Canadian ALLIANCE for Healthy Hearts & Minds

Insights from the CAHHM study: Creating an imaging platform and pathway to discovery

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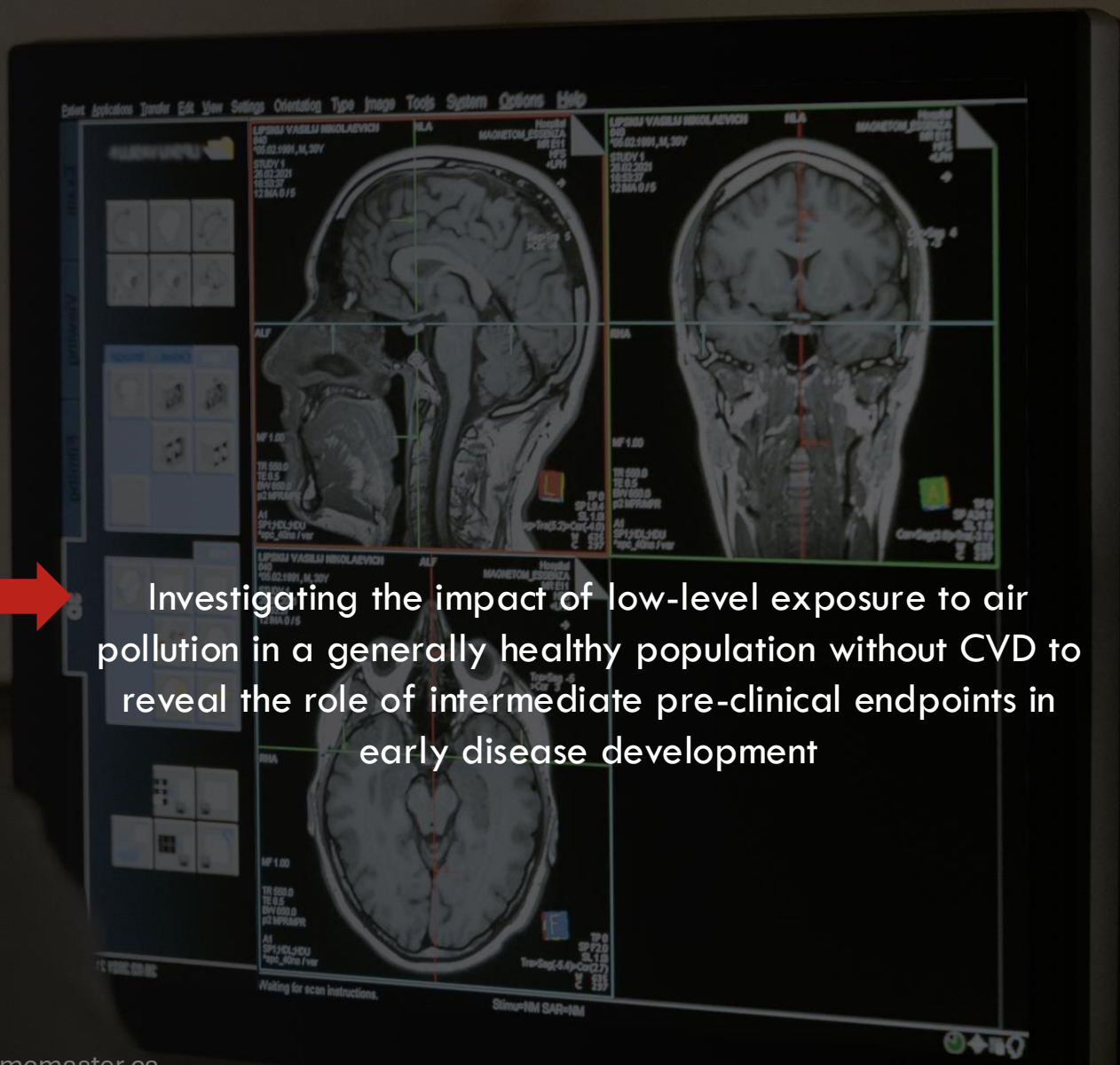
McMaster University | Mary Heersink School of Global Health & Social Medicine

Population Health Research Institute
HEALTH THROUGH KNOWLEDGE

Canadian Alliance For Healthy Hearts And Minds

CAHHM is a prospective cohort study designed to investigate the impact of community level factors, individual health behaviours, and access to health services, on cognitive function, subclinical vascular disease, fat distribution, and the development of chronic diseases among adults living in Canada.

Pan-Canadian, prospective, multiethnic cohort study



Investigating the impact of low-level exposure to air pollution in a generally healthy population without CVD to reveal the role of intermediate pre-clinical endpoints in early disease development

The History…

CANADIAN HEART HEALTH STRATEGY
and Action Plan

STRATÉGIE CANADIENNE DE SANTÉ CARDIOVASCULAIRE
et plan d'action

14M $

Canada

HEART & STROKE FOUNDATION OF CANADA | FONDATION DES MALADIES DU CŒUR DU CANADA

CANADIAN PARTNERSHIP AGAINST CANCER | PARTENARIAT CANADIEN CONTRE LE CANCER

Canadian Partnership for Tomorrow Project

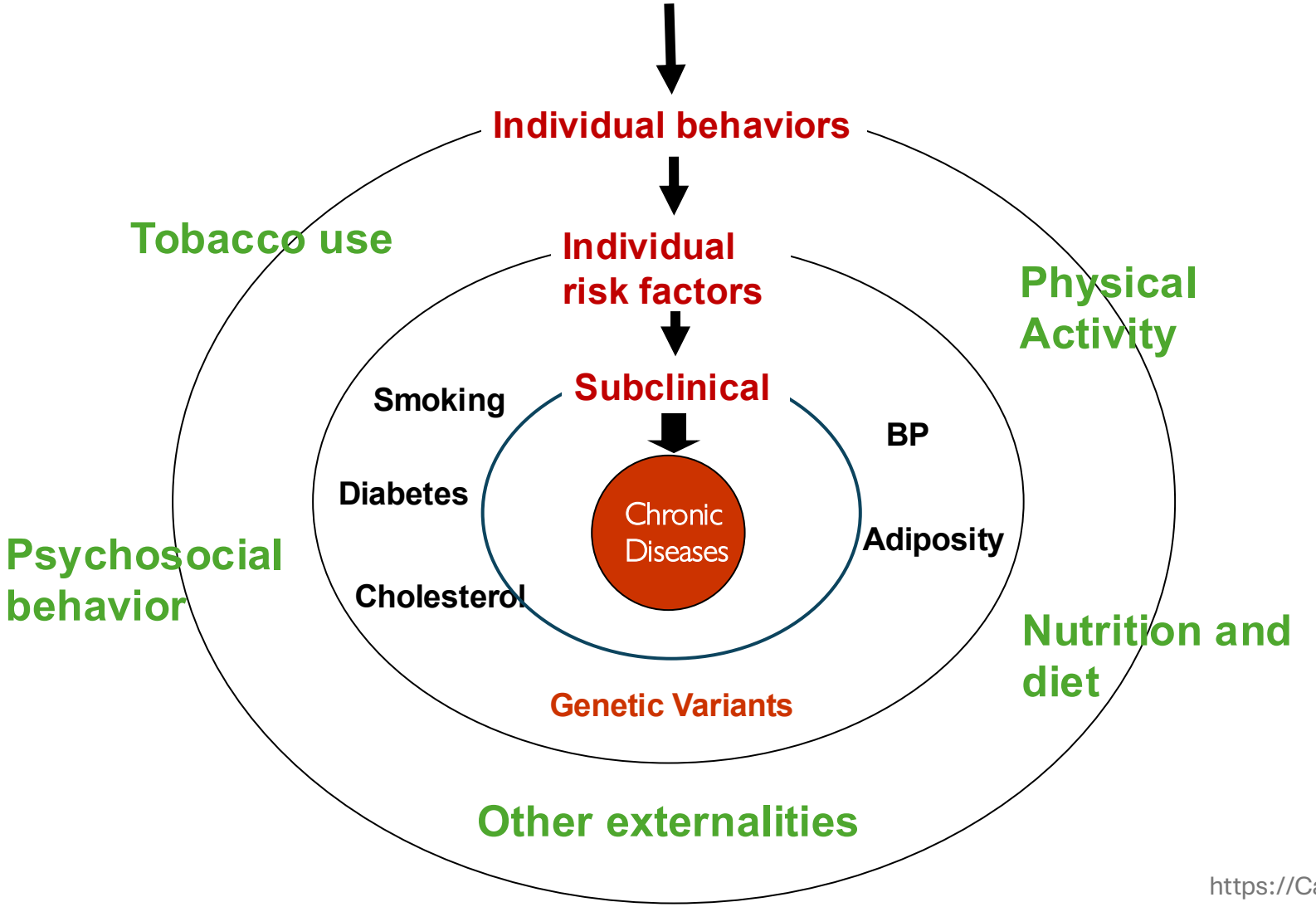
Call for Proposal

2M $

HEART & STROKE FOUNDATION OF CANADA | FONDATION DES MALADIES DU CŒUR DU CANADA

16M $

Contextual Factors and Chronic Diseases



Canadian Alliance of Healthy Hearts and Minds – Imaging Biomarkers

- East to West Gradient
- Subclinical Vascular Disease
- Cognitive Function
- Special Populations

McMaster McGill U of T

CAHHM Grants

Recruitment

All Study visits Completed

1st Results Paper Published

Centralized Data Access Platform

Repeat Assessments 2023 Open Access

2012 2013 2014 2015 2016 2017 2018 2019 2020

Protocol Development, Ethics, Planning, Recruitment Initiated

E-mail and on-line questionnaires

Chinese Cohort Recruitment Initiated

3 Papers Published in 2018

Data repatriation and Linkage

15 + Publications

+ Special First Nations Cohort

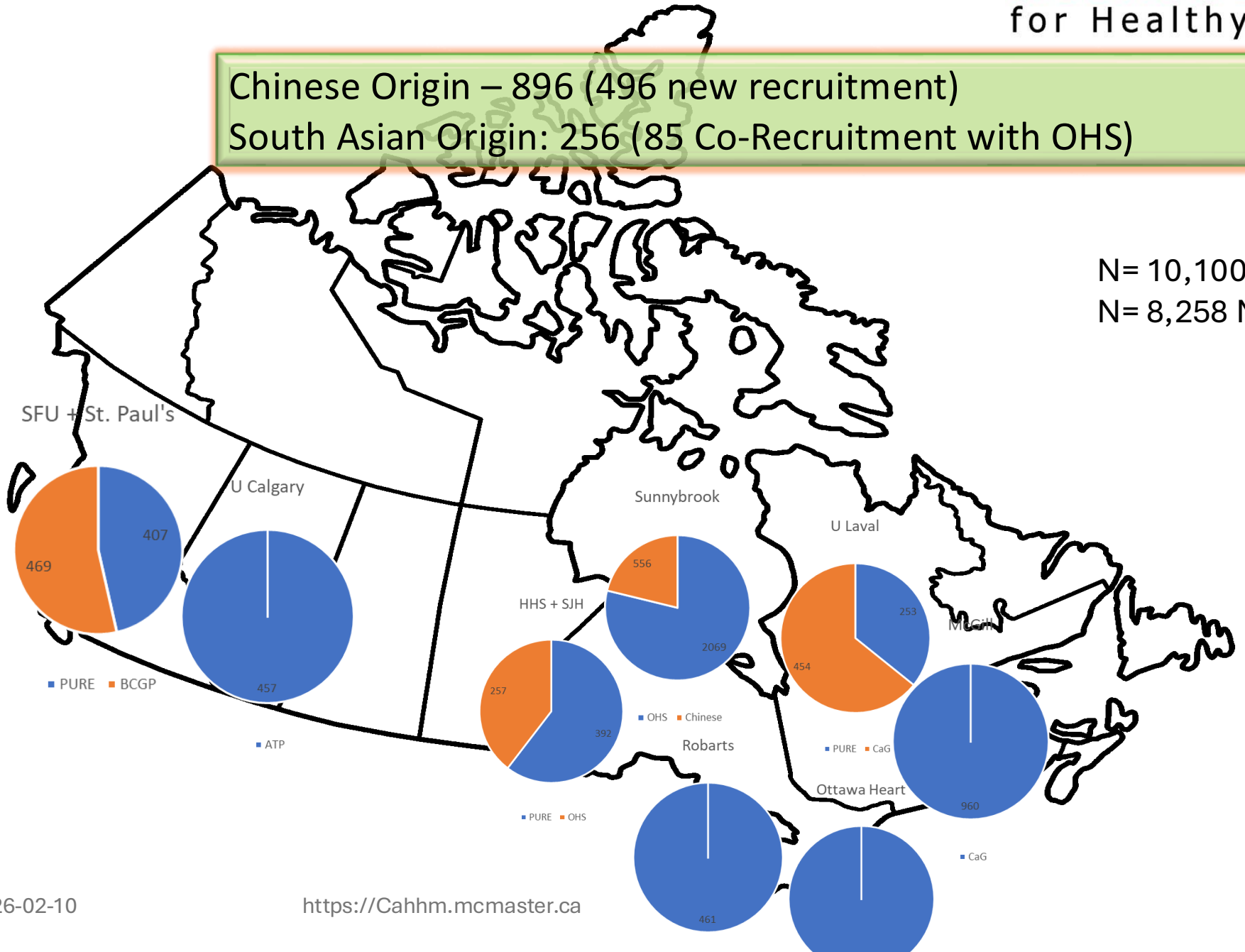
Canadian ALLIANCE for Healthy Hearts & Minds

"Cohort of Cohorts" N=11,000

Canadian ALLIANCE for Healthy Hearts & Minds

Chinese Origin – 896 (496 new recruitment)
South Asian Origin: 256 (85 Co-Recruitment with OHS)

N= 10,100 consent
N= 8,258 MRI



Data Collection Summary

Online/Mail

- **Health Services Research**
  - Access to Health Care
  - Risk Factors screening
  - CVD Screening
  - Medication Use/Adherence
  - Health Insurance
- Diet (Food Frequency Questionnaire)

Onsite Questionnaire

- **CPTP Core Questionnaire***
  - Socio Demographic Information
  - Personal Medical History and Health Status
  - Family Health History
  - Sleep
  - Sunlight Exposure
  - Alcohol and Tobacco Use
  - Ethnicity, Language
- **Immigration Questionnaire**
- **Acculturation**
- **Cultural Connectedness**
- **Contextual Factors**

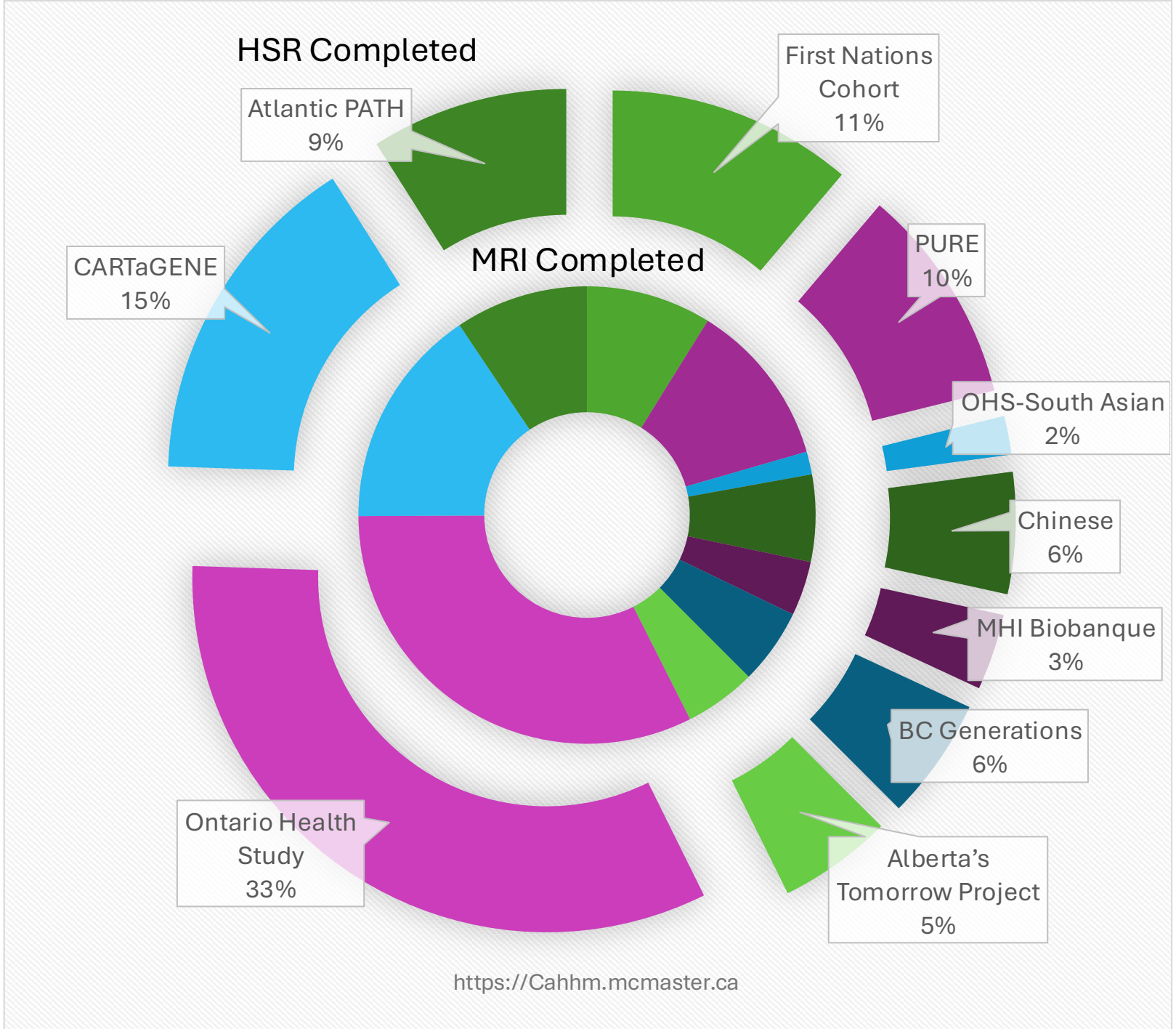
Assessment Visit

- **Cognition (MoCA and DSS)**
- **Physical Measures**
- **Blood Sample collection/analysis**
- **InterHeart Risk Score**
- **MRI**
  - Brain
  - Carotid
  - Cardiac
  - Abdomen

* CPTP core questionnaire only administered to non-CPTP cohort participants. For CPTP cohort participants this data was used from their baseline visit with the parent cohort.

CAHHM-Recruitment

Cohort	Consent	HSR	IHRS	Apo	MRI	MRI Brain	MRI Carotid	MRI Cardiac	MRI Abdomen
CPTP Cohorts:									
BC Generations	633	630	488	481	485	485	485	463	478
Alberta's Tomorrow Project	588	587	469	462	458	457	455	418	454
Ontario Health Study	3942	3914	3153	150	3077	3053	3046	2876	3043
CARTaGENE	1751	1751	1462	1458	1418	1411	1409	1369	1413
Atlantic PATH	1022	1017	917	871	853	834	816	808	822
Total CPTP Cohorts	***7936***	***7899***	***6489***	***3422***	***6291***	***6240***	***6211***	***5934***	***6210***
External Cohorts:									
MHI Biobanque	399	393	360	359	350	349	348	341	348
PURE	1135	1124	1109	0	1058	1051	1039	1018	1036
Total External Cohorts	***1534***	***1517***	***1469***	***359***	***1408***	***1400***	***1387***	***1359***	***1384***
First Nations Cohort	***1302***	***1262***	***1248***	***1059***	***802***	***786***	***767***	***715***	***763***
Ontario Chinese Cohort	***630***	***627***	***565***	***552***	***559***	***557***	***538***	***535***	***555***
Overall Total	***11,402***	***11,305***	***9,771***	***5,392***	***9,060***	***8,983***	***8903***	***8543***	***8,912***
Total Non-First Nations	***10,100***	***10,043***	***8,523***	***4,333***	***8,258***	***8,197***	***8,136***	***7,828***	***8,149***
Total First Nations	***1,302***	***1,262***	***1,248***	***1,059***	***802***	***786***	***767***	***715***	***763***


HSR Completed
Atlantic PATH
9%
First Nations
Cohort
11%
CARTaGENE
15%
MRI Completed
PURE
10%
OHS-South Asian
2%
Chinese
6%
MHI Biobanque
3%
BC Generations
6%
Ontario Health
Study
33%
Alberta's
Tomorrow Project
5%

CAHHM: Participant Flow

Participants provide online/phone consent to participate and complete some questionnaires

Participant visits a CAHHM site for in-person Clinical Assessment

- **Consent**
- **Questionnaire**
- **Physical Measures**
- **Blood Sample where applicable**
- **MRI Scan**

MR Images uploaded to CAIN Server via AGMednet

Data transferred to PHRI via iDataFax

Samples shipped to CRLB in Hamilton for Storage and Analysis

Parent Cohort:
Cohorts Invite their participants to participate in CAHHM – via email/phone

Data Repatriation to Cohorts

Population Health Research Institute
HEALTH THROUGH KNOWLEDGE

Reading for:

1. *Severe Structural Abnormality*
2. *Full Research Read*

Images read at 5 Core Lab locations:

1. Brain – Calgary/Toronto
2. Carotid – Toronto
3. Cardiac – Montreal/Quebec City
4. Abdomen – Quebec City

Contextual Factors: Audit of 2,074 communities in 10 provinces

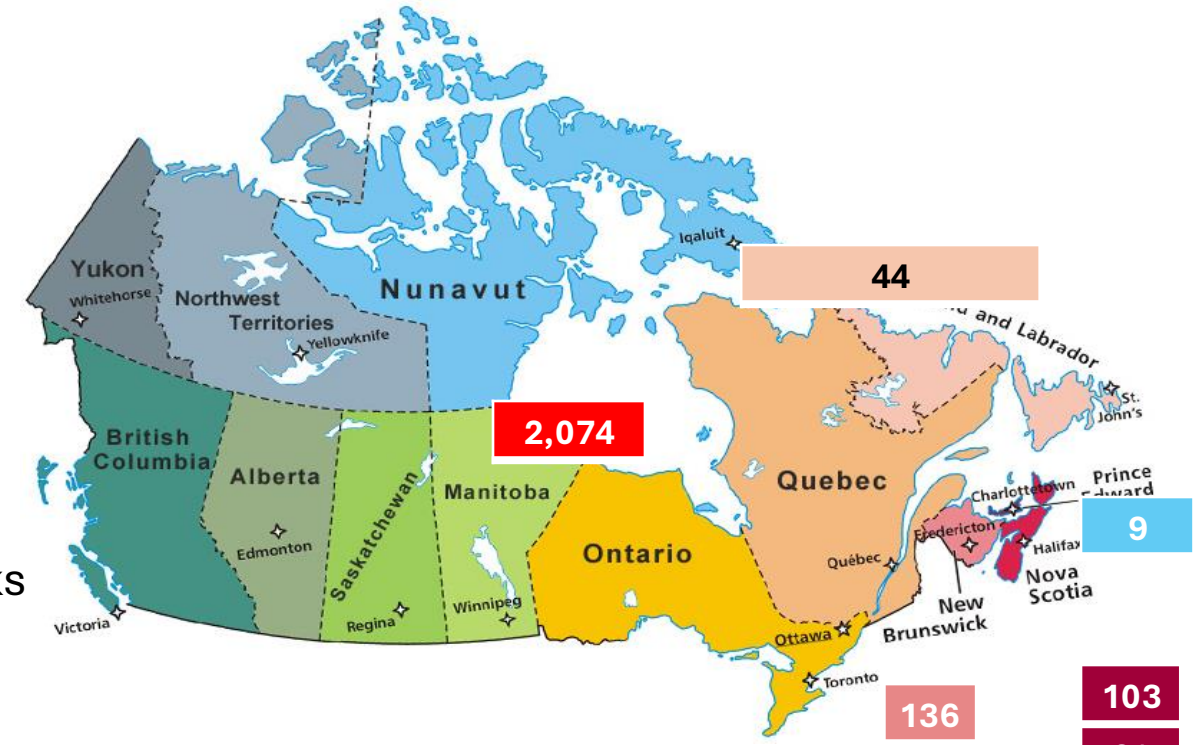
Key Findings:

1. **Rural communities see**
   - Higher food prices
   - > seasonal variation (produce)
   - Less healthy restaurant options
   - Less nutritional information

2. **In-store ads** for sweet drinks and junk food > than in-store advertisements for F+V

3. Cigarette prices lower and variety of brands greater in urban than in rural tobacco stores and ON, QC

4. Alcohol prices are lowest in Quebec



Audits	238	197	57	77	696	517
FSA	95	46	0	0	321	238

Link to map: https://cvcdcontextual.mcmaster.ca/

12 Academic Centres and Mobile MRI for Rural and First Nations

12 Experienced Centres: 3T Magnet

1.5 T magnet
Total Machine = 45 Tonnes
13 months x 2 trips across Canada
N=2,150

3 Core labs

Unique and Novel MRI Markers in CVCD

Marker	Outcome
▶ White Matter Lesions	▶ Cognitive impairment
▶ Quantitative cardiac markers	▶ MI, heart failure, hospitalization
▶ Atrial volume and function	▶ Atrial fibrillation, heart failure
▶ Subclinical injury (heart/brain)	▶ MI, stroke, heart failure, dysfunction
▶ Vascular function	▶ MI, hospitalization
▶ Carotid plaque composition	▶ Stroke, cognitive dysfunction
▶ “Adiposity” (liver fat)	▶ MI, stroke, heart failure

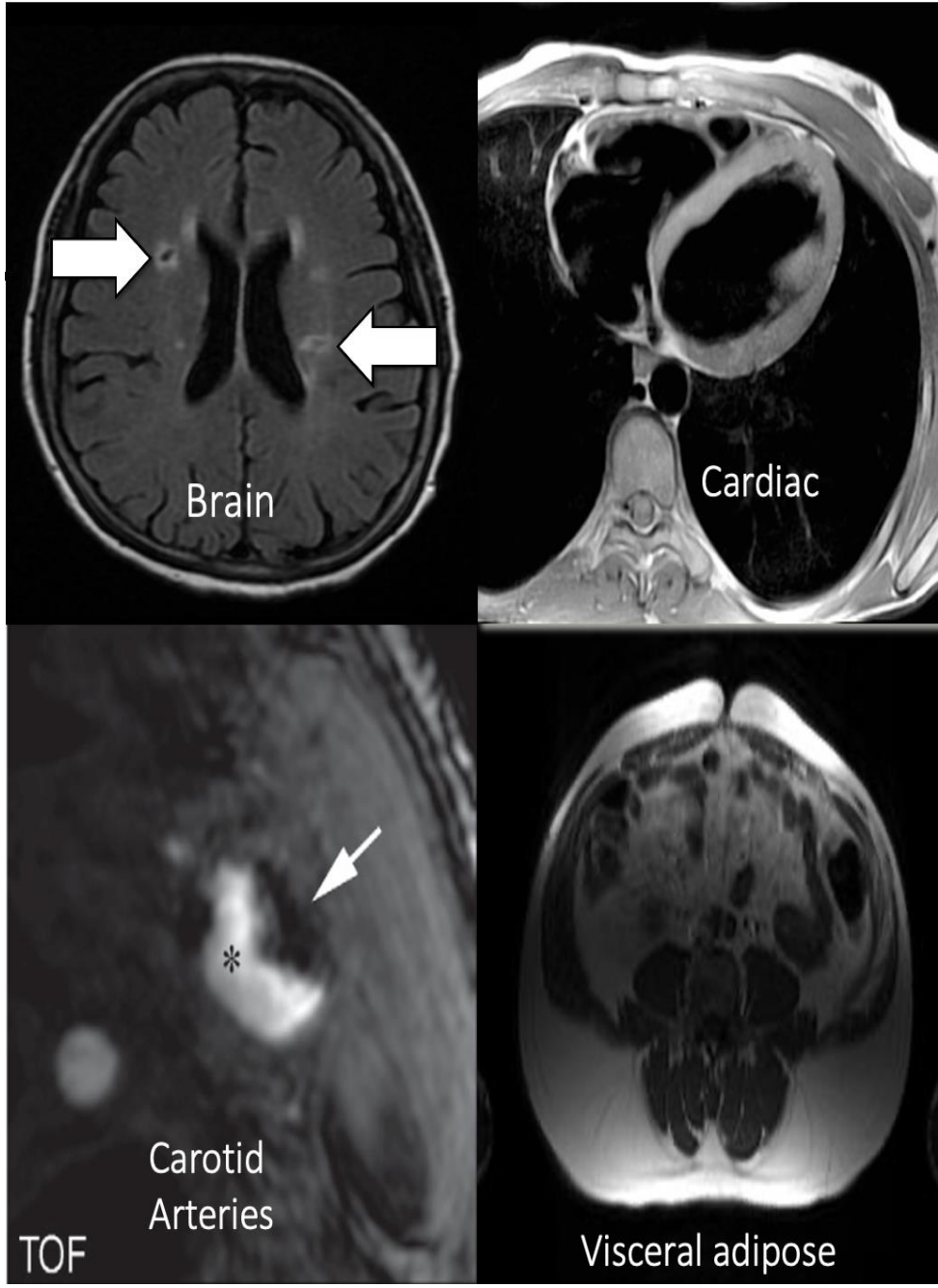
Canadian ALLIANCE for Healthy Hearts & Minds

The **Canadian Alliance of Healthy Hearts and Minds (CAHHM)** project, conducted between 2014-2018, recruited 8,200 participants across Canada.

Recruitment emphasis on South Asian and Chinese ethnic groups.

Data collection: Baseline serum, cognitive tests (MoCA, DSST), subset with brain, carotid, cardiac and abdomen MRIs

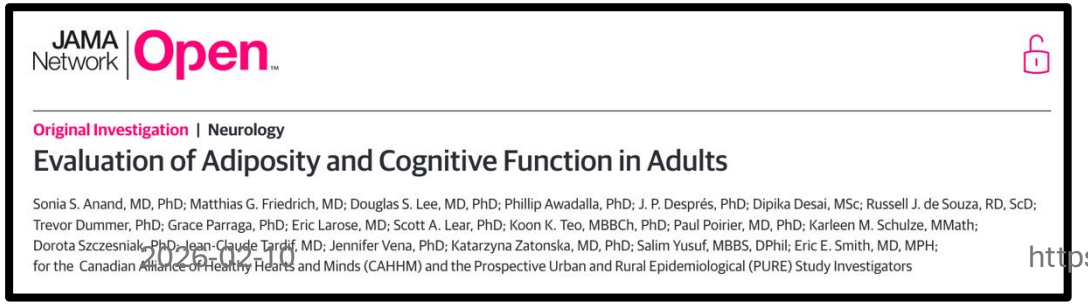
Follow-up: Repeat of cognitive tests and MRI being assessed 7 years from baseline MRI for disease progression, brain infarction and cognitive decline.



Questions?

1. Impact of CV risk factors including Adiposity
2. Transcontinental difference amongst Chinese
3. Dietary intake

On outcome: Vascular Brain Injury and Cognitive Function

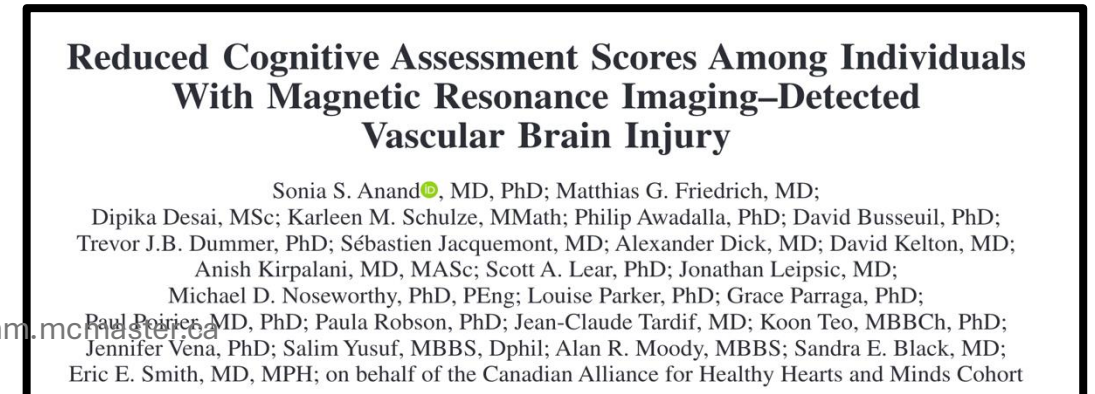


JAMA Network | Open

Original Investigation | Neurology

Evaluation of Adiposity and Cognitive Function in Adults

Sonia S. Anand, MD, PhD; Matthias G. Friedrich, MD; Douglas S. Lee, MD, PhD; Phillip Awadalla, PhD; J. P. Després, PhD; Dipika Desai, MSc; Russell J. de Souza, RD, ScD; Trevor Dummer, PhD; Grace Parraga, PhD; Eric Larose, MD; Scott A. Lear, PhD; Koon K. Teo, MBBCh, PhD; Paul Poirier, MD, PhD; Karleen M. Schulze, MMath; Dorota Szczesniak, PhD; Jean-Claude Tardif, MD; Jennifer Vena, PhD; Katarzyna Zatonska, MD, PhD; Salim Yusuf, MBBS, DPhil; Eric E. Smith, MD, MPH; for the Canadian Alliance of Healthy Hearts and Minds (CAHHM) and the Prospective Urban and Rural Epidemiological (PURE) Study Investigators



Reduced Cognitive Assessment Scores Among Individuals With Magnetic Resonance Imaging–Detected Vascular Brain Injury

Sonia S. Anand, MD, PhD; Matthias G. Friedrich, MD; Dipika Desai, MSc; Karleen M. Schulze, MMath; Philip Awadalla, PhD; David Busseuil, PhD; Trevor J.B. Dummer, PhD; Sébastien Jacquemont, MD; Alexander Dick, MD; David Kelton, MD; Anish Kirpalani, MD, MASc; Scott A. Lear, PhD; Jonathan Leipsic, MD; Michael D. Noseworthy, PhD, PEng; Louise Parker, PhD; Grace Parraga, PhD; Paul Poirier, MD, PhD; Paula Robson, PhD; Jean-Claude Tardif, MD; Koon Teo, MBBCh, PhD; Jennifer Vena, PhD; Salim Yusuf, MBBS, Dphil; Alan R. Moody, MBBS; Sandra E. Black, MD; Eric E. Smith, MD, MPH; on behalf of the Canadian Alliance for Healthy Hearts and Minds Cohort

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Population Attributable Risk of low test scores:

- No postsecondary: 15% (12–17)
- Moderate-high CV risk factors: 19% (8–30)
- MRI vascular brain injury: 10% (3-22)

JAMA Network | Open

Original Investigation | Neurology

Evaluation of Adiposity and Cognitive Function in Adults

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- Higher body fat %: 20.5% (7-33.2)

Dementia prevention, intervention, and care: 2020 report of the Lancet Commission

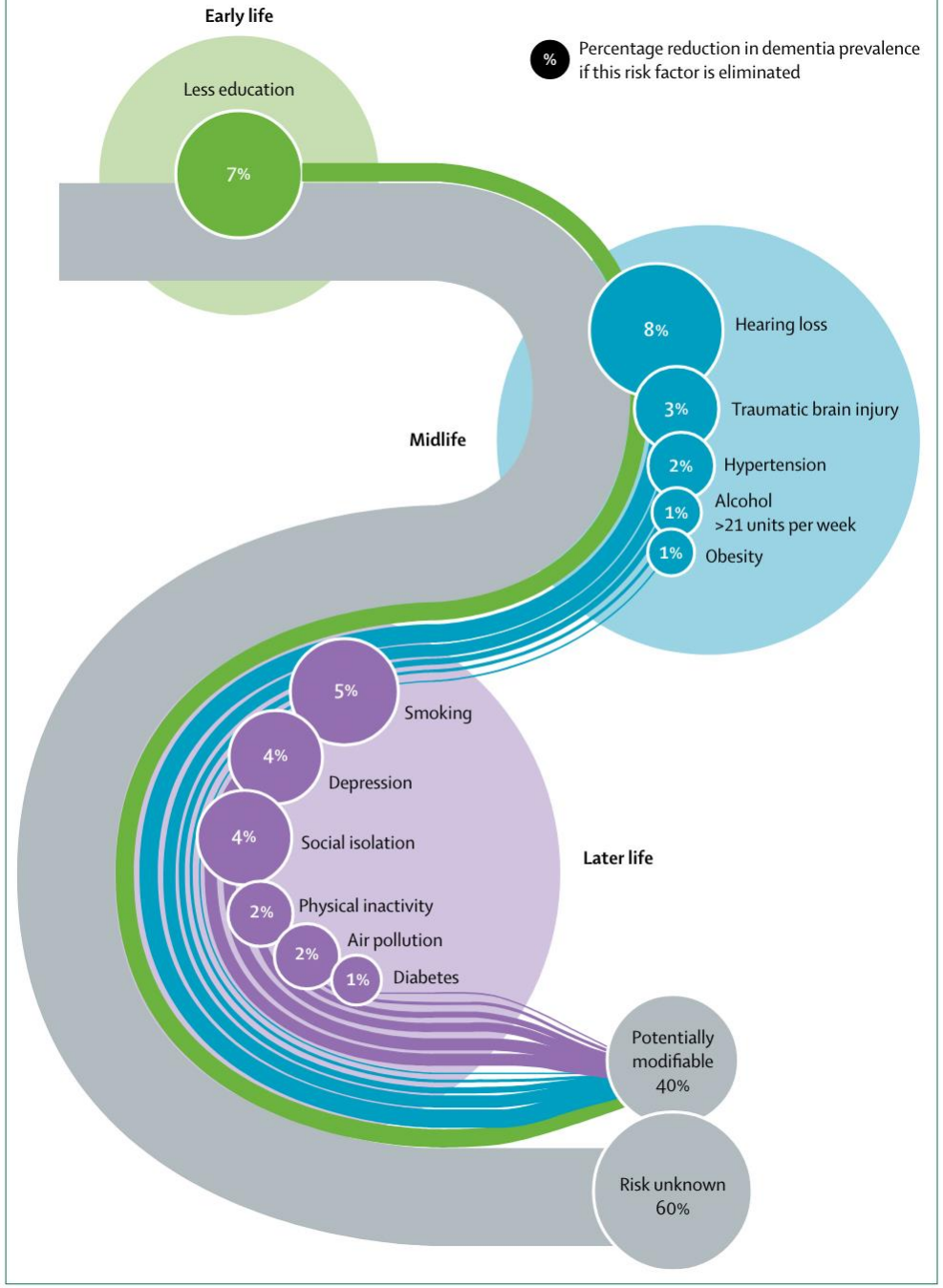


Figure 7: **Population attributable fraction of potentially modifiable risk factors for dementia**

Effect estimates of air pollution are smaller than other risk factors but given the population size potentially exposed to air pollutants, public health implications can be substantial.

Focus is Cardiac and Brain Health: "Brain-Heart Connectome"

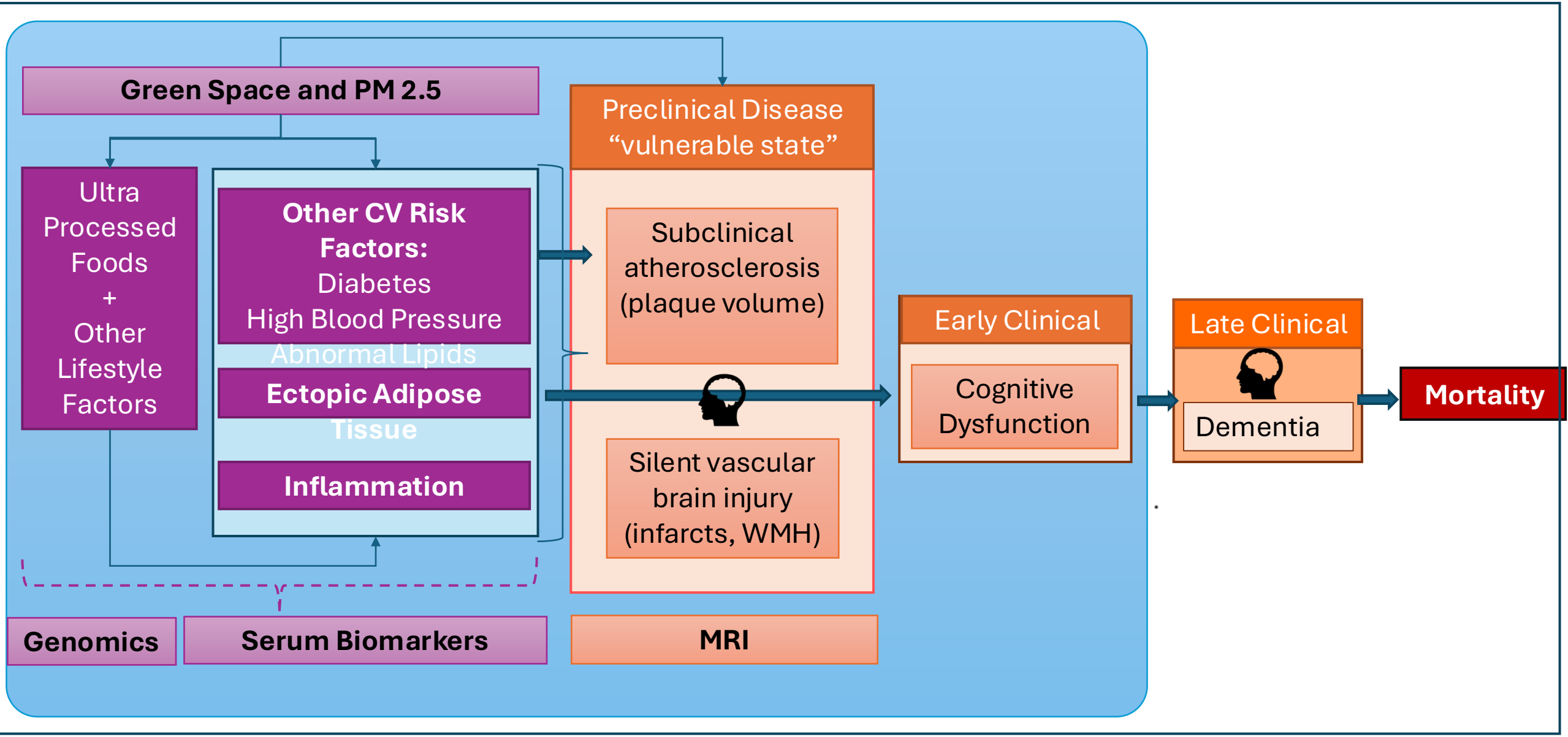
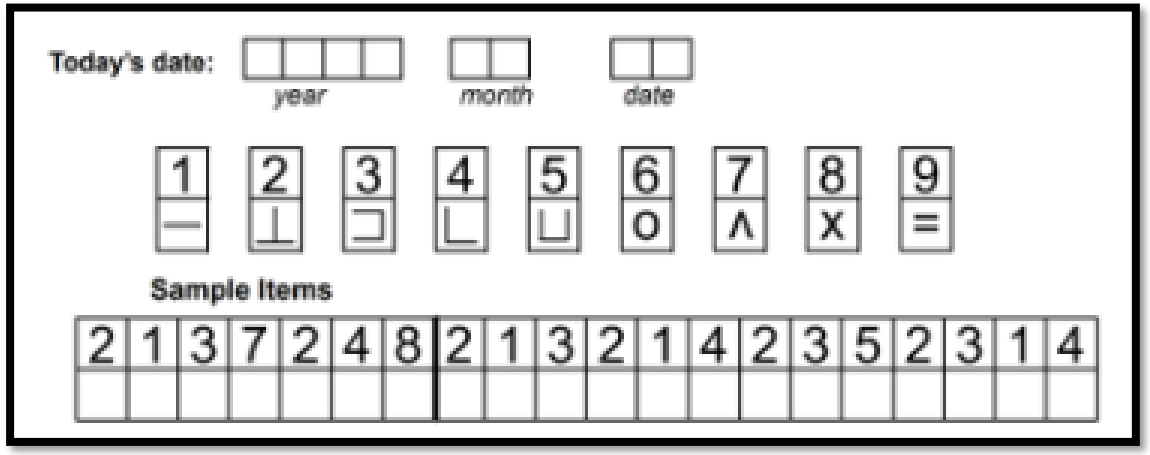


Figure 1: Hypotheses: i. Adipokines and inflammatory proteins (serum biomarkers) associated with higher Ectopic Adipose

Measuring Cognitive Function

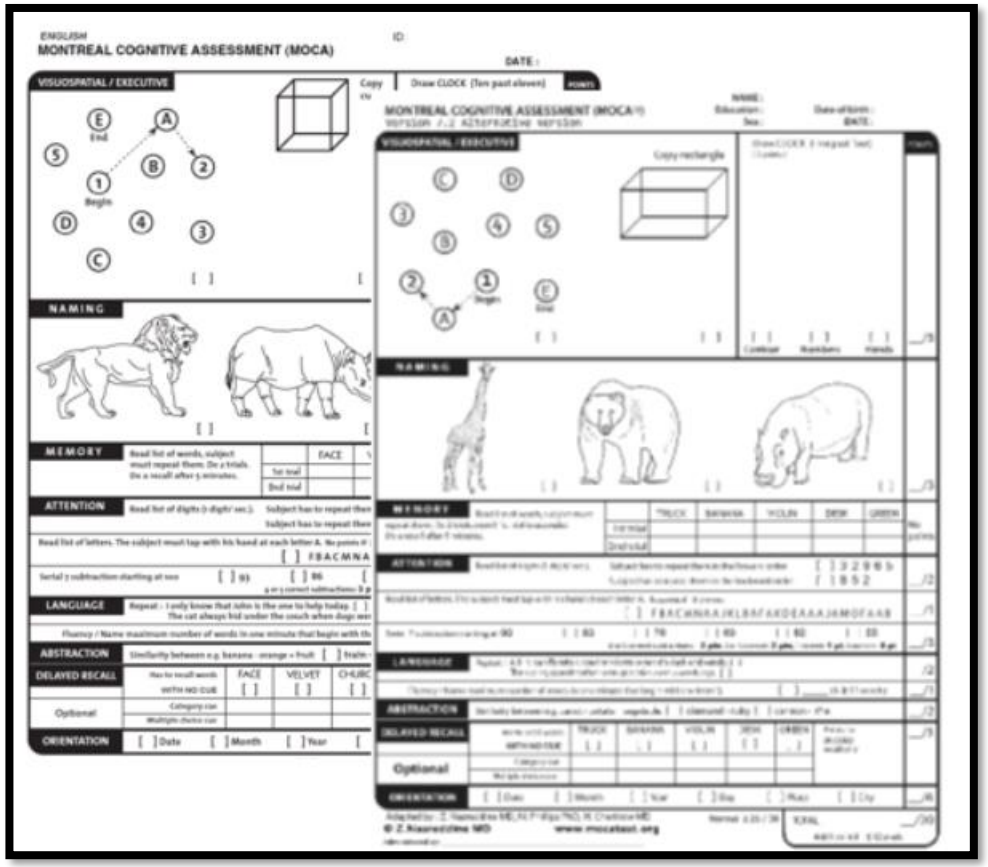
The MoCA and DSST were collected in the initial Alliance study.

In the recontact CAHHM study, they will be collected again in addition to the Creyos.



DSST

DSST; scores range from 0 to 133, with lower scores indicating lower cognitive function, average 73 in our cohort



MoCA

Scores range from 0 to 30, with a score of ≥26 denoting normal cognitive function

Harmonizing CAHHM and PURE-Mind

The CAHHM study was designed to align data elements with PURE, enabling integrated analysis of both studies.

Enrollment Criteria:

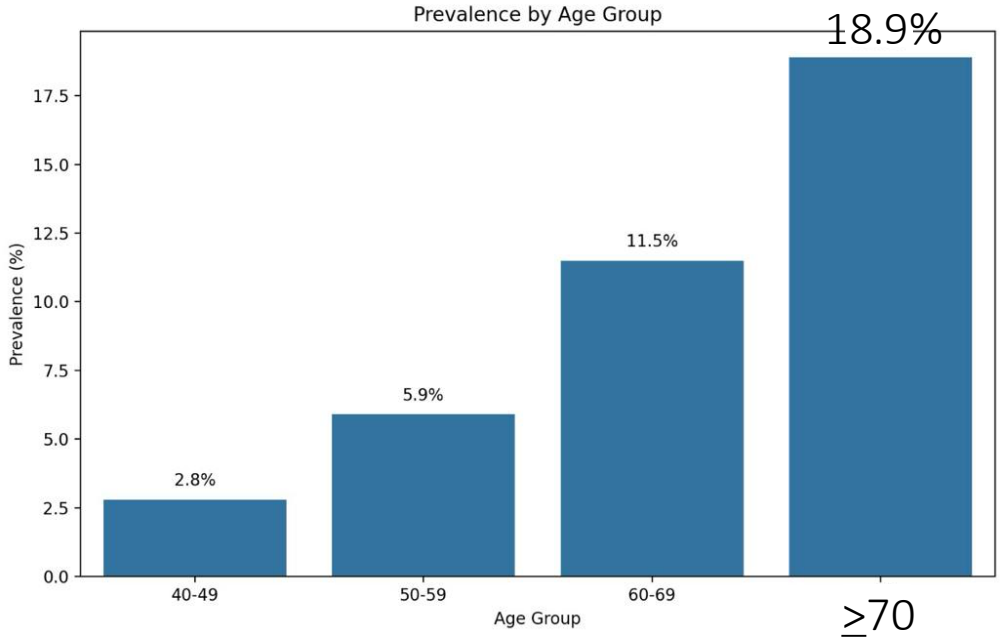
CAHHM (Canada): Adults aged **30-69 years** (2014-2018)

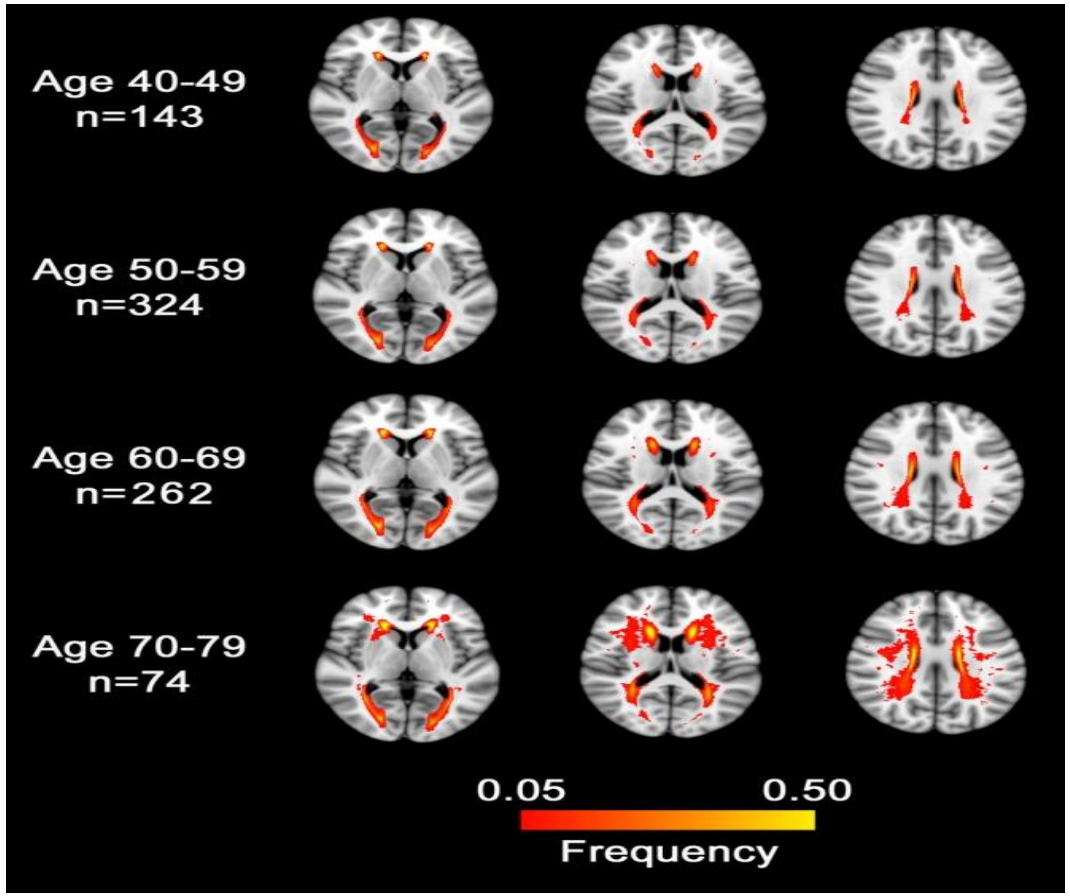
PURE-MIND (Canada & Poland): Adults aged **40-75 years** (2010-2018)

Combined sample size **9,100 participants**

Anand et al., 2022

Silent infarcts + White matter disease

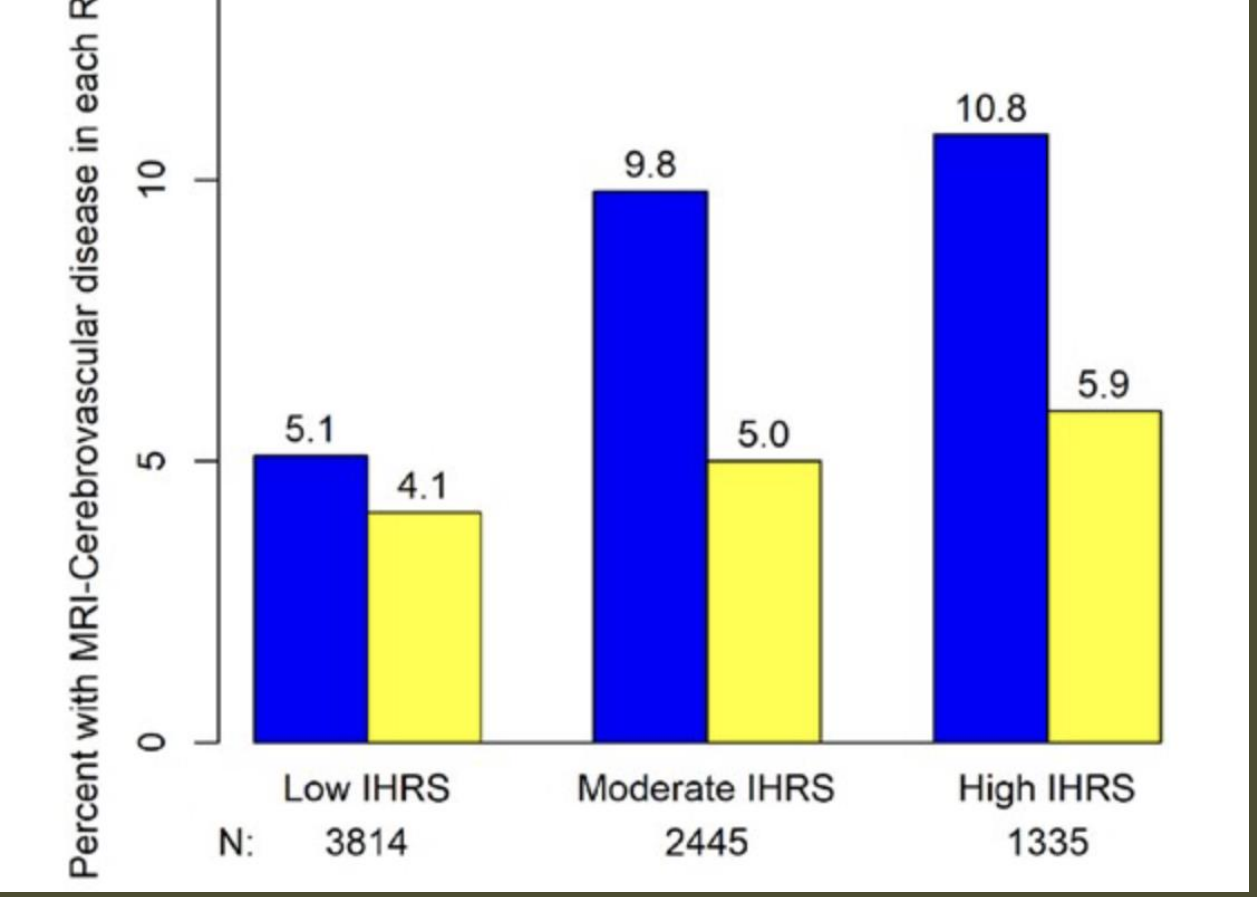


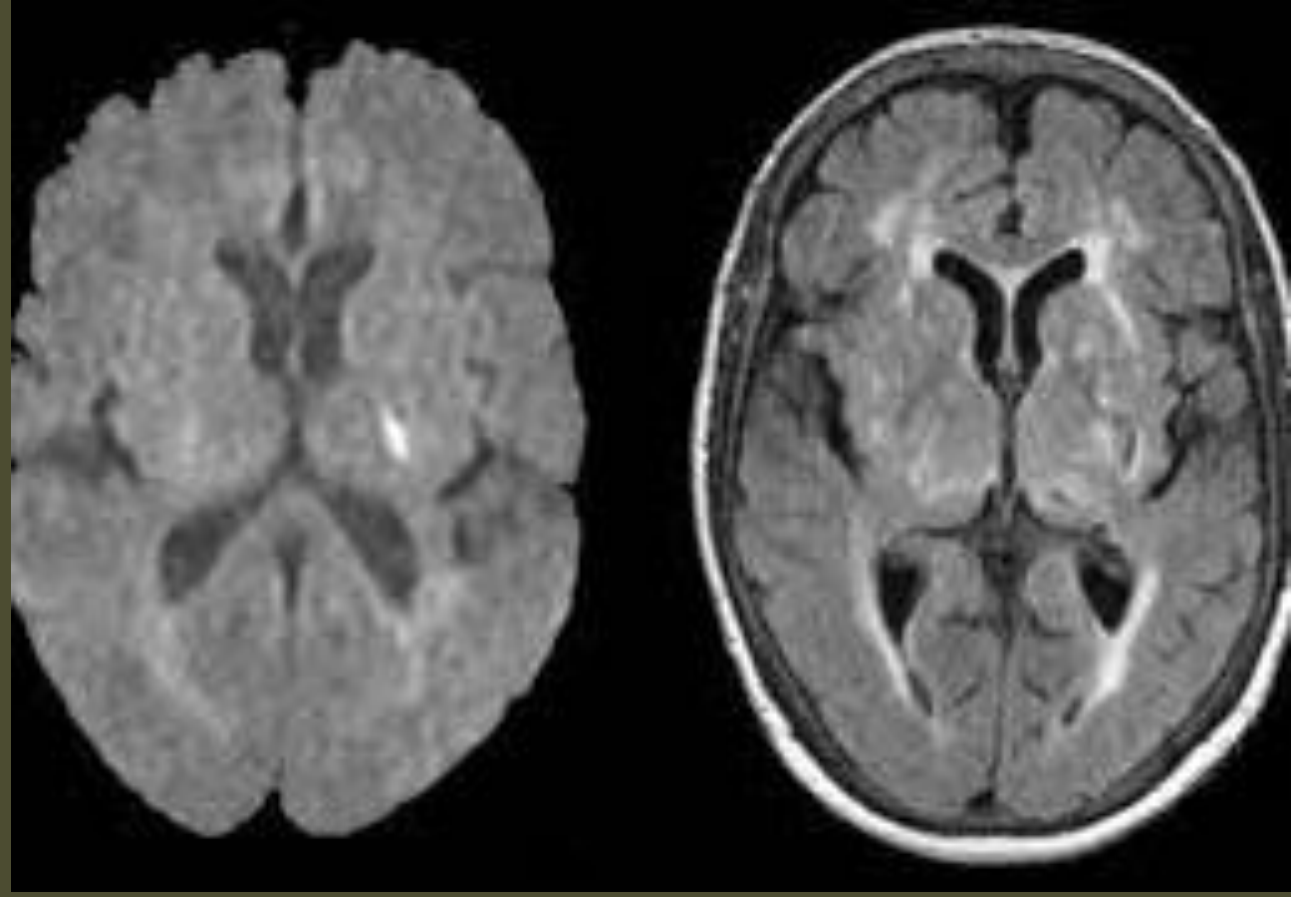


Clinical events

- 2.5x risk of clinical stroke
- 1.5-2x risk of dementia

Debette, S., et al (2019). Clinical Significance of Magnetic Resonance Imaging Markers of Vascular Brain Injury: A Systematic Review and Meta-analysis. *JAMA Neurology, 76*(1), 81–94.

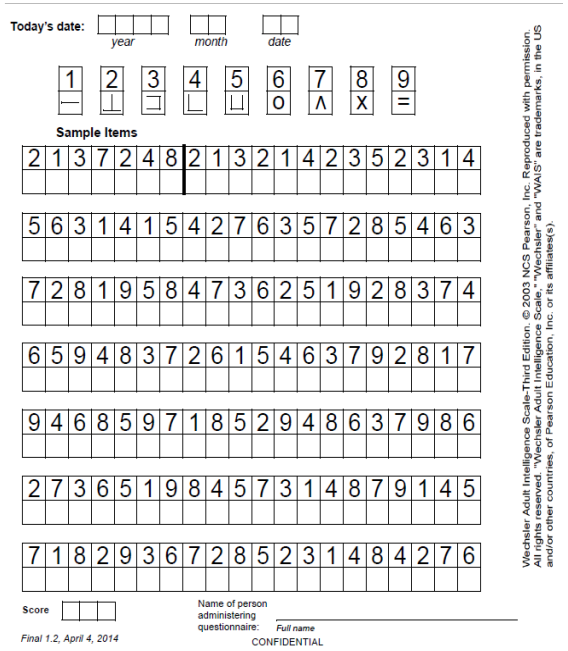




CV Risk Factors and Vascular Brain Injury

Anand SS et al Eur J Cardiovasc Imaging 2020

Silent Brain Infarction and Cognitive Function


Today's date: year month date

1 2 3 4 5 6 7 8 9

Sample Items

2 1 3 7 2 4 8 2 1 3 2 1 4 2 3 5 2 3 1 4

5 6 3 1 4 1 5 4 2 7 6 3 5 7 2 8 5 4 6 3

7 2 8 1 9 5 8 4 7 3 6 2 5 1 9 2 8 3 7 4

6 5 9 4 8 3 7 2 6 1 5 4 6 3 7 9 2 8 1 7

9 4 6 8 5 9 7 1 8 5 2 9 4 8 6 3 7 9 8 6

2 7 3 6 5 1 9 8 4 5 7 3 1 4 8 7 9 1 4 5

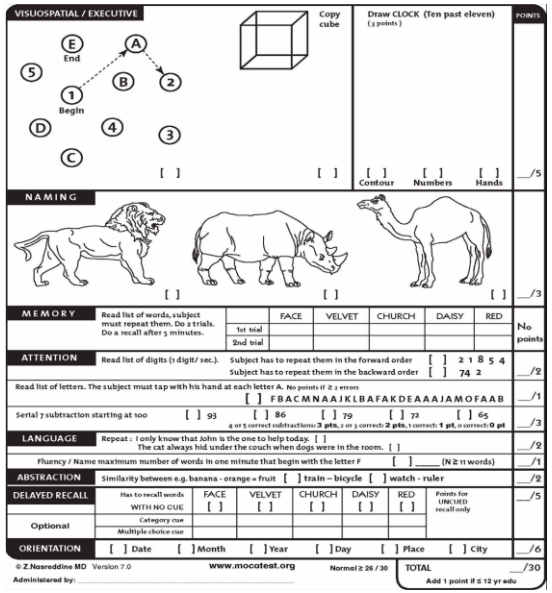
7 1 8 2 9 3 6 7 2 8 5 2 3 1 4 8 4 2 7 6

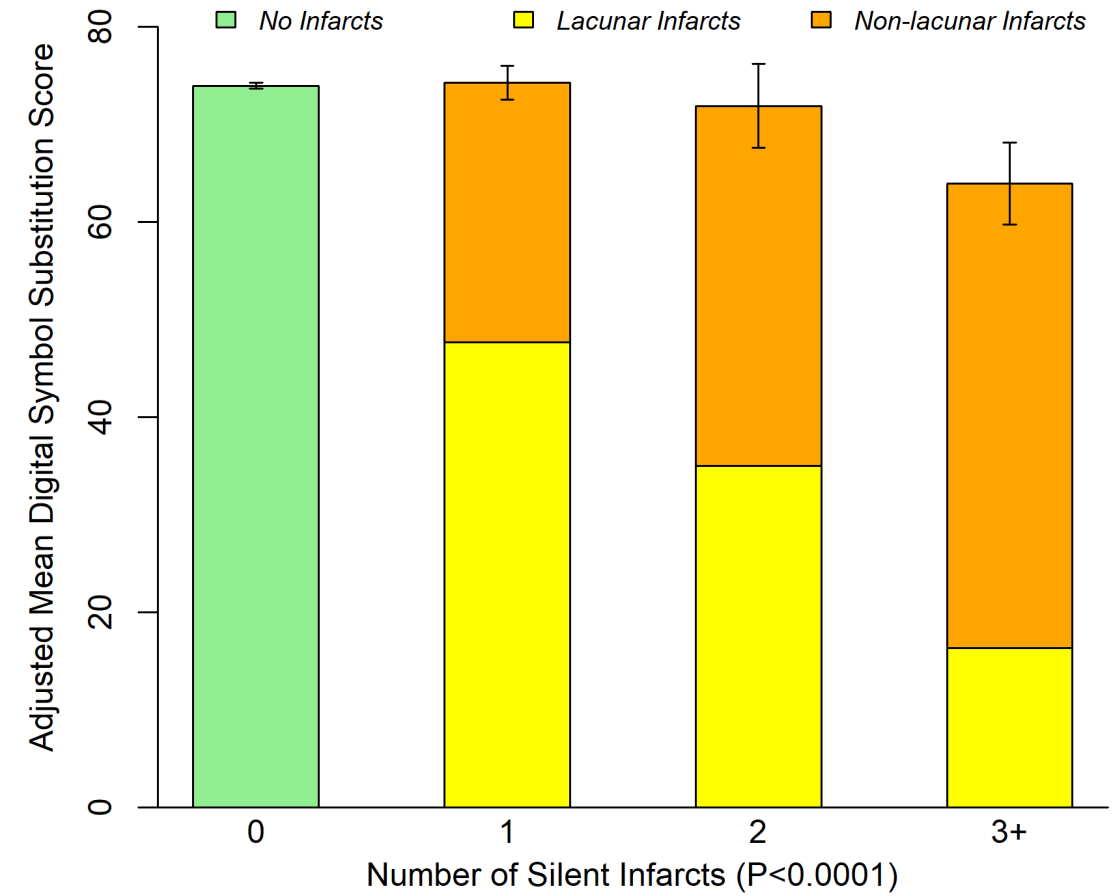
Score

Name of person administering questionnaire: Full name

CONFIDENTIAL

Final 1.2, April 4, 2014

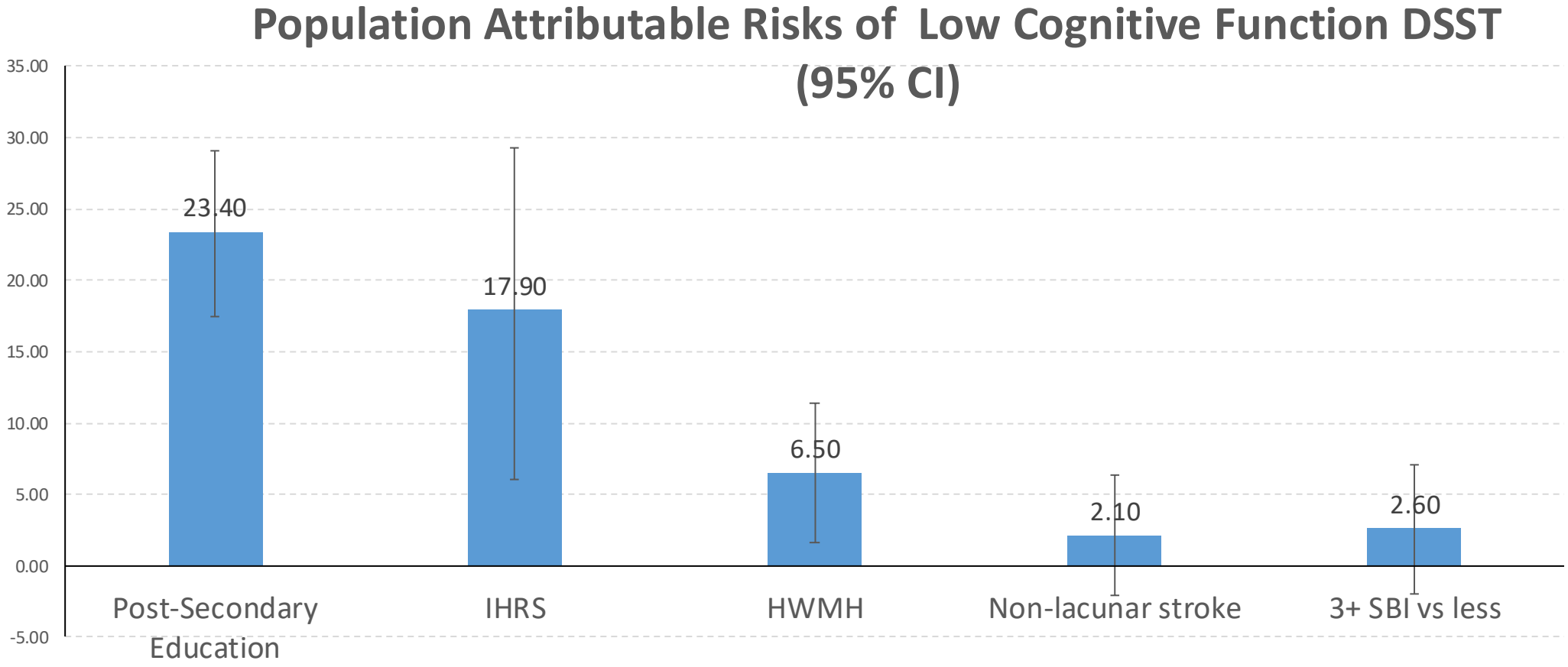




N:	7241	226	39	39
DSS (SE):	74.0 (0.2)	74.3 (0.9)	71.9 (2.2)	64.0 (2.1)

9 points lower on DSST

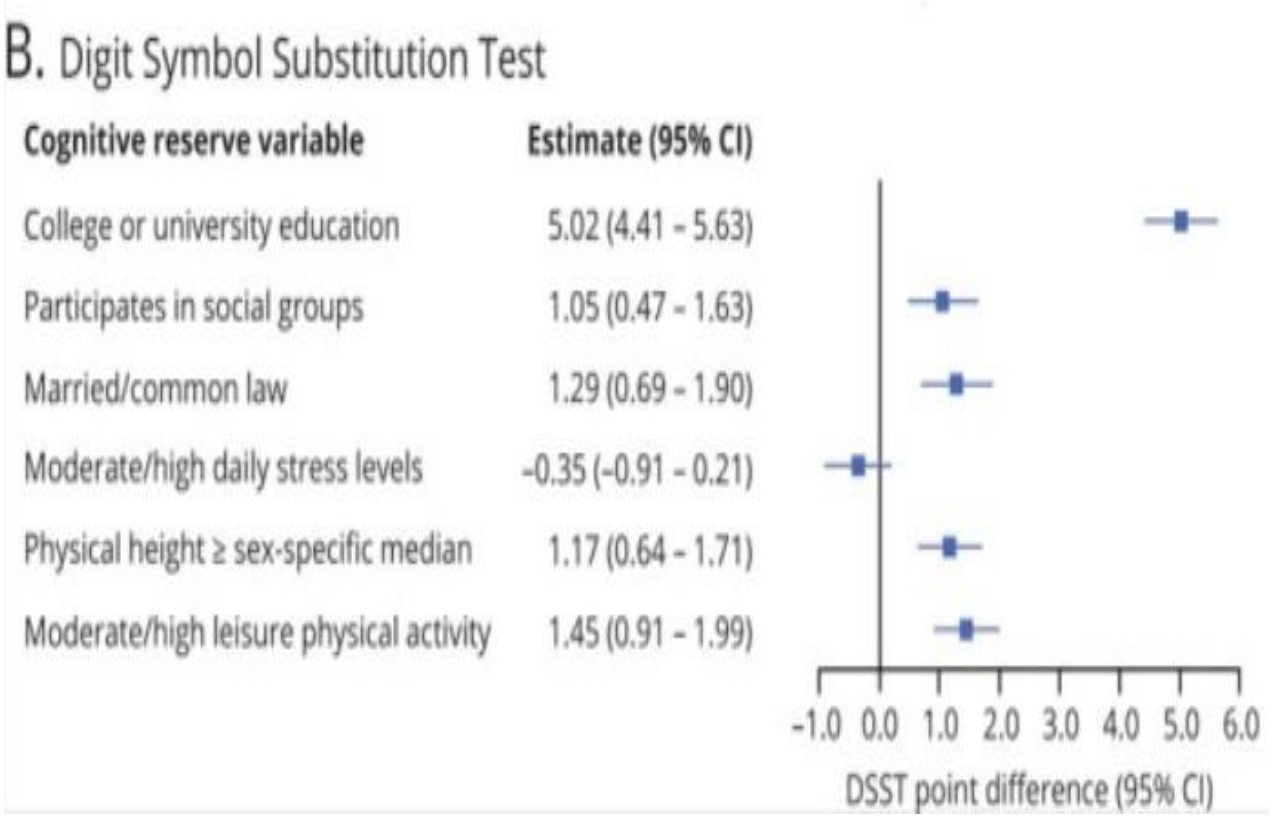
Anand SS et al. Stroke 4 March 2020



Determinants of low Cognitive Function

Protective factors

- *Education*
- *Physical activity*
- *Social activity*
- *Cognitive activity*
- *Healthy sleep*

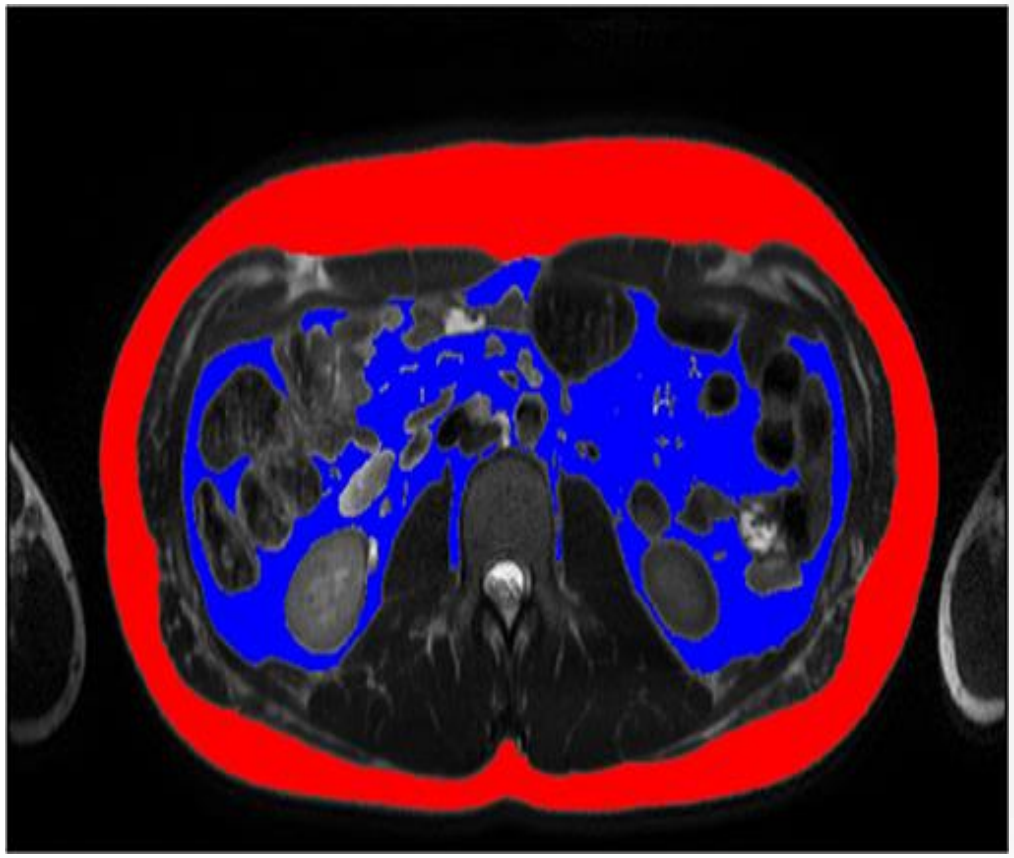


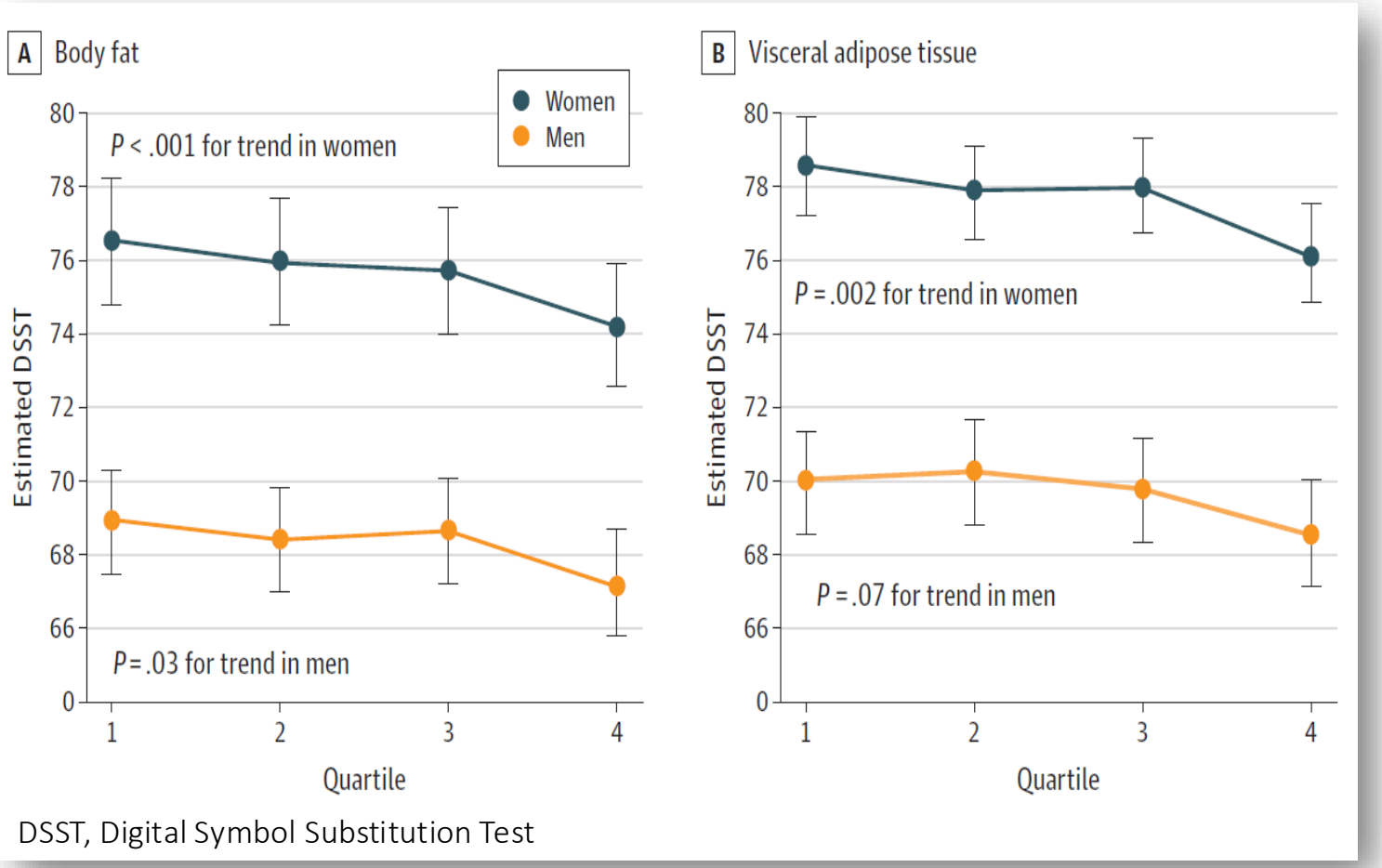
Durrani, R., et al.... Smith, E. E. (2021). Effect of Cognitive Reserve on the Association of Vascular Brain Injury With Cognition: An alysis of the PURE and CAHHM Studies. *Neurology*, *97*(17), e1707

Verghese, Jet al (2003). Leisure Activities and the Risk of Dementia in the Elderly. *New England Journal of Medicine*, *348*(25), 2508–2516.

Increased Adiposity is Associated with Reduced Cognitive Performance

N= 9189 participants





DSST, Digital Symbol Substitution Test

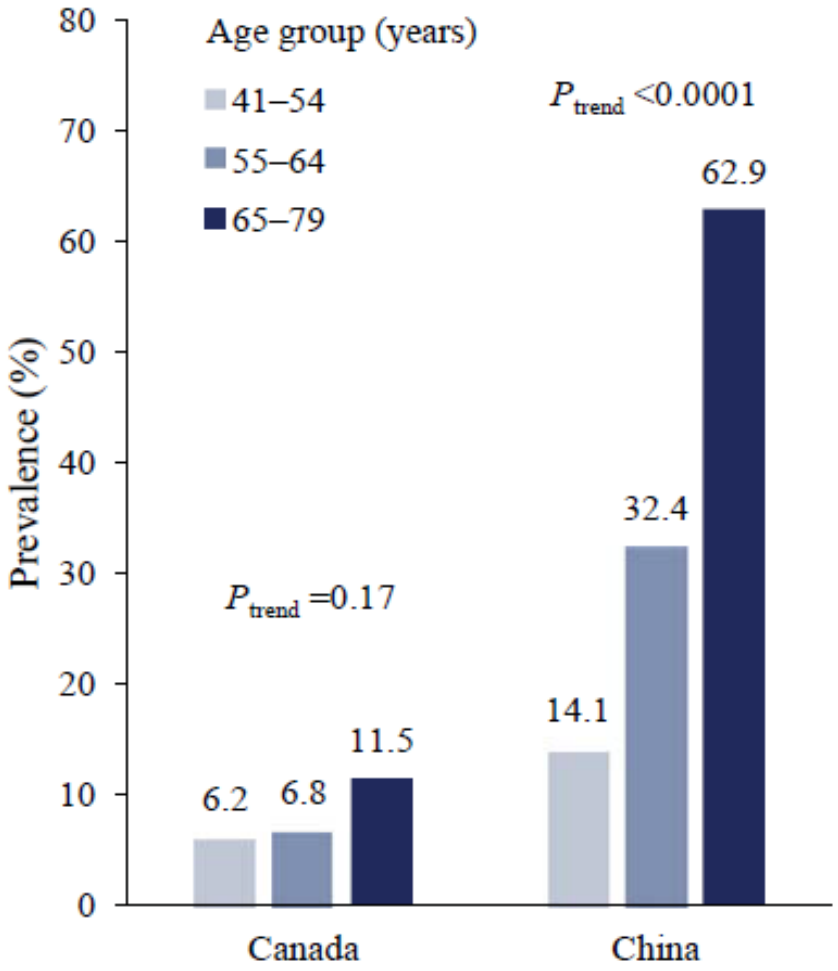
(Anand et al.. 2022. JAMA Network Open)

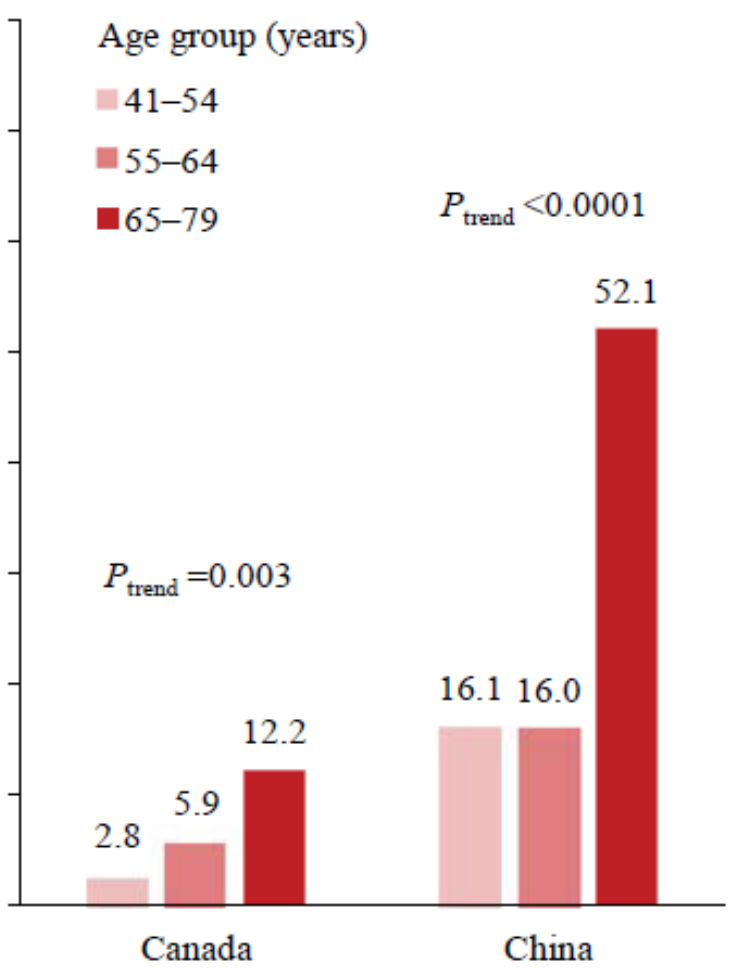
For every 1 SD increase in VAT (36 mL) the DSST was lower by 0.8 points; $P < .001$) adj for cardiovascular risk factors and vascular brain injury.

Covert Vascular Brain Injury and Cognitive Dysfunction Among Chinese Adults Living in Canada and China

Total N=1300

Ke et al., Neurology (2024)





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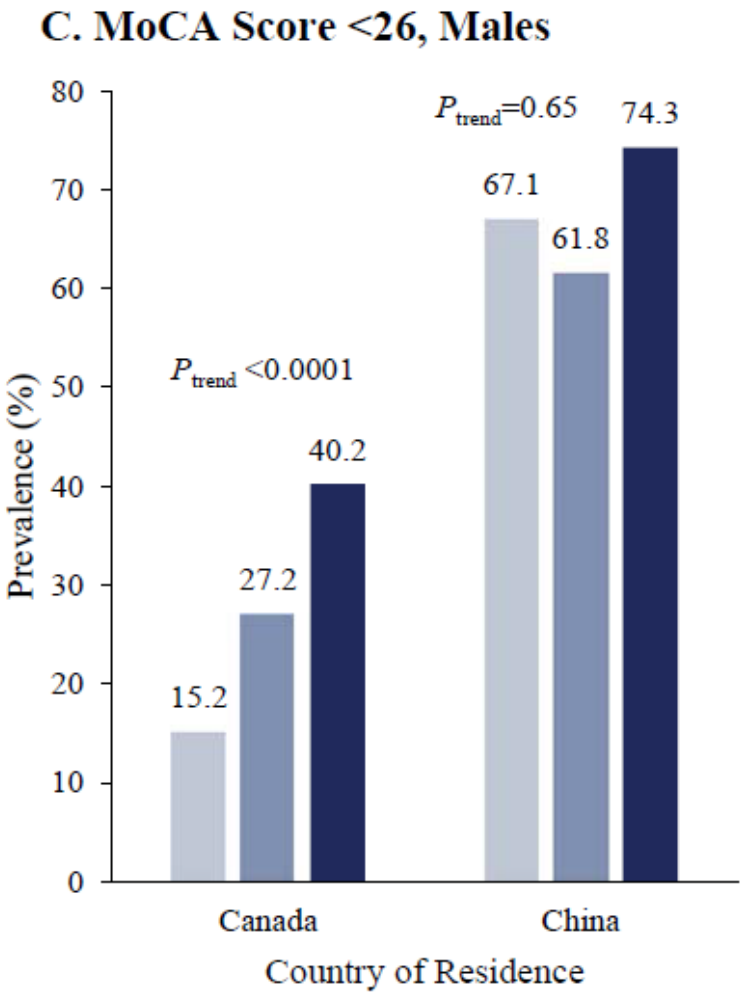
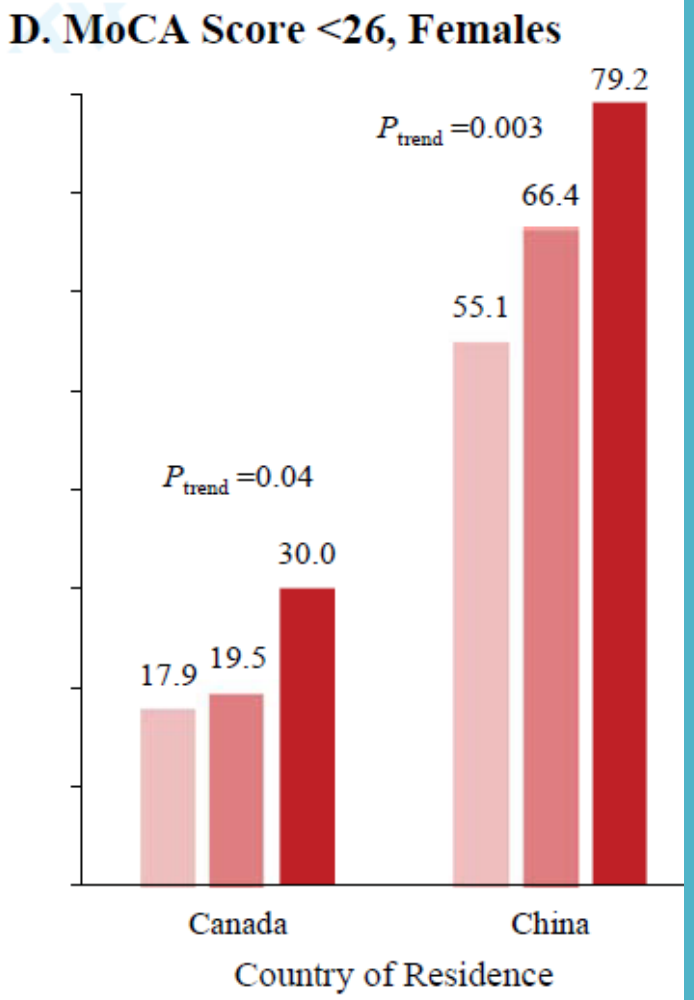


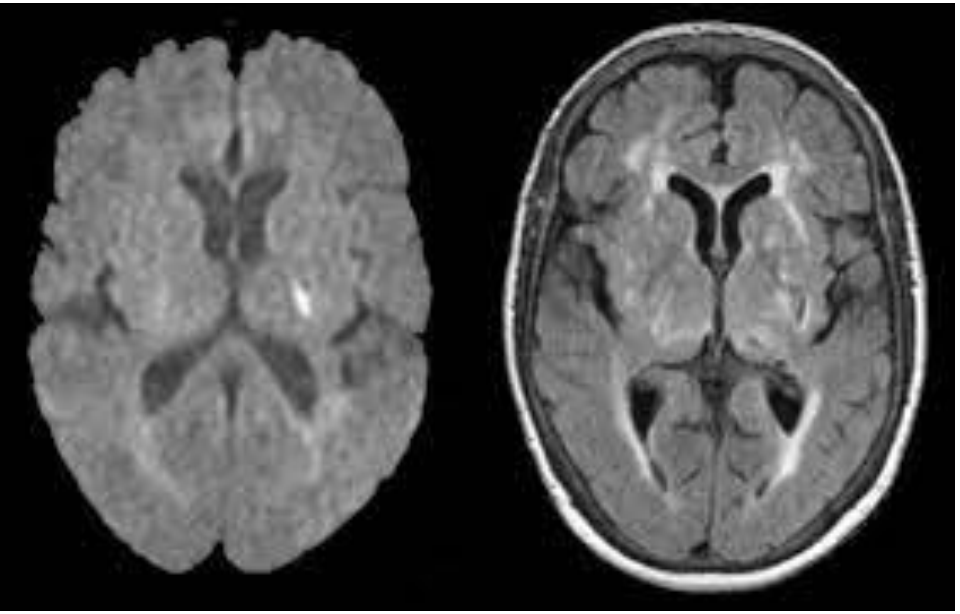


Cognitive dysfunction defined as a MoCA score <26

Ke et al., Neurology (2024)

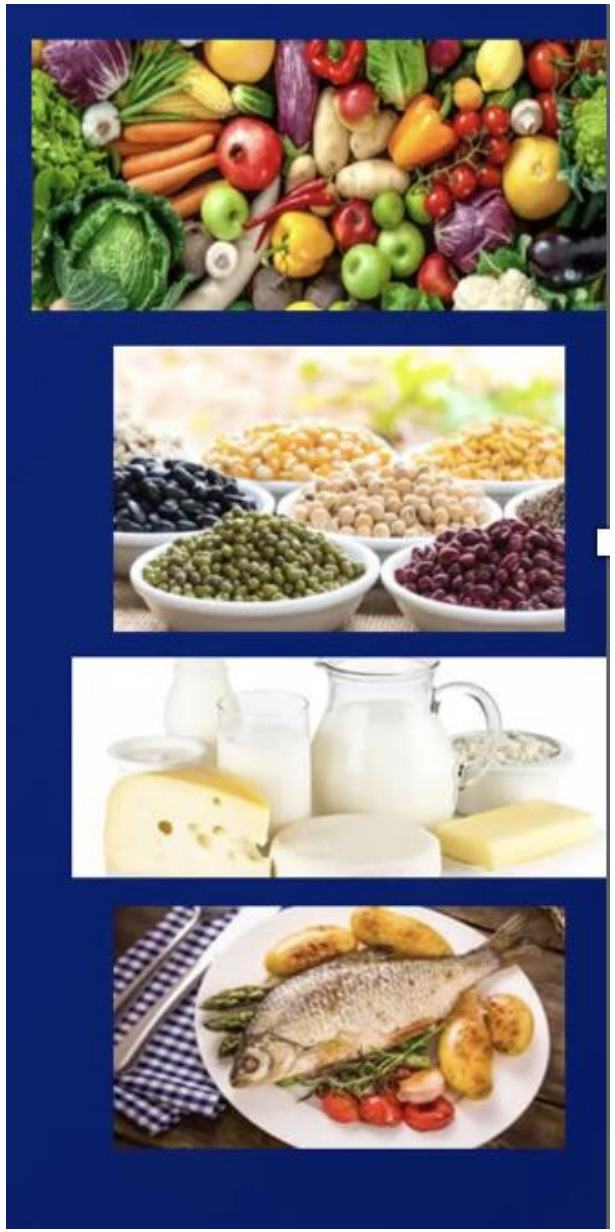
Results:

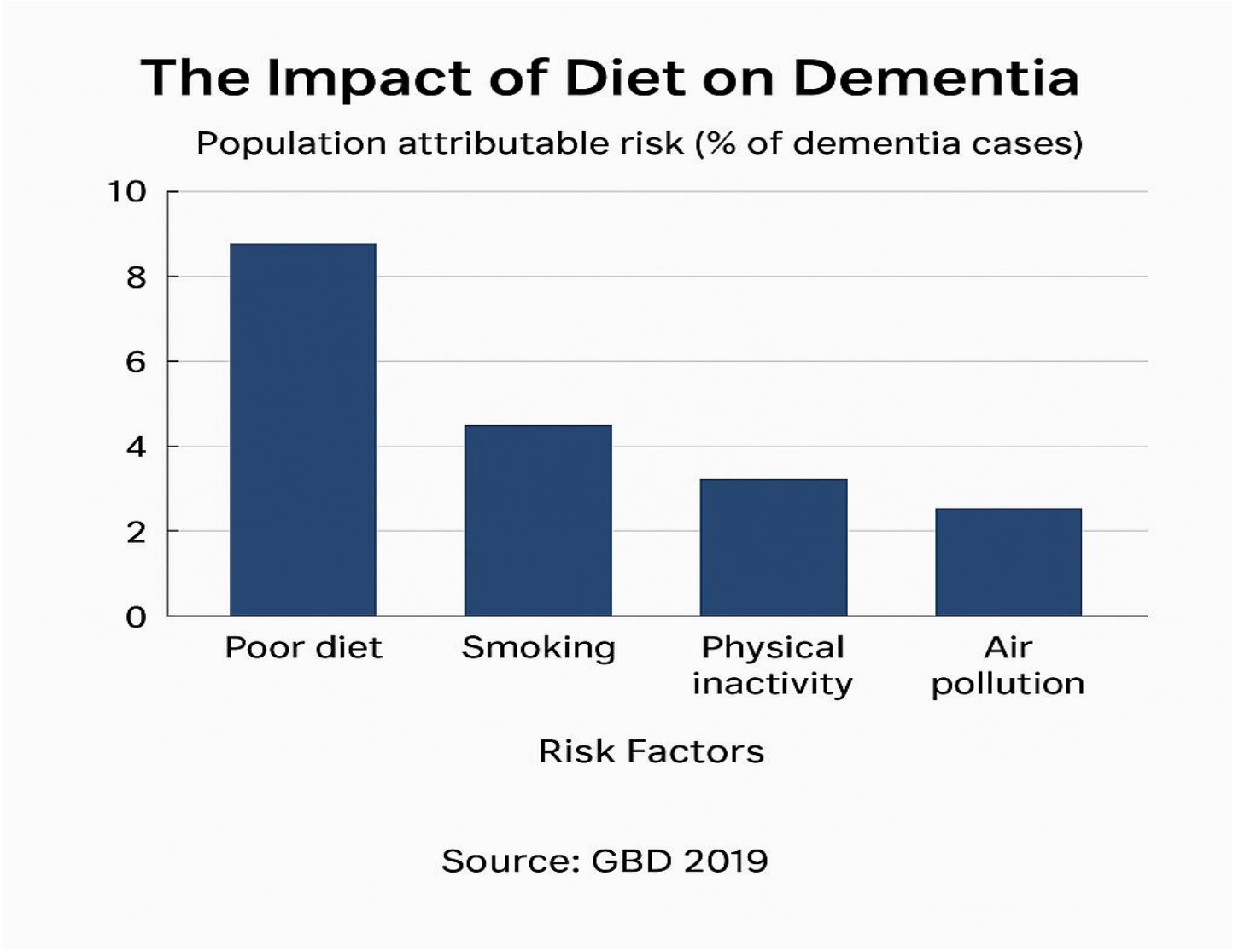
Up to **7-fold increase** in prevalence in Chinese individuals in China compared to Canada, even without stroke history



- Greater **hypertension** in China, Lower Cognitive Scores
- **Higher Prevalence** of covert brain infarcts in Chinese from China than those living in Canada
- **Unclear Causes:** Ethnic-specific behaviors, clinical risk factors, or environmental/systemic differences may drive variations

Ke et al., Neurology (2024)




The Impact of Diet on Dementia
Population attributable risk (% of dementia cases)
10
8
6
4
2
0
Poor diet
Smoking
Physical inactivity
Air pollution
Risk Factors
Source: GBD 2019

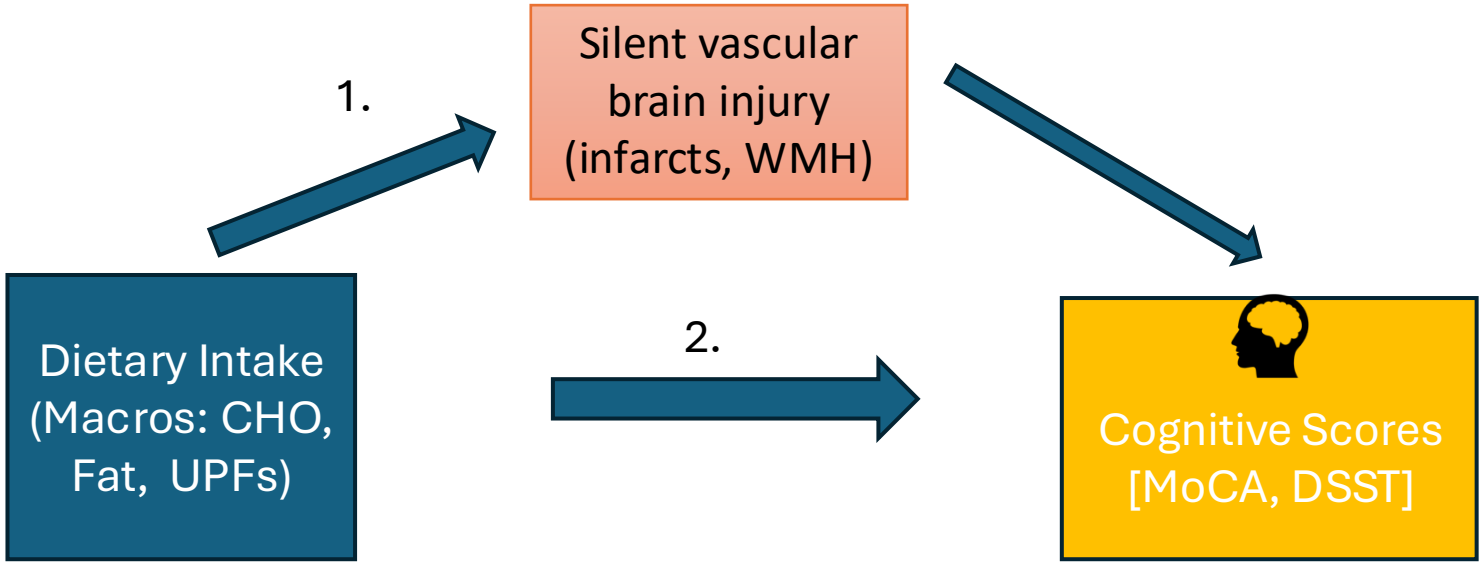
Canadian ALLIANCE for Healthy Hearts & Minds

Overview for Dietary Analyses

- Dietary Analyses from CAHHM and PURE-Mind Study
- Diet Score linked to Heart disease and Stroke, death, Cognitive Function, and dementia
- Adjusted for all other ‘confounding factors’
- Macronutrients and Cognitive Function?

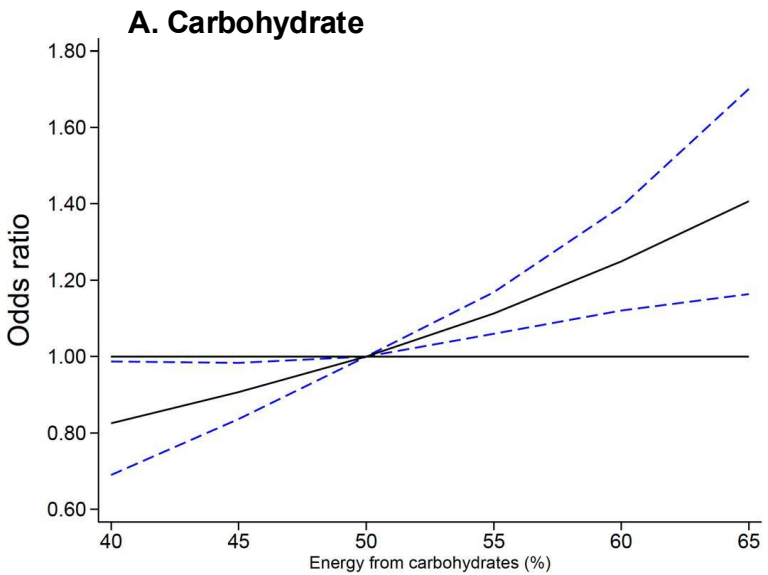
Dietary Influences

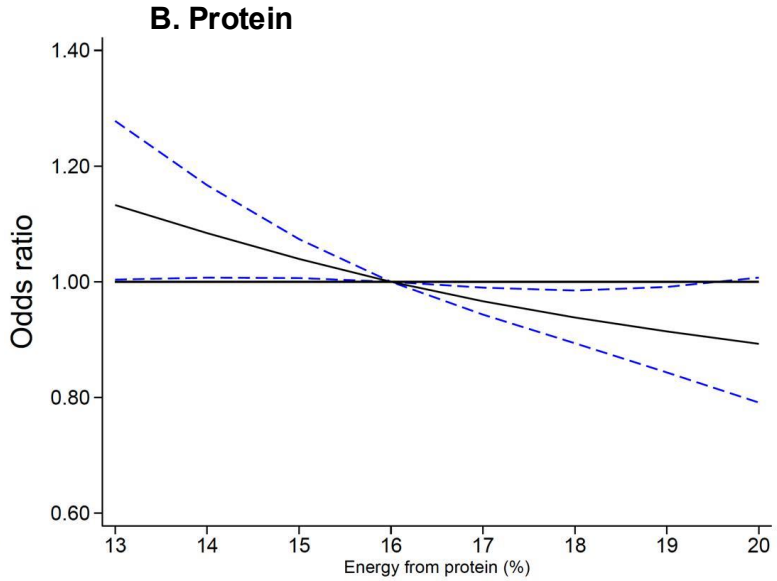
N=9,688

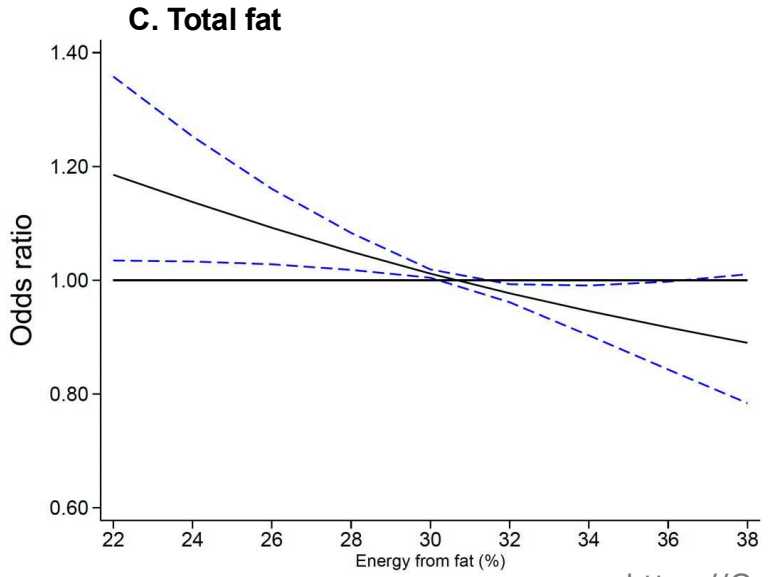


V. Miller, A. Mente, R. DeSouza *EClinicalMedicine* 86 (2025)

Association between percentage energy from macronutrients and vascular brain injury (N=9,688)



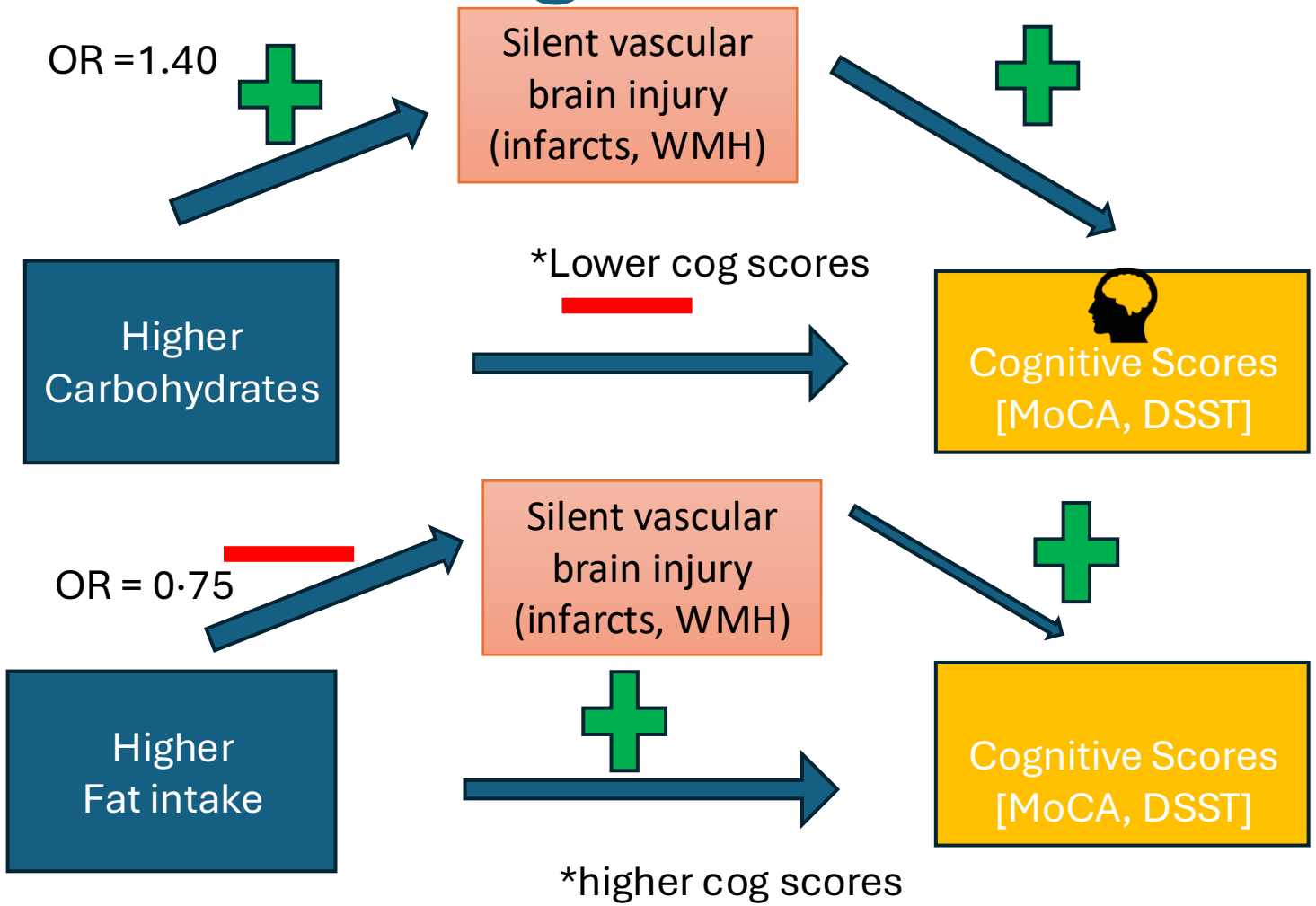




Adjusted for age, sex, center (random effect), urban/rural location, education, household income, waist-to-hip ratio, physical activity level, current smoker, history of hypertension, history of diabetes, and energy intake.

V. Miller, A. Mente, R. DeSouza *EClinicalMedicine* 86 (2025)

Dietary Influences and Cognitive Scores



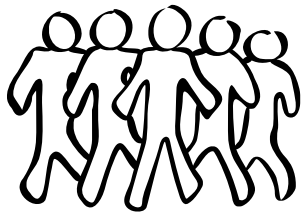
V. Miller, A. Mente, R. DeSouza E-Clinical Med 2025

Ultraprocessed foods on VBI and Cogntive Scores

PURE-MIND: Prospective Urban-Rural Epidemiologic MIND Study

Canadian ALLIANCE for Healthy Hearts & Minds

8,420 middle-aged Canadians



56% WOMEN

7.8 SERVINGS UPF/2000 KCAL/D

For every 9 servings/ per 2000 kcal

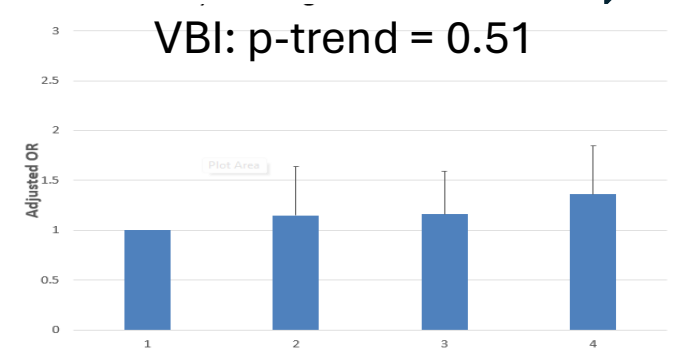
↑ % body fat: +1.7%

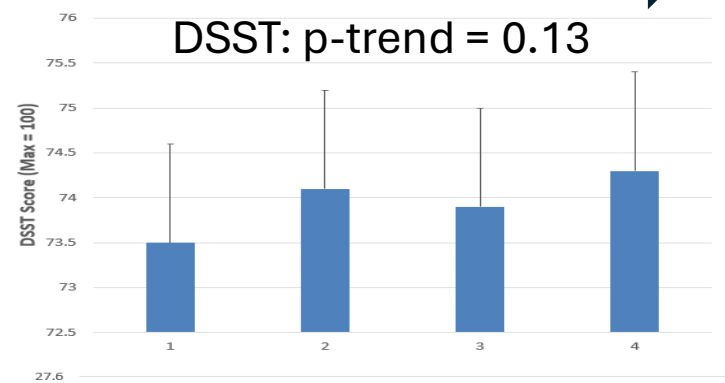
↑ Visceral fat: +6.3 mL

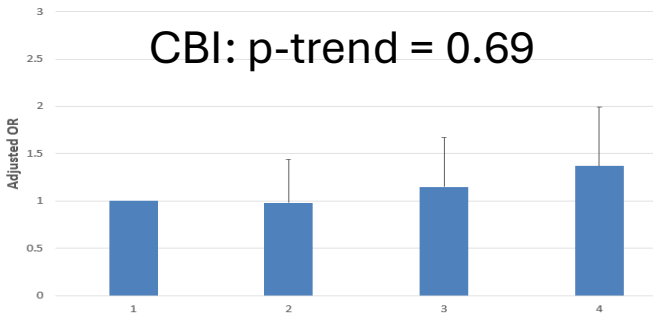
3.1 6.6 8.8 12.8

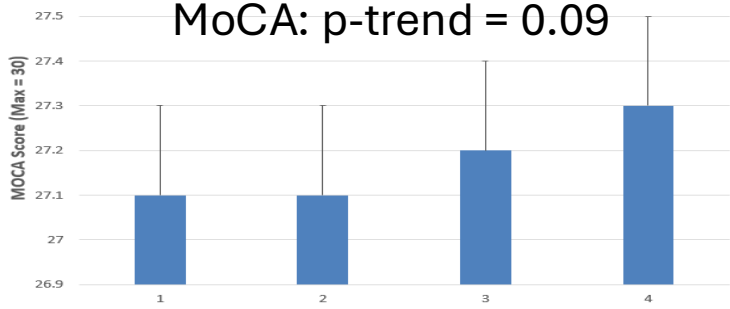
3.1 Servings per 2000 kcal 12.8

3.1 Servings per 2000 kcal 12.8









R de Souza in preparation

Association of dietary macronutrients with cognitive function in 9,886 participants

Higher carbohydrate intake is significantly associated with reduced cognitive function, and a greater odds of covert brain infarcts and high WMH.

Conversely, higher intake of total fat and individual types of fatty acids were significantly associated with higher cognitive scores and lower odds of covert brain infarcts and high WMH.

UPF associated with VAT and body fat but not cognitive scores or VBI

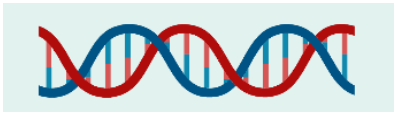
Canadian ALLIANCE for Healthy Hearts & Minds

Adjusted for sociodemographic, lifestyle factors, and health history

‘OMICS and Biomarkers– Mendelian Randomization

- To determine whether VAT-related biomarkers are **causally** related to cognitive decline

Genetic Variants impacting biomarkers levels



Circulating biomarkers related to VAT

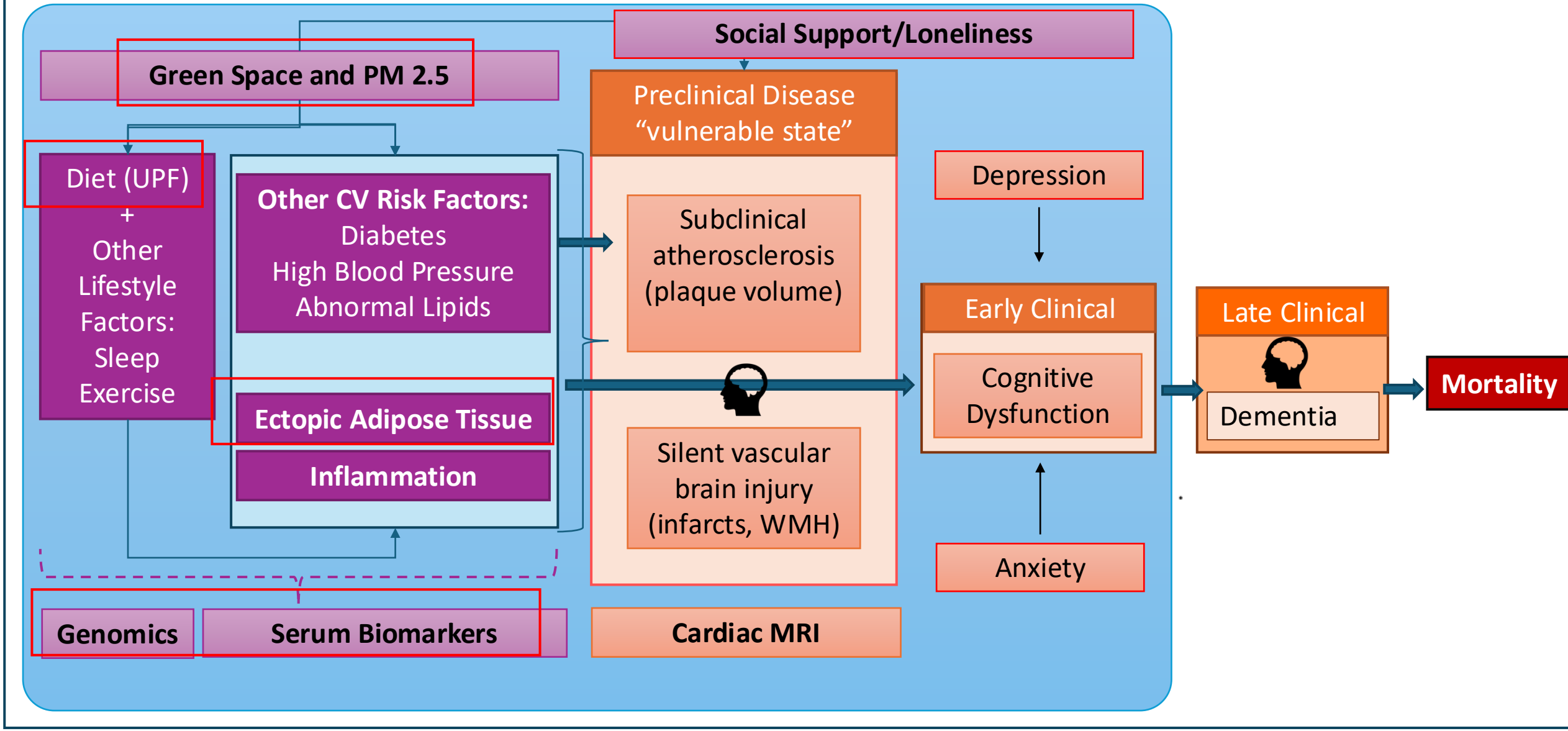
Cognitive Decline

Confounding Factors

<u>Inferential Advantages:</u>
Robust to unmeasured confounding
Robust to reverse causal mechanisms

High-throughput proteomic measures (**Olink**) in blood samples at baseline **768 circulating proteins**

Repeat Evaluation: Pathways to Cognitive Decline



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Imaging

Sonia Anand
Hamilton, ON
Epidemiology

Douglas Lee
Toronto, ON
Health Records Linkage

Corelab Leads

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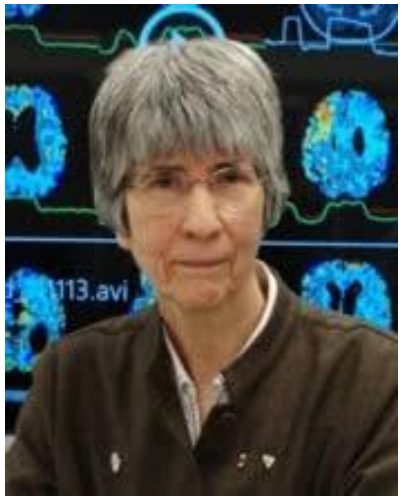
Ottawa, ON
Abdomen Corelab

Eric Smith
Calgary, AB
Brain Corelab



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Brain Corelab

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Cardiac Corelab

Alan Moody
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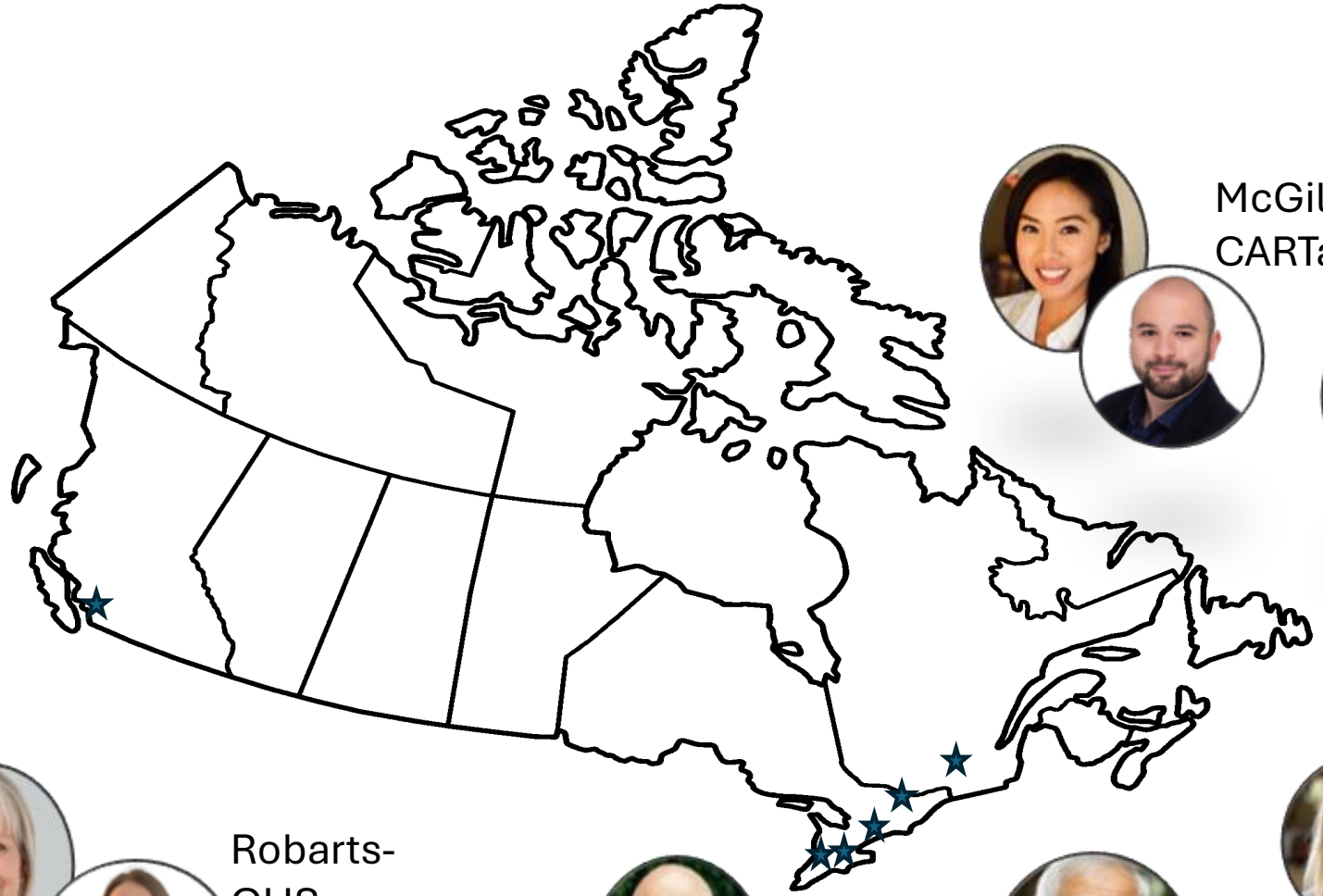
Carotid Corelab

CAHHM Recontact Sites

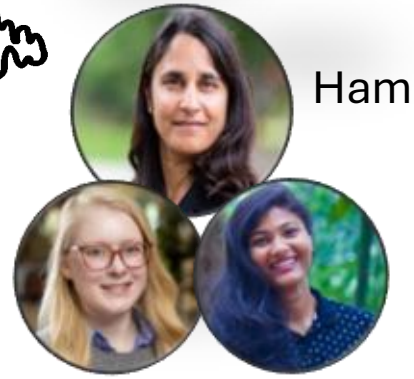


PURE BC

McGill-
CARTaGENE

Ottawa- OHS

Hamilton- OHS

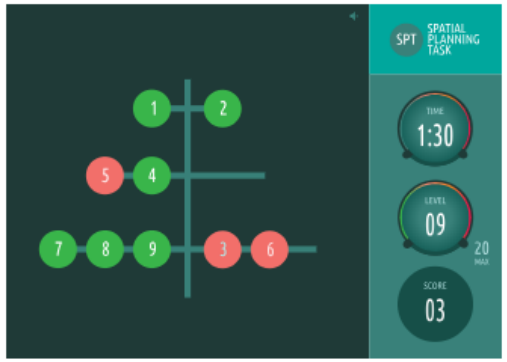


Robarts-
OHS

Sunnybrook (Chinese
Cohort and OHS)

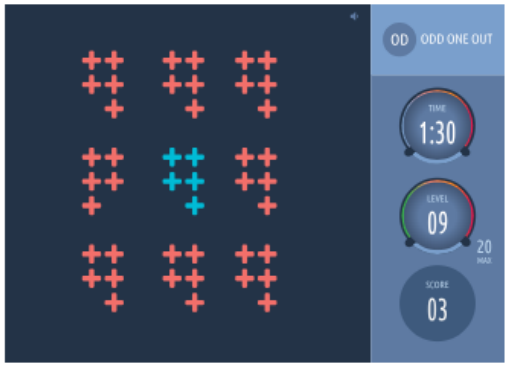
PURE Hamilton

Creyos
CAHHM Cognitive Tasks



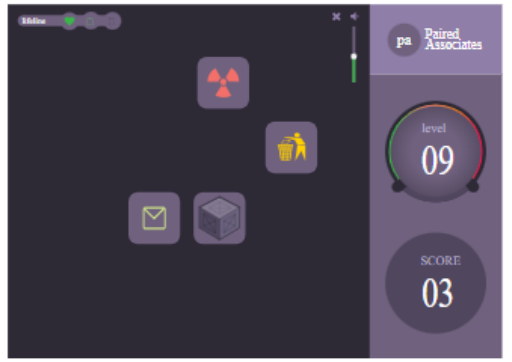
SPATIAL PLANNING

A planning task.



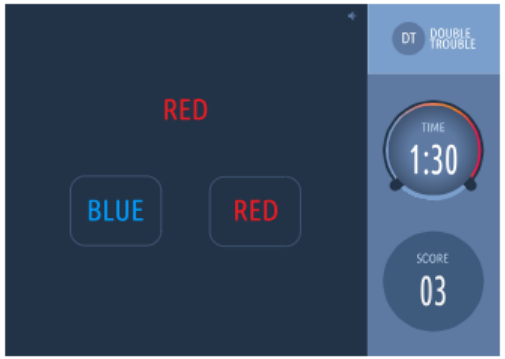
ODD ONE OUT

A deductive reasoning task.



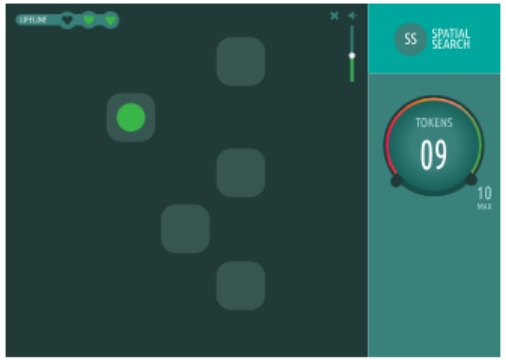
PAIRED ASSOCIATES

An episodic memory task.



DOUBLE TROUBLE

A Stroop task to assess response inhibition.



TOKEN SEARCH

A working memory task.

POLYGONS

A visuospatial processing task.

Canadian ALLIANCE for Healthy Hearts & Minds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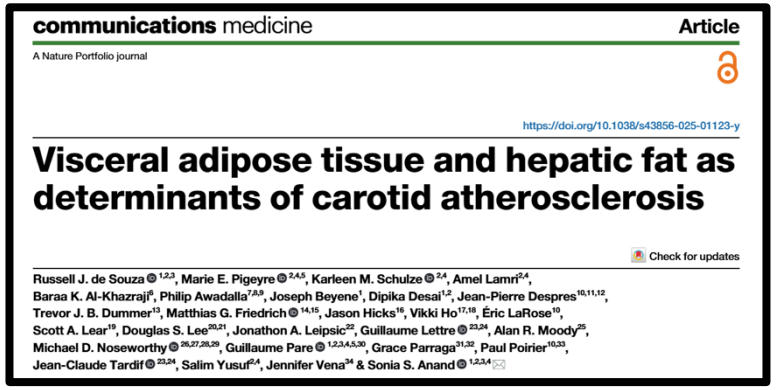
Association of dietary macronutrients with MRI-detected vascular brain injury and cognition in 9886 middle-aged participants from four countries: for the Canadian Alliance of Healthy Hearts and Minds (CAHHM) and the Prospective Urban Rural Epidemiological (PURE) Study Investigators

Victoria Miller [a,b] · Eric Smith [c,d,e] · Karleen M. Schulze [a] · Dipika Desai [a] · Vikki Ho [f,g] · Trevor J.B. Dummer [h] · et al. Show more


communications medicine — Article

A Nature Portfolio journal

https://doi.org/10.1038/s43856-025-01123-y

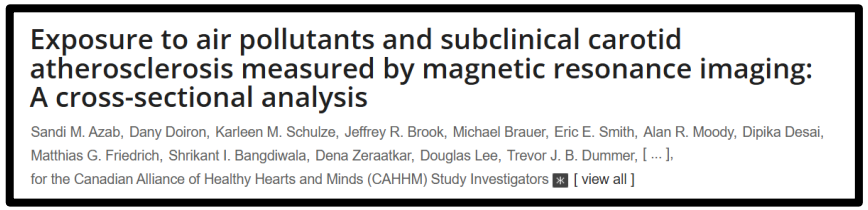
Visceral adipose tissue and hepatic fat as determinants of carotid atherosclerosis

Check for updates

Russell J. de Souza [1,2,3], Marie E. Pigeyre [2,4,5], Karleen M. Schulze [2,4], Amel Lamri [2,4], Baraa K. Al-Khazraji [6], Philip Awadalla [7,8,9], Joseph Beyene [1], Dipika Desai [1,2], Jean-Pierre Despres [10,11,12], Trevor J. B. Dummer [13], Matthias G. Friedrich [14,15], Jason Hicks [16], Vikki Ho [17,18], Éric LaRose [10], Scott A. Lear [19], Douglas S. Lee [20,21], Jonathon A. Leipsic [22], Guillaume Lettre [23,24], Alan R. Moody [25], Michael D. Noseworthy [26,27,28,29], Guillaume Pare [1,2,3,4,5,30], Grace Parraga [31,32], Paul Poirier [10,33], Jean-Claude Tardif [23,24], Salim Yusuf [2,4], Jennifer Vena [34] & Sonia S. Anand [1,2,3,4]

Total Publications: 21

Publications in 2025: 4


Exposure to air pollutants and subclinical carotid atherosclerosis measured by magnetic resonance imaging: A cross-sectional analysis

Sandi M. Azab, Dany Doiron, Karleen M. Schulze, Jeffrey R. Brook, Michael Brauer, Eric E. Smith, Alan R. Moody, Dipika Desai, Matthias G. Friedrich, Shrikant I. Bangdiwala, Dena Zeraatkar, Douglas Lee, Trevor J. B. Dummer, [...], for the Canadian Alliance of Healthy Hearts and Minds (CAHHM) Study Investigators [view all]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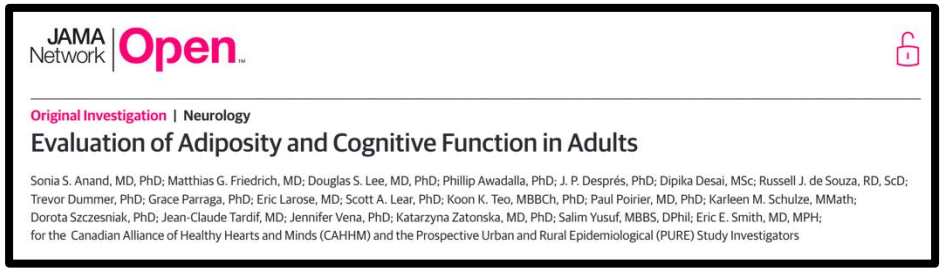
RESEARCH ARTICLE | January 9, 2025 — Check for updates

Covert Vascular Brain Injury and Cognitive Dysfunction Among Chinese Adults Living in Canada and China

The CAHHM and PURE-MIND Studies

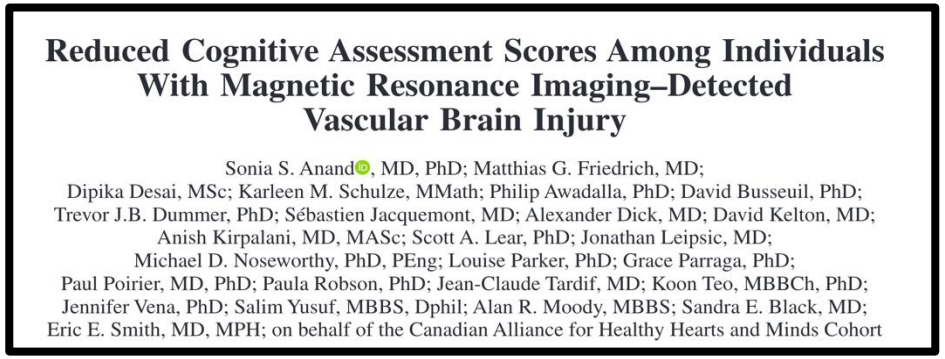
Calvin Ke, Sonia S. Anand, Eric E. Smith, Karleen M. Schulze, Alan Moody, Scott Lear, Paul Poirier, ... SHOW ALL ... as the Canadian Alliance of Healthy Hearts and Minds (CAHHM) and the Prospective Urban Rural Epidemiological (PURE) Study Investigators | AUTHORS INFO & AFFILIATIONS


JAMA Network | Open

Original Investigation | Neurology

Evaluation of Adiposity and Cognitive Function in Adults

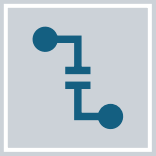
Sonia S. Anand, MD, PhD; Matthias G. Friedrich, MD; Douglas S. Lee, MD, PhD; Phillip Awadalla, PhD; J. P. Després, PhD; Dipika Desai, MSc; Russell J. de Souza, RD, ScD; Trevor Dummer, PhD; Grace Parraga, PhD; Eric Larose, MD; Scott A. Lear, PhD; Koon K. Teo, MBBCh, PhD; Paul Poirier, MD, PhD; Karleen M. Schulze, MMath; Dorota Szczesniak, PhD; Jean-Claude Tardif, MD; Jennifer Vena, PhD; Katarzyna Zatonska, MD, PhD; Salim Yusuf, MBBS, DPhil; Eric E. Smith, MD, MPH; for the Canadian Alliance of Healthy Hearts and Minds (CAHHM) and the Prospective Urban and Rural Epidemiological (PURE) Study Investigators


Reduced Cognitive Assessment Scores Among Individuals With Magnetic Resonance Imaging–Detected Vascular Brain Injury

Sonia S. Anand, MD, PhD; Matthias G. Friedrich, MD; Dipika Desai, MSc; Karleen M. Schulze, MMath; Philip Awadalla, PhD; David Busseuil, PhD; Trevor J.B. Dummer, PhD; Sébastien Jacquemont, MD; Alexander Dick, MD; David Kelton, MD; Anish Kirpalani, MD, MASc; Scott A. Lear, PhD; Jonathan Leipsic, MD; Michael D. Noseworthy, PhD, PEng; Louise Parker, PhD; Grace Parraga, PhD; Paul Poirier, MD, PhD; Paula Robson, PhD; Jean-Claude Tardif, MD; Koon Teo, MBBCh, PhD; Jennifer Vena, PhD; Salim Yusuf, MBBS, Dphil; Alan R. Moody, MBBS; Sandra E. Black, MD; Eric E. Smith, MD, MPH; on behalf of the Canadian Alliance for Healthy Hearts and Minds Cohort

Physical Activity and Improved Cognitive Scores

Association Between Physical Activity and Cognitive Function: A study published in *Scientific Reports* analyzed data from the UK Biobank found higher levels of accelerometer-measured physical activity were associated with better cognitive performance.

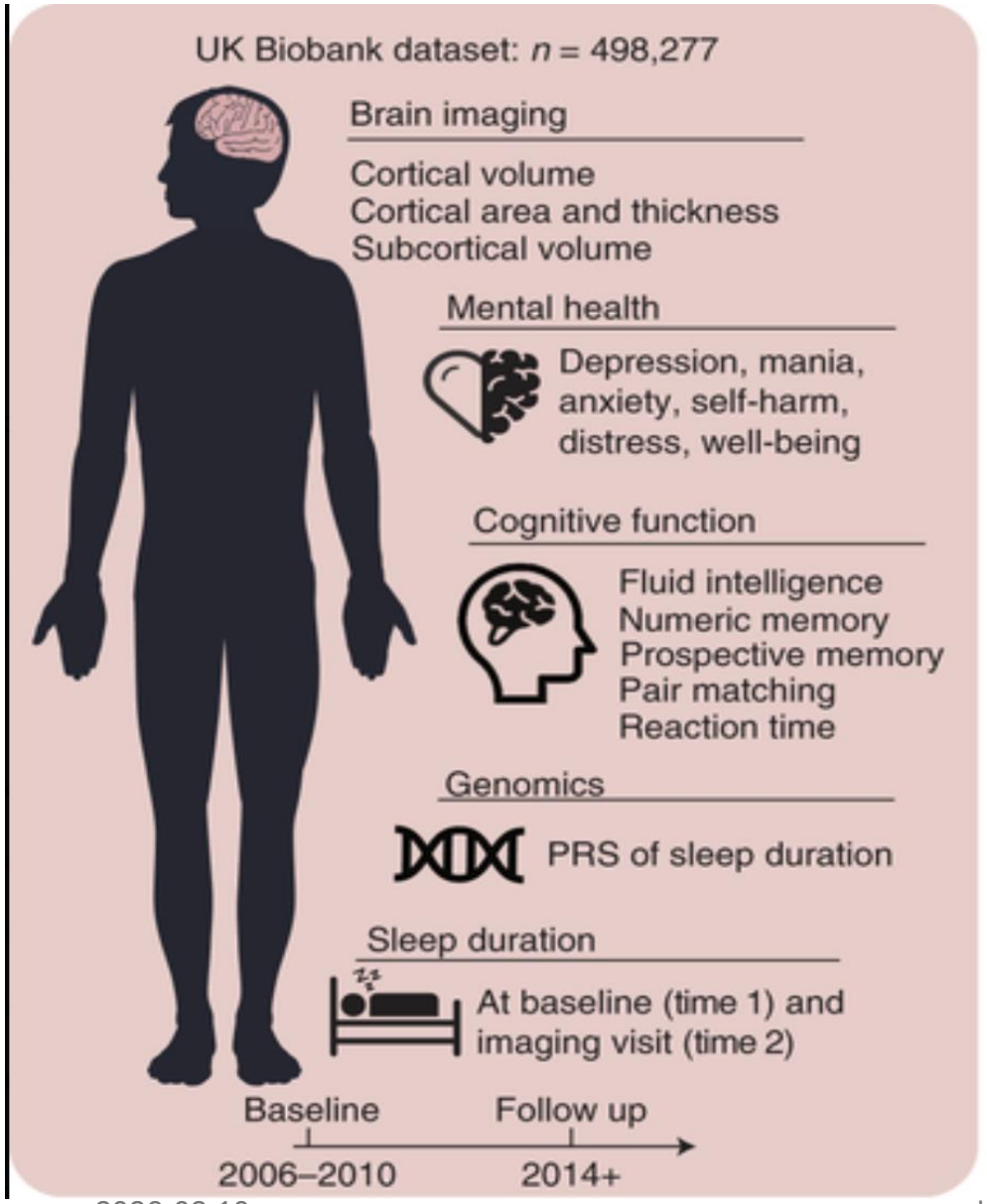


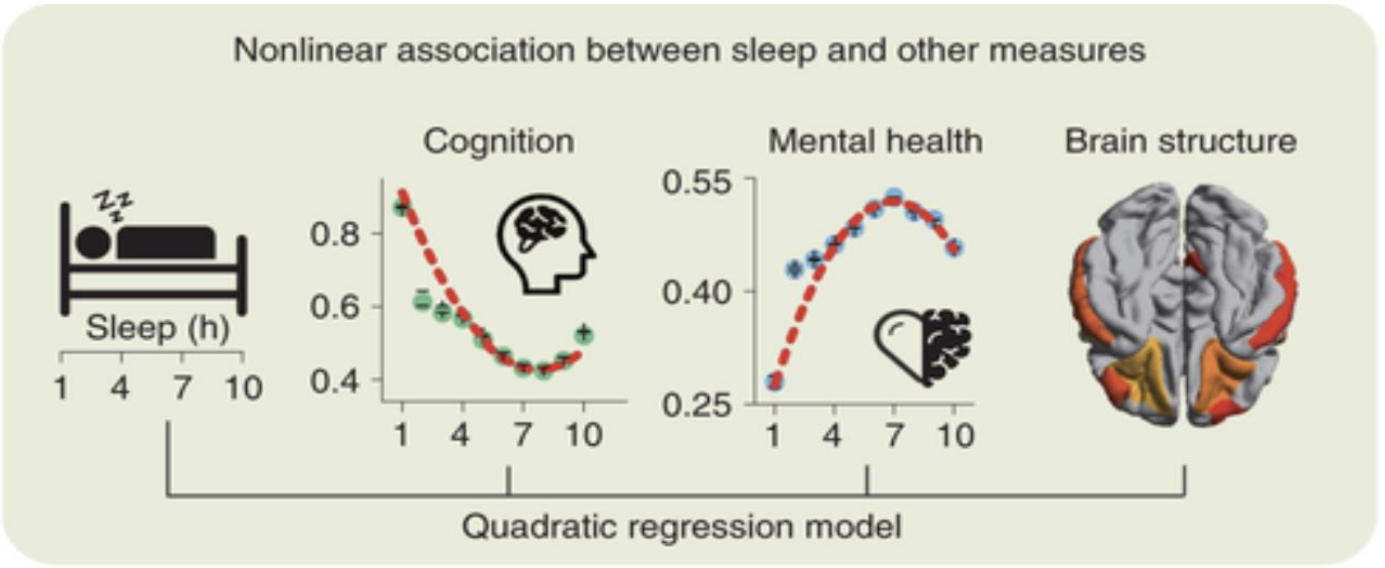
Mendelian randomization to assess the causal relationship, suggesting that increased physical activity may lead to improved cognitive function.

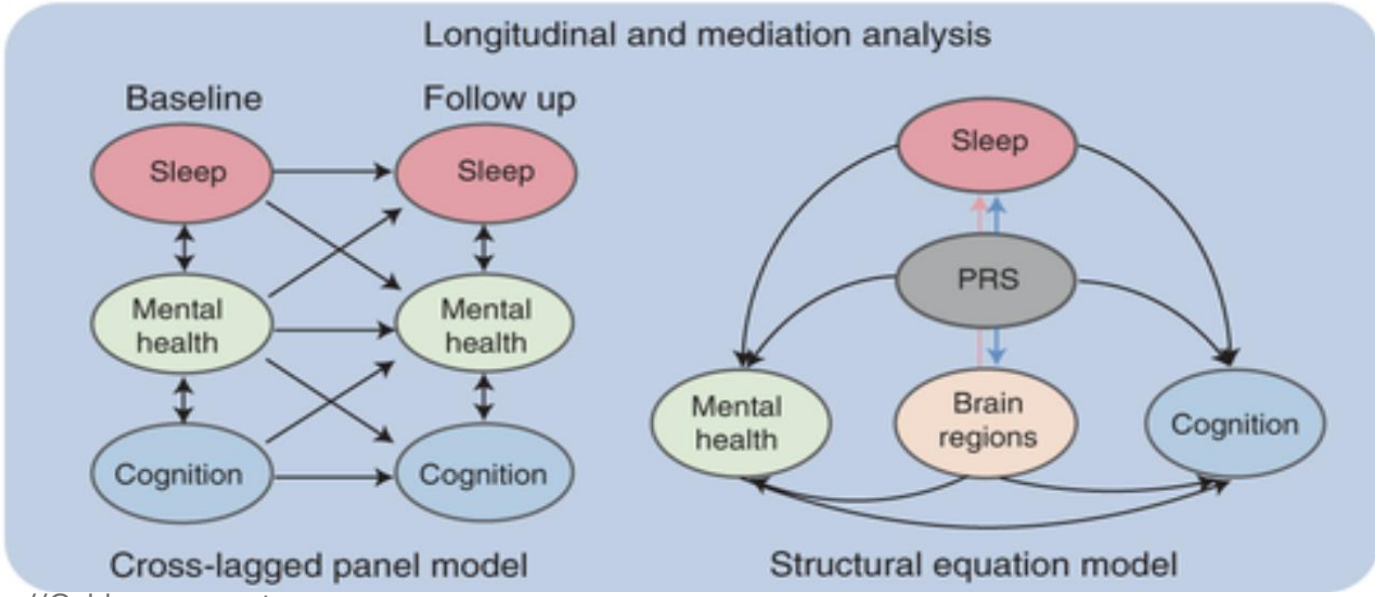
Combination of seven-hour/day sleep, moderate-to-high LTPA, and low-to-moderate sedentary behavior showed the lowest dementia risk (0.59[0.50–0.69]) compared to the ref group (longer or shorter sleep/low LTPA/high sedentary behavior).

Scientific Reports; and *Molecular Psychiatry* **volume 27**, pages 4343–4354 (2022).

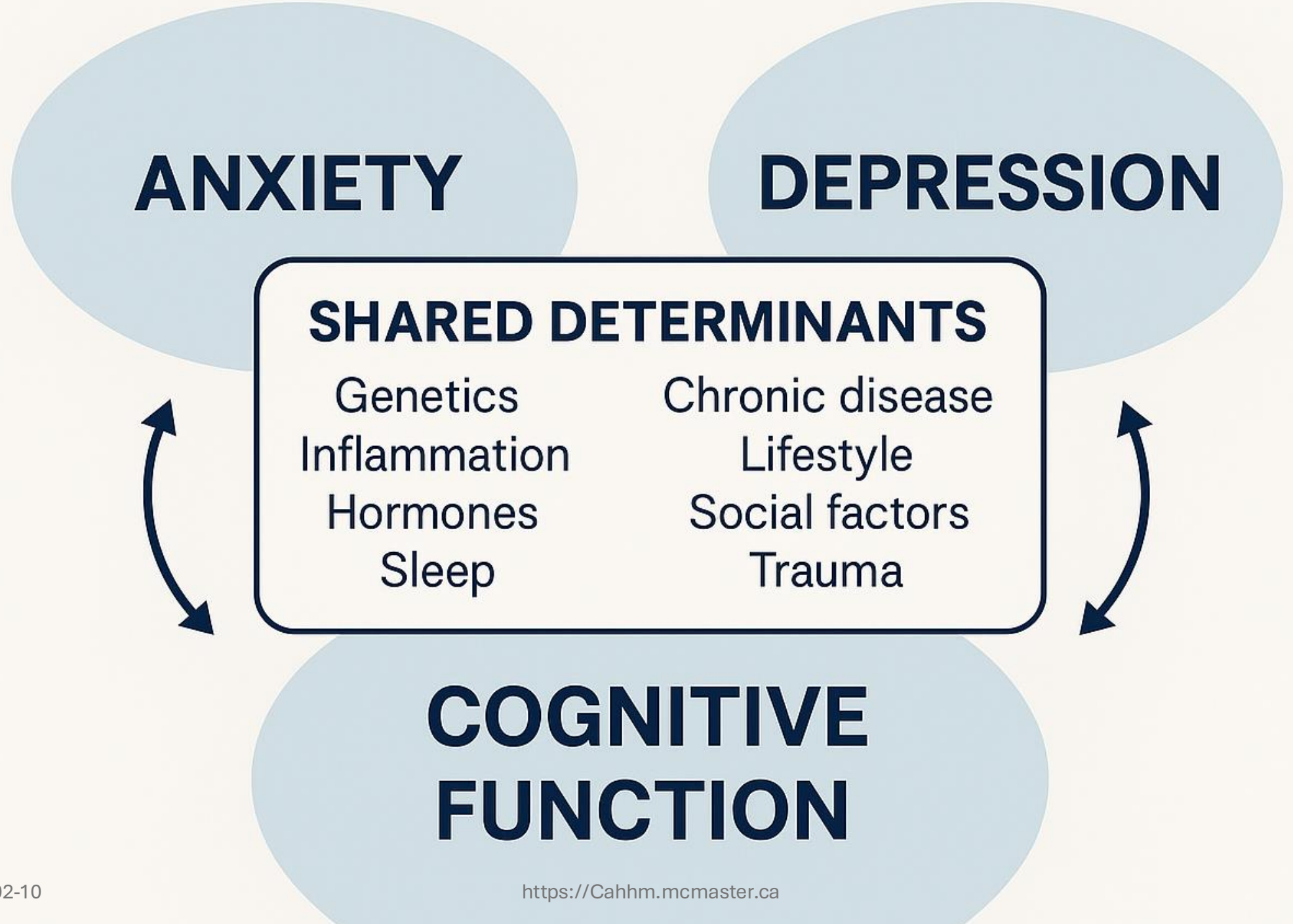
Sleep and Cognitive Scores – 7 hours is optimal







Nature Aging 2022


ANXIETY
DEPRESSION
SHARED DETERMINANTS
Genetics
Inflammation
Hormones
Sleep
Chronic disease
Lifestyle
Social factors
Trauma
COGNITIVE FUNCTION

Key Messages

1) CAHHM is a large cross- section of men and women across Canada which has already produced significant insights into subclinical ASCVD and VAT

2) On going follow-up with new cognitive function measures and MRI will enable study of causes of cognitive decline

3) Broad determinants of health such as air pollution, green space and dietary intake

4) OMIC evaluations and Imaging biomarkers

5) Opportunities for ML/AI analyses

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

McMaster University

Mary Heersink School of Global Health & Social Medicine

Hamilton Health Sciences

HEART & STROKE FOUNDATION

Population Health Research Institute
HEALTH THROUGH KNOWLEDGE

PURE

Canadian ALLIANCE for Healthy Hearts & Minds

Who Thrives in Canada? Results from CAHHM

Population

Canadian Alliance of Healthy Hearts and Minds (CAHHM)

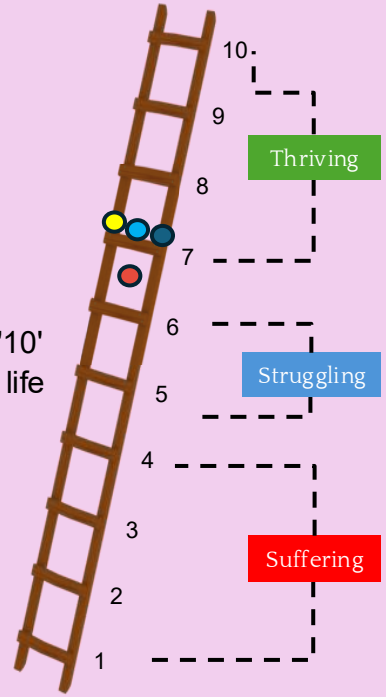
N=8063
1496 Racialized Persons
2142 Immigrants

Life Satisfaction

Primary Outcome:
Life Satisfaction

Measure:
Cantril Ladder

Cantril Ladder:
'1' indicating the worst and '10' indicating the best possible life

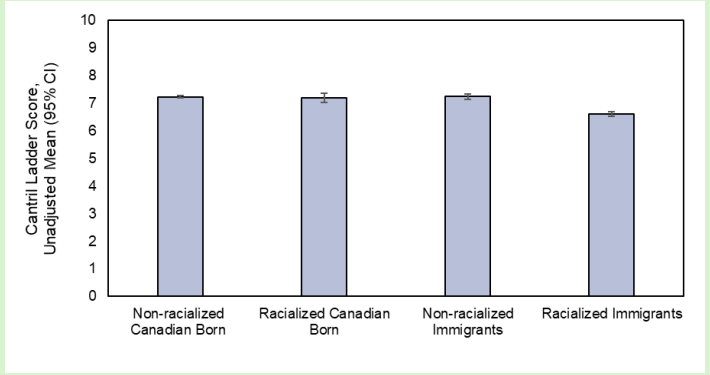


Average Life Satisfaction Scores*	
Non-Racialized Canadian Born	
Racialized Canadian Born	
Non-Racialized Immigrants	
Racialized Immigrants	

**adjusted for years in Canada*

Life Satisfaction in the CAHHM Cohort

Racialized Immigrants have the **lowest** life satisfaction scores



**P for differences between groups <0.0001*

Factors Associated with Life Satisfaction in the CAHHM Cohort

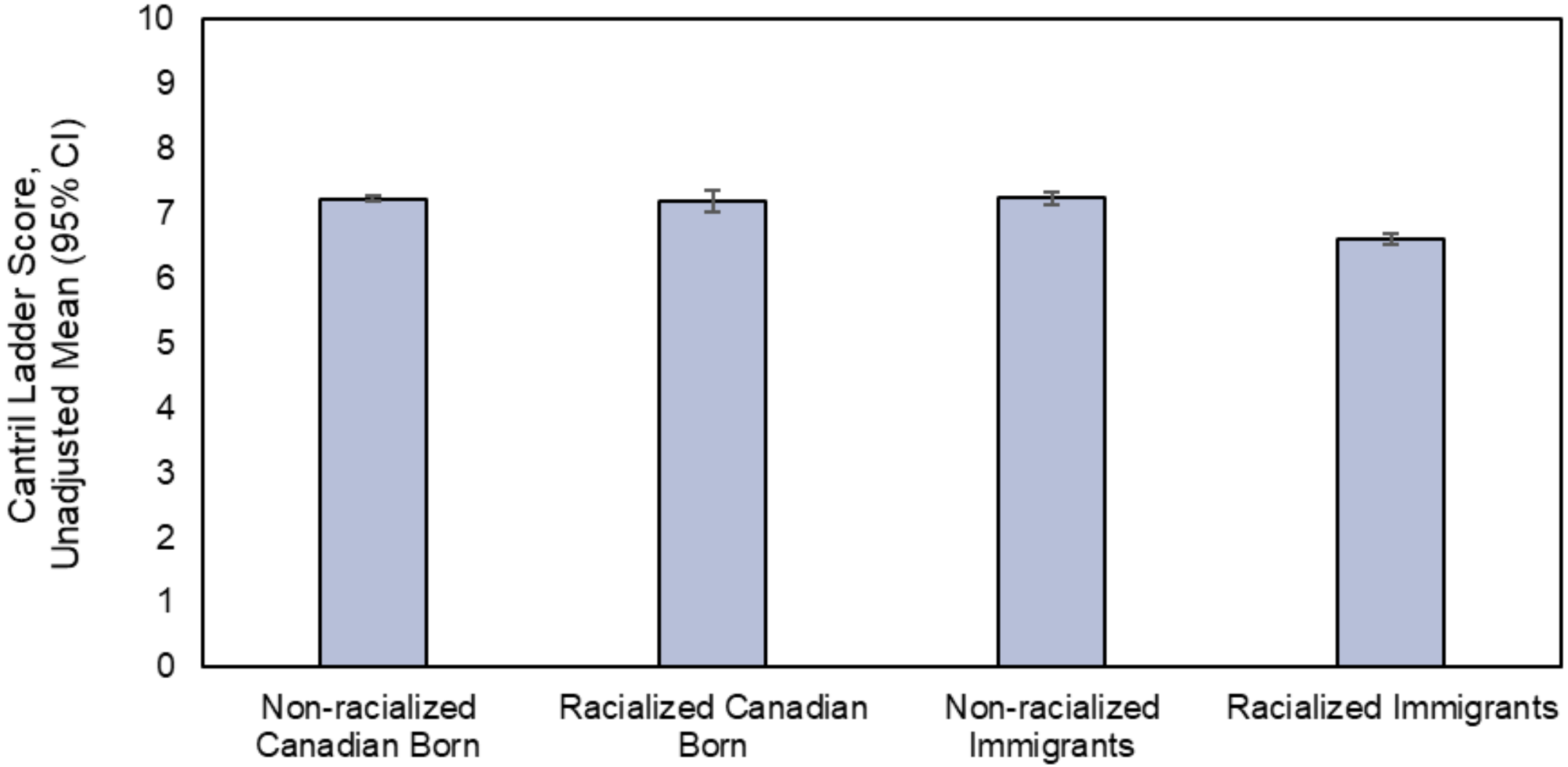
Higher Life Satisfaction	Lower Life Satisfaction
Having Trusted Neighbours	Unable to Afford Prescription Medications
Language Concordant Family Doctor	High Social Disadvantage
Neighbours Work Together	Racialized Immigrant
Neighbours are Willing to Help	Female
Age Increase by 10 Years	Higher Cardiovascular Risk Factor Burden
	Visited ER in Last 12 Months

Key Takeaway Message

Opportunities to advance in Canadian society are enhanced by having trusted neighbours and access to primary healthcare, and it is more challenging for women, those with higher social disadvantage, and racialized immigrants. Being unable to afford prescription medications, needing to visit an emergency room, and having more cardiovascular risk factors impedes life satisfaction in Canada.

Continued work to mitigate structural barriers in healthcare access, income inequality, and racism is required to provide more equal opportunity for all Canadians.

Anand SS et al PLOS Global Public Health, 2025

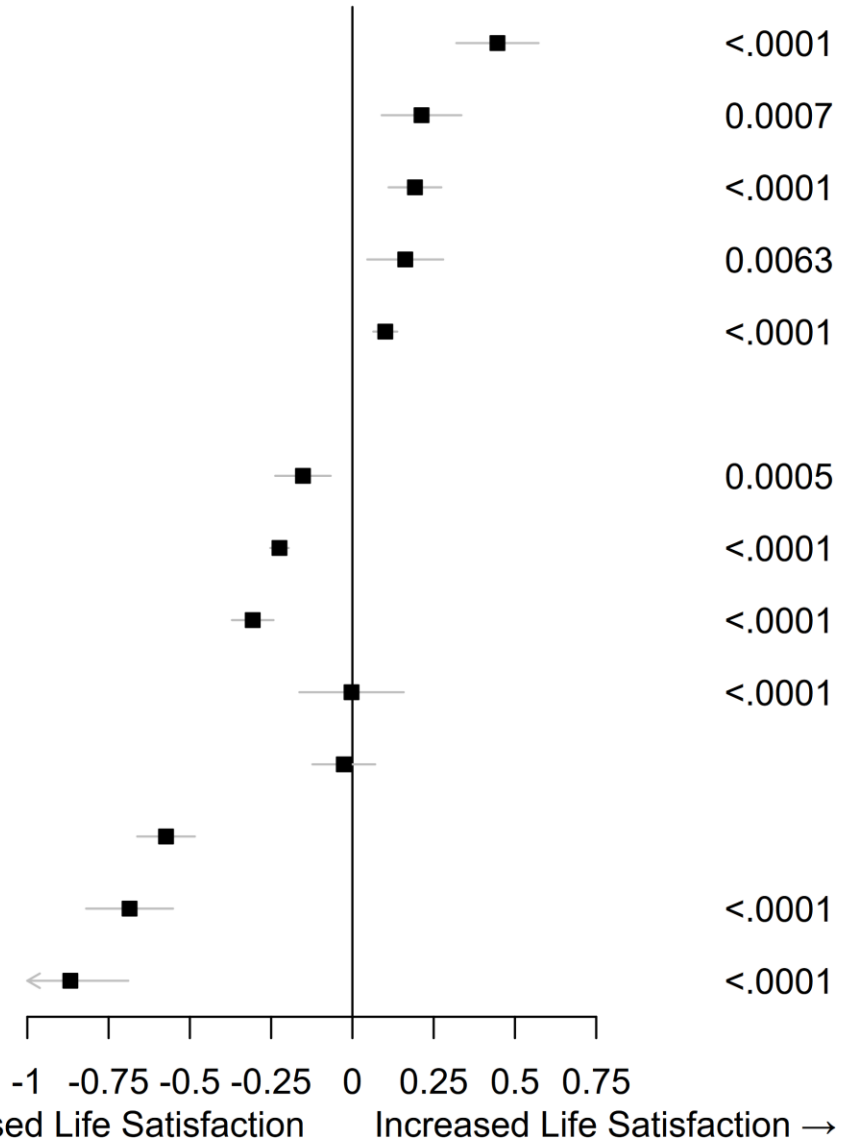


Anand SS et al PLOS Global Public Health, 2025

Factors Influencing Life Satisfaction

Overall Sample

Positive Factors:		
I can trust my neighbours	0.45 (0.32,0.57)	<.0001
Have primary care provider that speaks same language	0.21 (0.09,0.34)	0.0007
If a problem, neighbours work together	0.19 (0.11,0.27)	<.0001
Neighbours willing to help	0.16 (0.05,0.28)	0.0063
Age, by 10 years	0.10 (0.06,0.14)	<.0001
Negative Factors:		
In the past year, attend a hospital Emergency Department for care?	-0.15 (-0.24,-0.07)	0.0005
IHRS, by 5 point	-0.22 (-0.25,-0.20)	<.0001
Female	-0.31 (-0.37,-0.24)	<.0001
Racialized Canadian born (vs. Non-racialized Canadian born)	-0.00 (-0.16,0.16)	<.0001
Non-racialized immigrants (vs. Non-racialized Canadian born)	-0.03 (-0.12,0.07)	
Racialized immigrants (vs. Non-racialized Canadian born)	-0.57 (-0.66,-0.48)	
High social disadvantage	-0.69 (-0.82,-0.55)	<.0001
Did not fill a presciption for medication due to cost?	-0.87 (-1.05,-0.69)	<.0001



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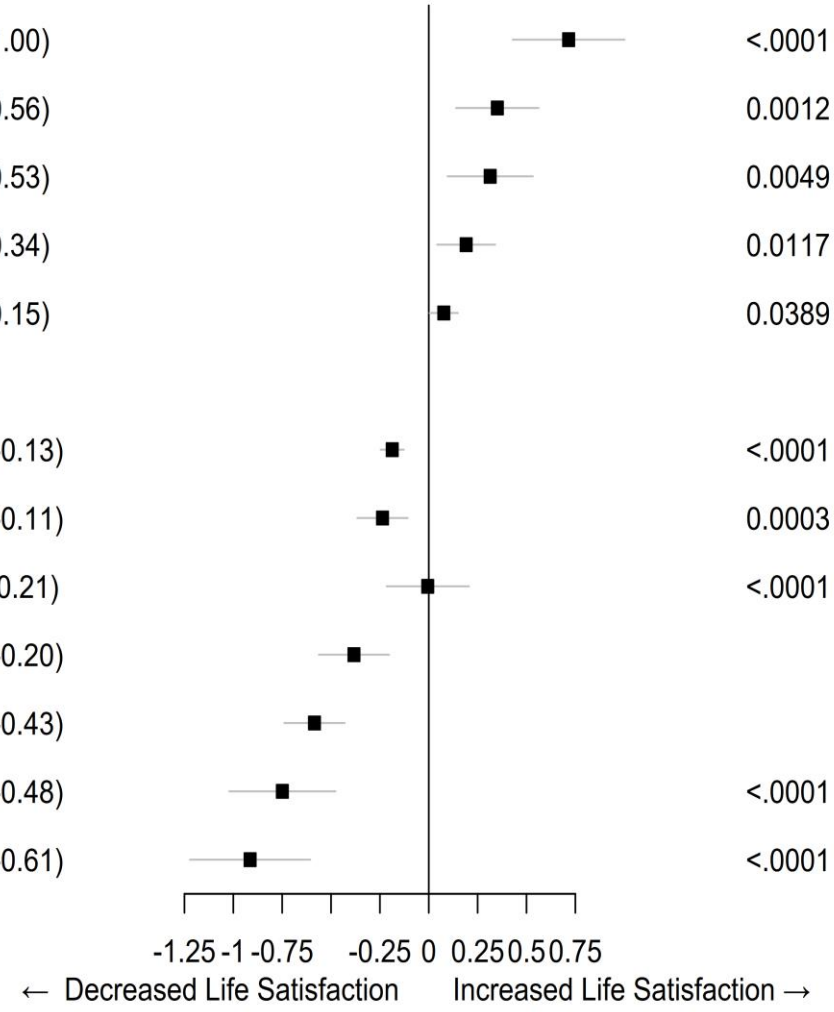
Factors Influencing Life Satisfaction Amongst Immigrants

Positive Factors:		
Years in Canada >=10	0.72 (0.43,1.00)	<.0001
Have primary care provider that speaks same language	0.35 (0.14,0.56)	0.0012
I can trust my neighbours	0.31 (0.10,0.53)	0.0049
If a problem, neighbours work together	0.19 (0.04,0.34)	0.0117
Age, by 10 years	0.08 (0.00,0.15)	0.0389
Negative Factors:		
IHRS, by 5 point	-0.19 (-0.25,-0.13)	<.0001
Female	-0.24 (-0.37,-0.11)	0.0003
Non-racialized experiencing discrimination (vs Non-racialized not experiencing discrimitation)	-0.01 (-0.22,0.21)	<.0001
Racialized not experiencing discrimination (vs Non-racialized not experiencing discrimitation)	-0.38 (-0.56,-0.20)	
Racialized experiencing discrimination (vs Non-racialized not experiencing discrimitation)	-0.58 (-0.74,-0.43)	
High social disadvantage	-0.75 (-1.02,-0.48)	<.0001
Did not fill a presciption for medication due to cost?	-0.91 (-1.22,-0.61)	<.0001



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