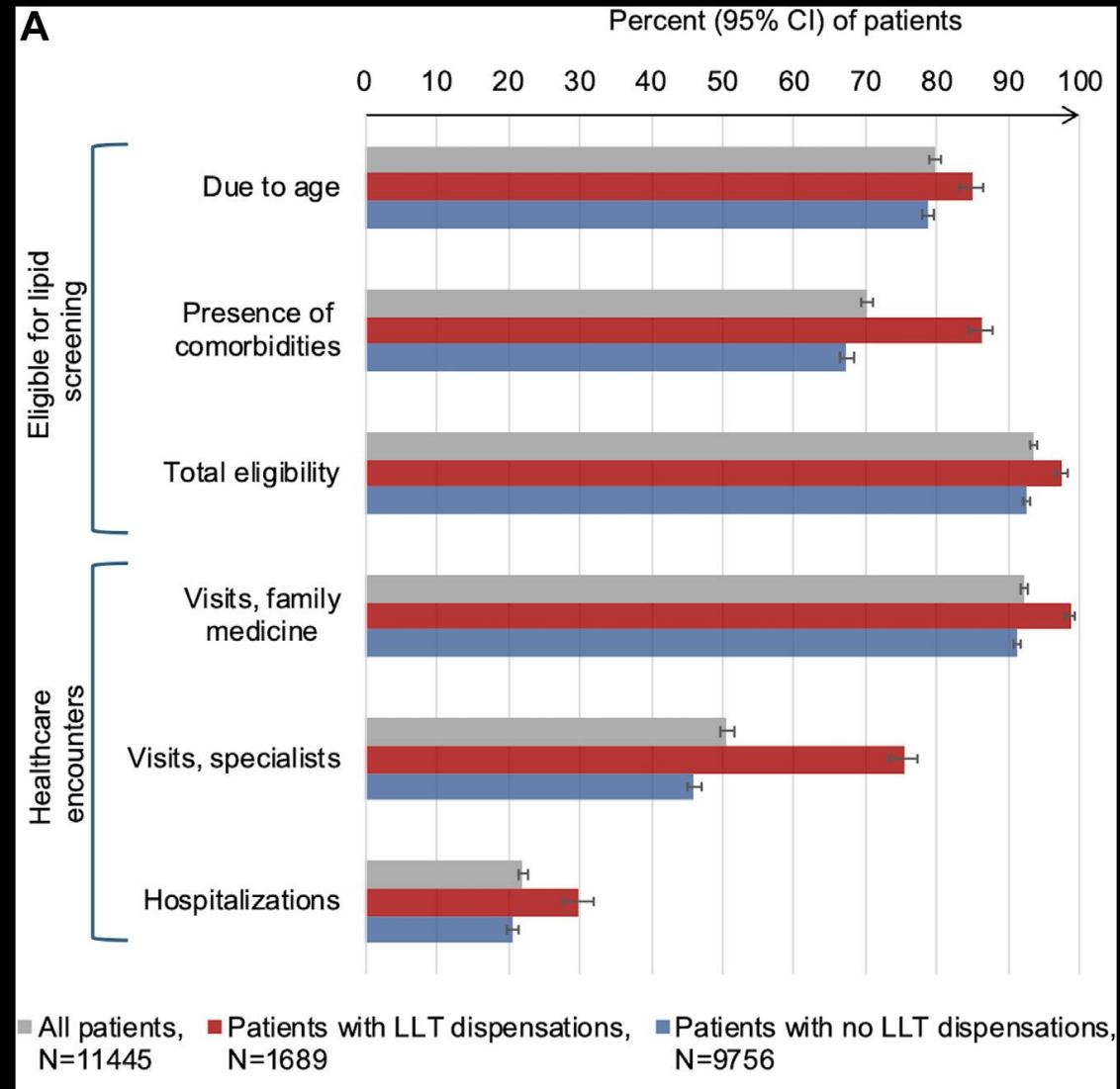
Adherence to treatment is poor among patients who received primary preventative lipid-lowering therapy

Vikulova et al. *JACC Advances* 2025

Underuse of primary preventative statin therapy is not primarily due to lack of interaction with healthcare
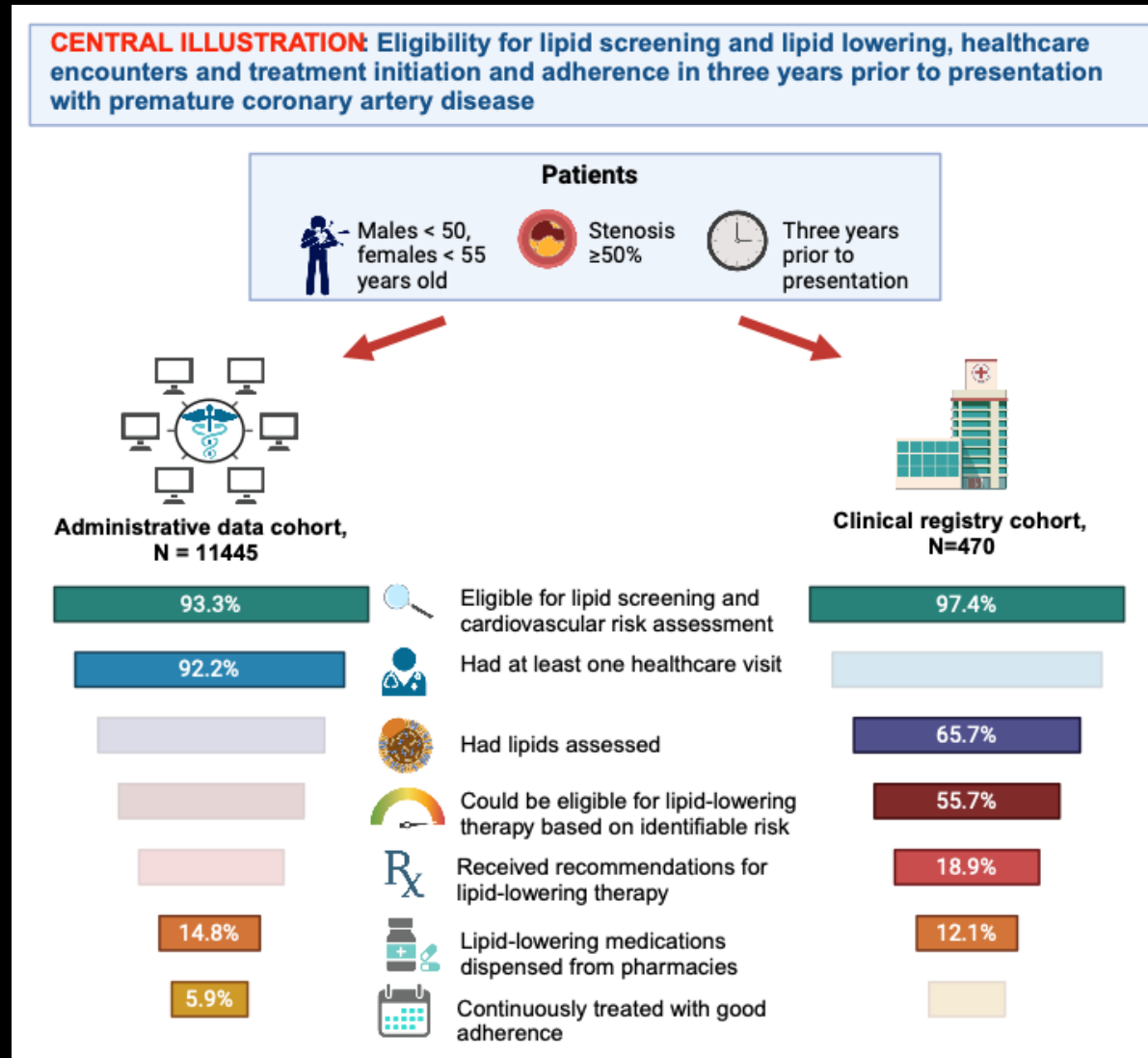

CENTRAL ILLUSTRATION: Eligibility for lipid screening and lipid lowering, healthcare encounters and treatment initiation and adherence in three years prior to presentation with premature coronary artery disease

Patients

- Males < 50, females < 55 years old
- Stenosis ≥50%
- Three years prior to presentation

Administrative data cohort, N = 11445

Clinical registry cohort, N=470

93.3%	Eligible for lipid screening and cardiovascular risk assessment	97.4%
92.2%	Had at least one healthcare visit	
	Had lipids assessed	65.7%
	Could be eligible for lipid-lowering therapy based on identifiable risk	55.7%
	Received recommendations for lipid-lowering therapy	18.9%
14.8%	Lipid-lowering medications dispensed from pharmacies	12.1%
5.9%	Continuously treated with good adherence	

Primary preventative statin therapy is associated with lower risk of acute coronary syndrome

11,455 patients presenting with premature CAD

Treatment	OR (95% CI)	p-value
High intensity, good adherence	0.24 (0.18-0.37)	<0.001
High intensity, low adherence	0.36 (0.25-0.52)	<0.001
Lower intensity, good adherence	0.40 (0.34-0.47)	<0.001
Lower intensity, low adherence	0.65 (0.52-0.82)	<0.001
No lipid-lowering therapy	Reference	Reference

Odds ratio (95% CI)

Lower risk of ACS
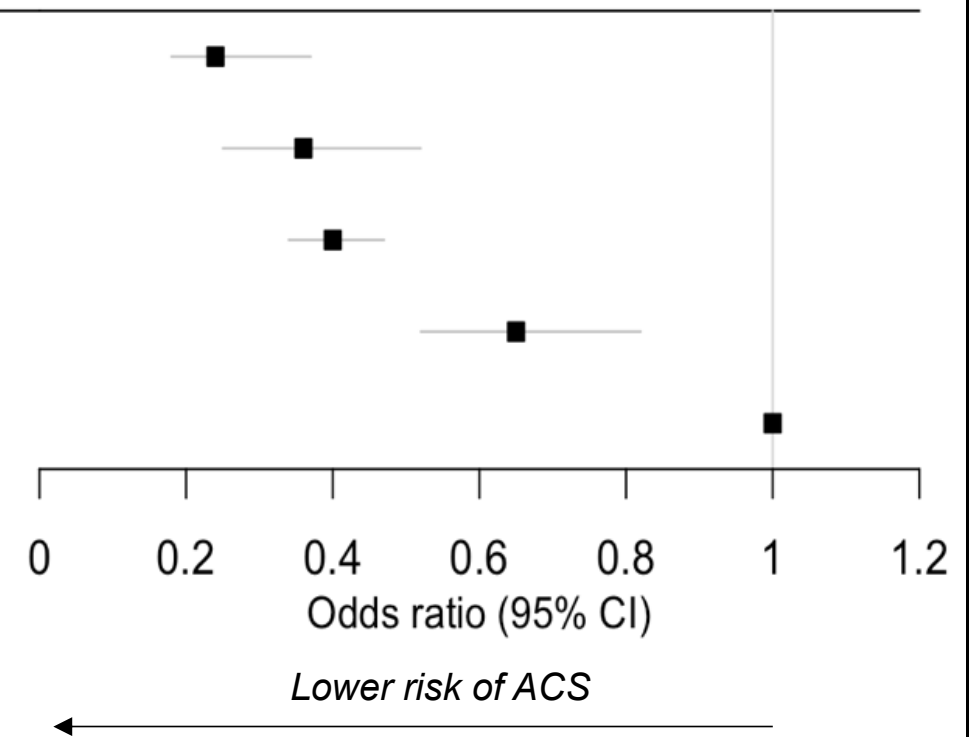
Statin therapy is widely underused to prevent premature ASCVD

This underuse is not primarily due to lack of interaction with healthcare, but may relate to under-appreciation of risk

There is a need for approaches to identify patients at risk

SAVE BC is an observational study of patients with premature CAD and their first degree relatives

Brunham et al. *Clin Cariol*. 2015
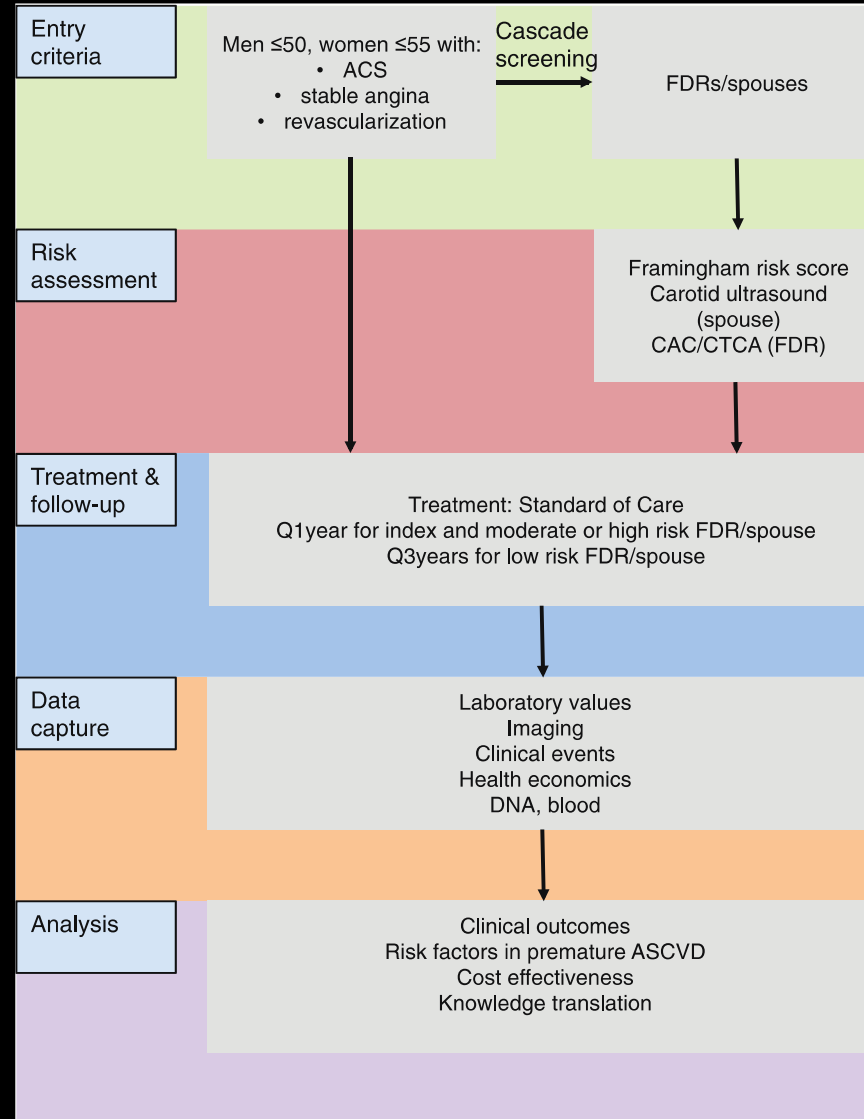
Methods
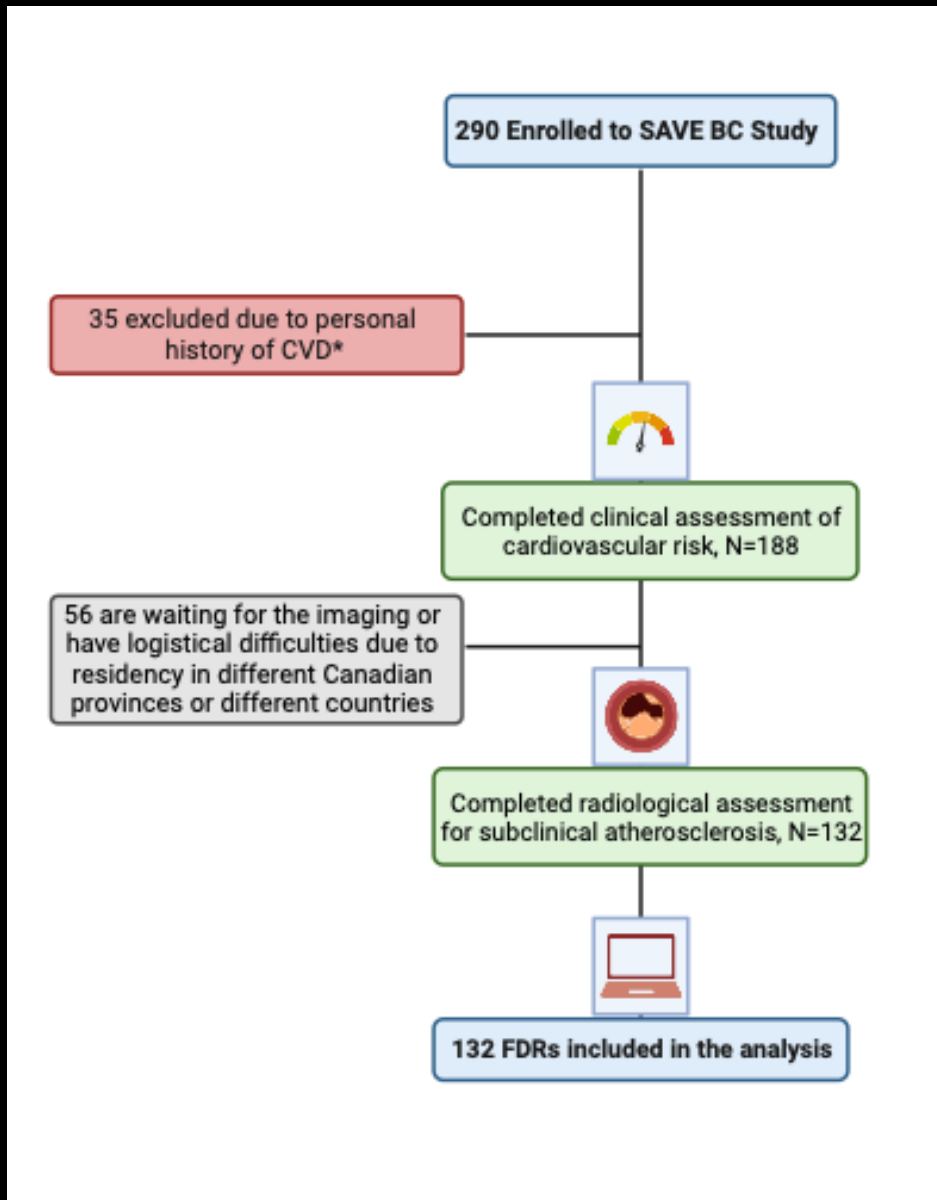
Imaging recommendations in SAVE BC
FDRs >age 45   CAC
FDR 35 – 45   CTCA
FDR <45 years   carotid U/S

Significant subclinical atherosclerosis was defined as:
- CAC >100 Agatston units or >75th percentile
- Plaque on CUS
- Obstructive or extensive non-obstructive coronary atherosclerosis on CCTA.

Characteristics of FDRs

Table 2

Clinical risk groups and prevalence of statin-indicated conditions and cardiovascular risk enhancers in FDRs of patients with premature CAD.

	All patients, $N =$ 132	< 40 years old $N =$ 41	≥ 40 years old $N =$ 91
Clinical risk group[1], mFRS			
low	65 (49.62%)	40 (97.56%)	26 (28.57%)
moderate	16 (12.21%)	0	16 (17.58%)
high	50 (38.17%)	1 (2.5%)	49 (53.84%)
Clinical risk groups[2], PCE			
Low	75 (56.8%)	42 (95.5%)	33 (37.5%)
Borderline	12 (9.1%)	1 (2.3%)	11 (12.5%)
Moderate	11 (8.3%)	0	11 (12.5%)
High	34 (25.8%)	1 (2.3%)	33 (37.5%)
LDL-C $\geq$ 5.0 mmol/L	18 (13.6%)	1 (2.4%)	17 (18.68%)
Diabetes	16 (12.2%)	0	16 (17.58%)
CKD	2 (1.52%)	0	2 (2.20%)
Lipoprotein(a)3			
<300 mg/L	79 (72.5%)	29 (80.6%)	50 (68.5%)
300–499 mg/L	5 (4.55%)	2 (5.6%)	3 (4.1%)
500–699 mg/L	5 (4.55%)	1 (2.8%)	4 (5.5%)
$\geq$700 mg/L	20 (18.18%)	4 (11.1%)	16 (21.9%)

[1] Estimated using Framingham Risk Score calculator and Canadian Cardiovascular Society Guidelines 2016 and 2021;.

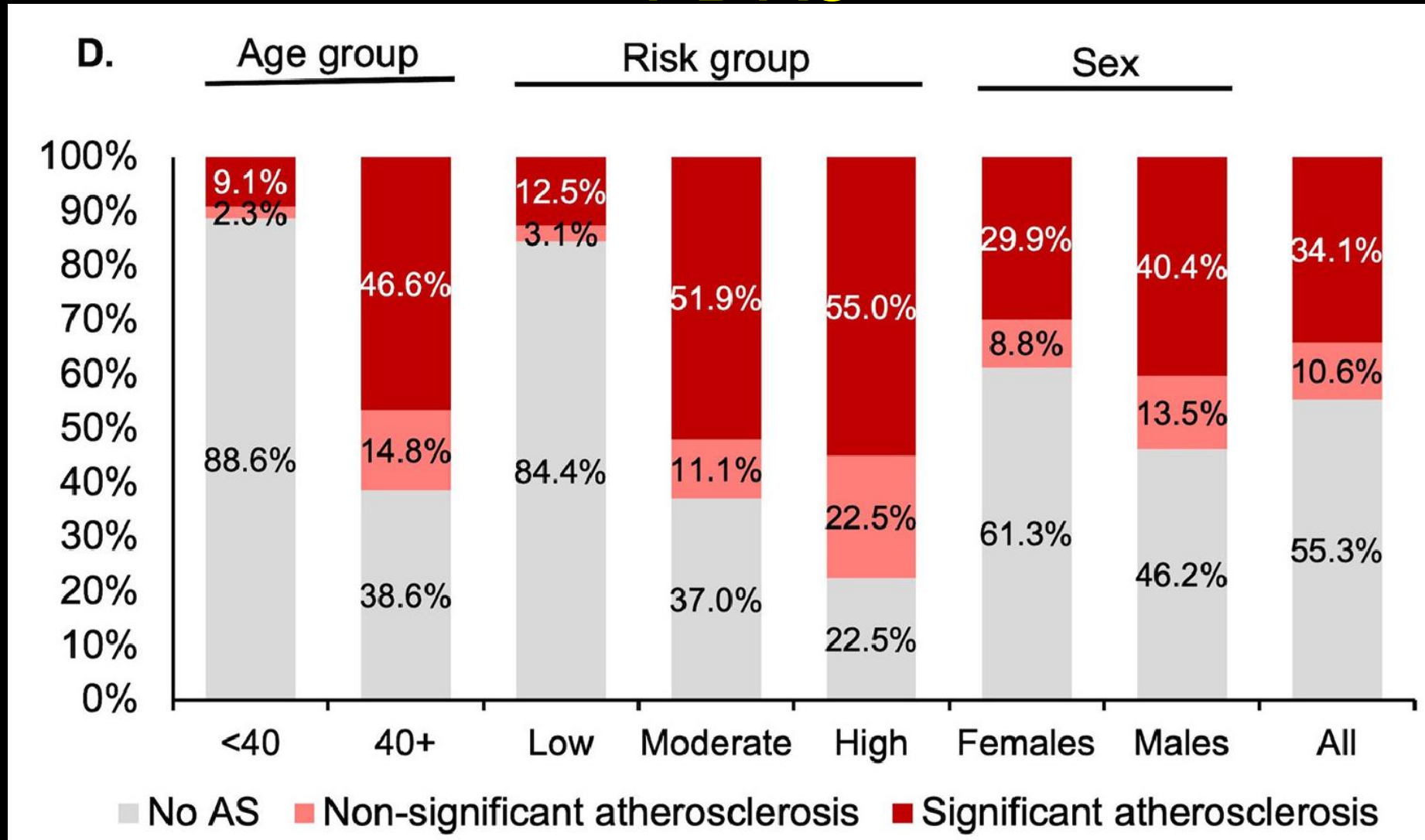[2] Estimated using Pooled Cohort Equations calculator and recommendations of the AHA/ACC Guidelines 2018;

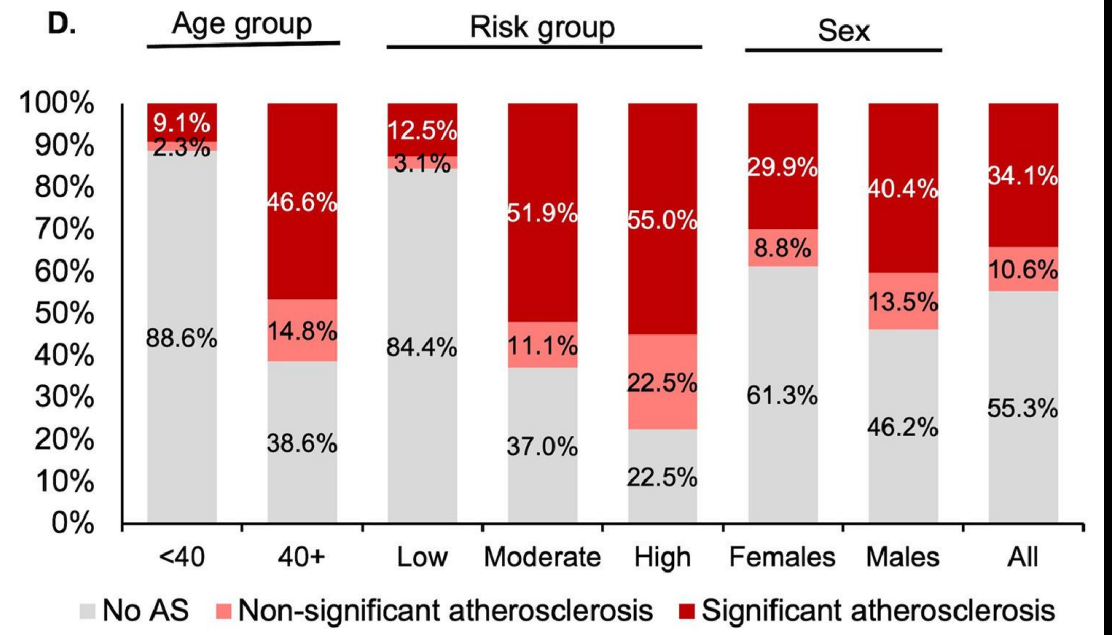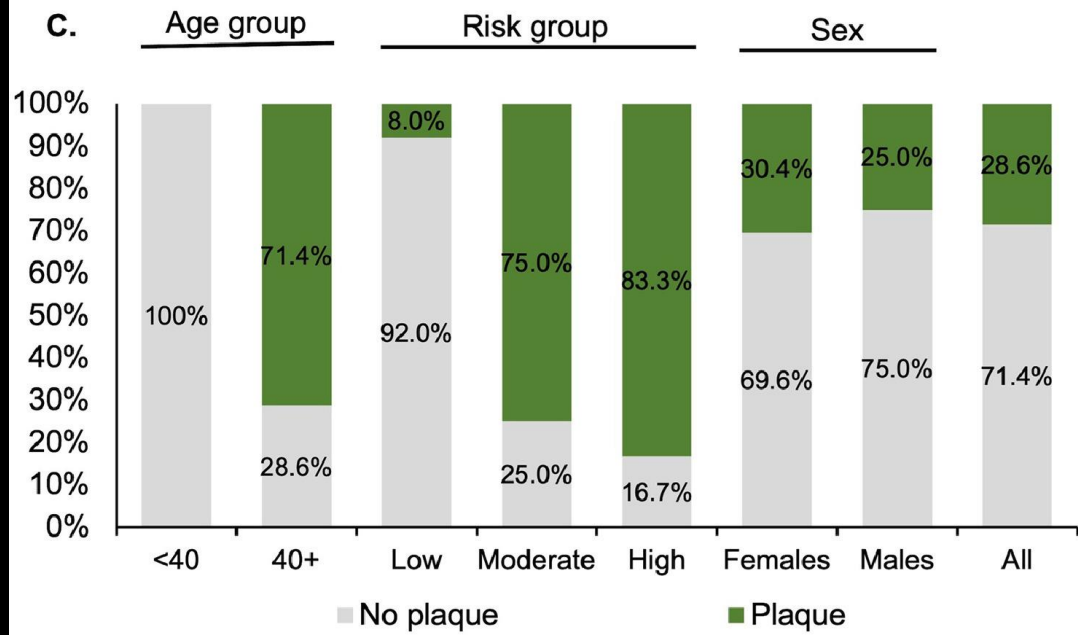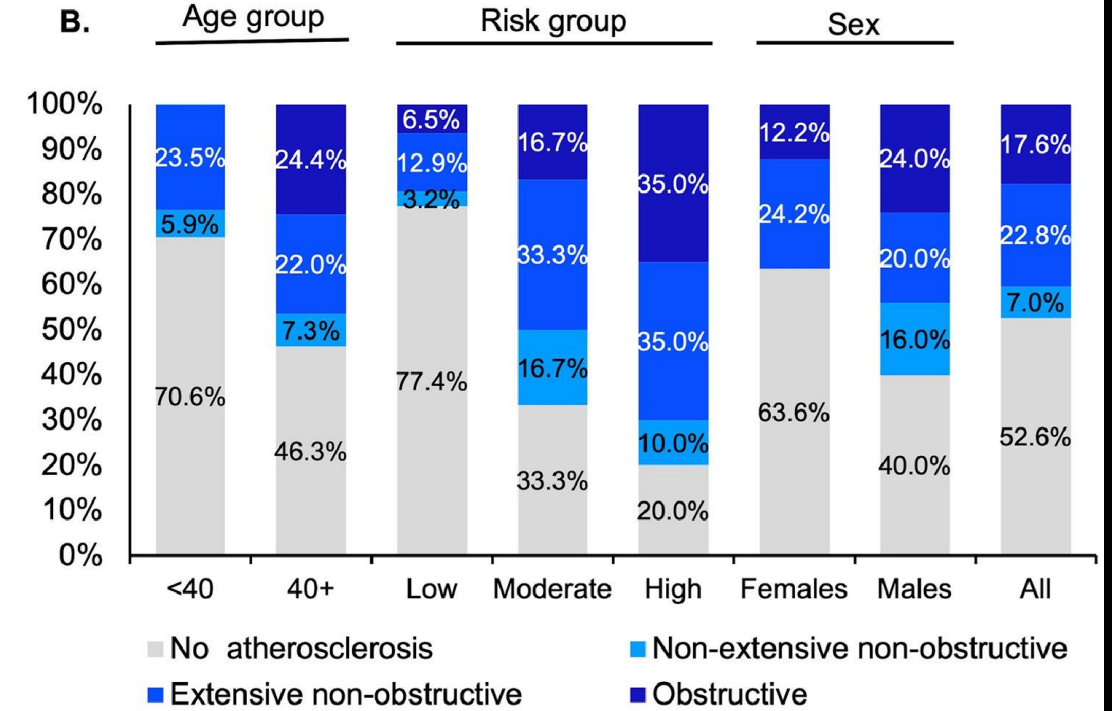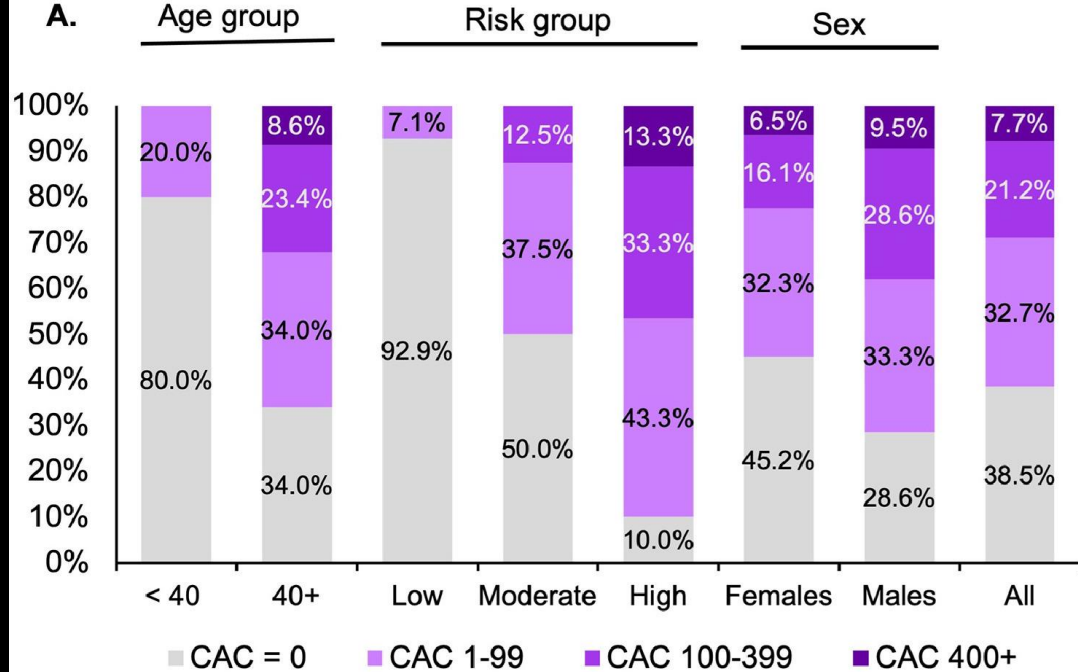[3] 23 missing. Values are presented as n (%).

Supplemental Table 3. Prevalence of major cardiovascular risk factor in SAVE BC FDRs population and general Canadian population[6] as estimated in the year 2020, by sex and age.

	Females					
	SAVE BC FDR			**General population[3,4]**		
Age (years)	**<30 (N=15)**	**30-49 (N=22)**	**50+ (N=43)**	**18-35**	**35-49**	**50-65**
Diabetes	0	4.5% (0.5-19.3)	16.3% (7.6-29.3)	0.7% (0.4-1.1)	3.4% (2.6-4.5)	7.7% (6.6-9.0)
Dyslipidemia	6.7% (0.7-27.2)	36.4% (18.9-57.1)	51.2% (36.6-65.6)	NA	34% (NA)[a]	
Hypertension	0	4.5% (0.5-19.3)	39.5% (26.0-54.4)	1.5% (1.0-2.1)	6.0% (6.9-9.6)	21.6% (19.7-23.6)
Obesity	13.3% (2.9-36.3)	13.6% (4.0-32.1)	34.9% (22.0-49.7)	21.2% (18.9-23.6)	26.8% (21.0-33.5)	21.4% (17.0-26.4)
Current smoking	13.3% (2.9-36.3)	9.1% (1.9-26.1%)	11.9% (4.7-24.1)	5.1% (4.2-6.2%)	11.9% (10.4-13.4)	13.7% (12.1-15.4)
	Males					
	SAVE BC FDRs			**General population[3,4]**		
Age (years)	**<30 (N=14)**	**30-49 (N=18)**	**50+ (N=20)**	**18-35**	**35-49**	**50-65**
Diabetes	0	16.7% (4.9-38.1)	25.0% (10.2-46.4)	1.5% (0.9-2.6)	4.1% (3.8-5.2)	11.8 (10.3-13.3)
Dyslipidemia	7.1% (0.8-28.8)	33.3% (15.3-56.3)	55.0% (33.8-74.9)	34% (NA)[a]		
Hypertension	0	16.7% (4.9-38.1)	40.0% (21.1-61.6)	3.8% (2.7-5.2)	10.3% (8.8-12.1)	27.1% (25.0-29.4)
Obesity	0	33.3% (15.3-56.3%)	35.0% (17.2-56.8)	20.8% (18.4-23.4)	28.9% (22.8-36.0)	28.7% (22.2-36.2)
Current smoking	0	27.8% (11.5-50.6)	5.0% (0.5-21.1)	11.3% (9.5-13.3)	18.1% (16.3-20.1)	18.3% (16.2-20.6)

[a]Data by sex, age, and 95% confidence interval are not available.

Presence of significant subclinical atherosclerosis in FDRs

D.

Age group | **Risk group** | **Sex**

	<40	40+	Low	Moderate	High	Females	Males	All
Significant atherosclerosis	9.1%	46.6%	12.5%	51.9%	55.0%	29.9%	40.4%	34.1%
Non-significant atherosclerosis	2.3%	14.8%	3.1%	11.1%	22.5%	8.8%	13.5%	10.6%
No AS	88.6%	38.6%	84.4%	37.0%	22.5%	61.3%	46.2%	55.3%

Legend: No AS · Non-significant atherosclerosis · Significant atherosclerosis

A.

	Age group		Risk group			Sex		
	< 40	40+	Low	Moderate	High	Females	Males	All

CAC = 0 (grey) • CAC 1-99 (light purple) • CAC 100-399 (purple) • CAC 400+ (dark purple)

Age group: <40 — 80.0%, 20.0%; 40+ — 34.0%, 34.0%, 23.4%, 8.6%
Risk group: Low — 92.9%, 7.1%; Moderate — 50.0%, 37.5%, 12.5%; High — 10.0%, 43.3%, 33.3%, 13.3%
Sex: Females — 45.2%, 32.3%, 16.1%, 6.5%; Males — 28.6%, 33.3%, 28.6%, 9.5%
All — 38.5%, 32.7%, 21.2%, 7.7%

B.

No atherosclerosis (grey) • Non-extensive non-obstructive (light blue) • Extensive non-obstructive (blue) • Obstructive (dark blue)

Age group: <40 — 70.6%, 5.9%, 23.5%; 40+ — 46.3%, 7.3%, 22.0%, 24.4%
Risk group: Low — 77.4%, 3.2%, 12.9%, 6.5%; Moderate — 33.3%, 16.7%, 33.3%, 16.7%; High — 20.0%, 10.0%, 35.0%, 35.0%
Sex: Females — 63.6%, 24.2%, 12.2%; Males — 40.0%, 16.0%, 20.0%, 24.0%
All — 52.6%, 7.0%, 22.8%, 17.6%

C.

No plaque (grey) • Plaque (green)

Age group: <40 — 100%; 40+ — 28.6%, 71.4%
Risk group: Low — 92.0%, 8.0%; Moderate — 25.0%, 75.0%; High — 16.7%, 83.3%
Sex: Females — 69.6%, 30.4%; Males — 75.0%, 25.0%
All — 71.4%, 28.6%

D.

No AS (grey) • Non-significant atherosclerosis (pink) • Significant atherosclerosis (red)

Age group: <40 — 88.6%, 2.3%, 9.1%; 40+ — 38.6%, 14.8%, 46.6%
Risk group: Low — 84.4%, 3.1%, 12.5%; Moderate — 37.0%, 11.1%, 51.9%; High — 22.5%, 22.5%, 55.0%
Sex: Females — 61.3%, 8.8%, 29.9%; Males — 46.2%, 13.5%, 40.4%
All — 55.3%, 10.6%, 34.1%

Screening in SAVE BC led to initiation of lipid lowering therapy and reductions in LDL-C

Screening of first-degree relatives of patients with premature coronary artery disease: diagnostic yield and impact on patient management.
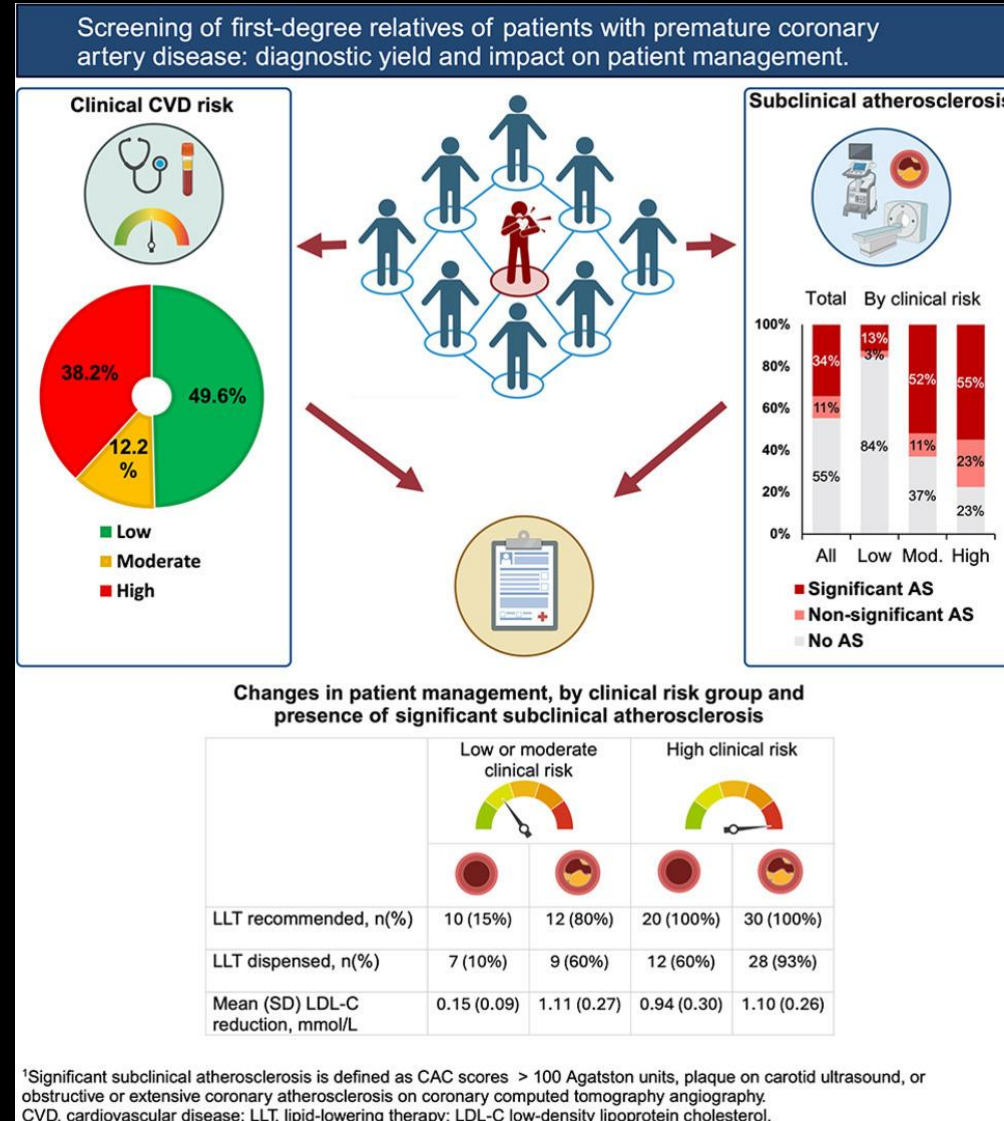
Lipid lowering therapy was initiated or intensified in 48% of FDRs after participation in SAVE BC

Summary

- Most patients who develop premature CAD no not receive primary preventative LLT
- This may be due to an inability to identify patients at risk
- A family-based screening program that combines clinical evaluation with imaging for subclinical atherosclerosis can identify patients at risk and lead to implementation of evidence-based therapies

Future Directions

- Cost-effectiveness analysis of the SAVE BC program
- Expansion of FDR population
- Incorporation of other screening modalities such as polygenic risk scores

Acknowledgements

Brunham lab
Diana Vikulova
Nicol Vaisman
Eric Deng
Kate Huang
Shinya Iwase
Linda Jackson
Luba Cermakova

SAVE BC
Danielle Pinheiro Muller
Simon Pimstone

SAVE BC Steering
Committee:
John Mancini
Chris Fordyce
Gordon Francis
Tara Sedlak
Chris Franco
Thomas Roston
Frank Halperin
Andrew Krahn
Keith Walley

Patients and
collaborators

CIHR IRSC
Canadian Institutes of Health Research   Instituts de recherche en santé du Canada