Spanning bench to behaviour: Harnessing CPTP data to understand lifestyle risks across the health spectrum

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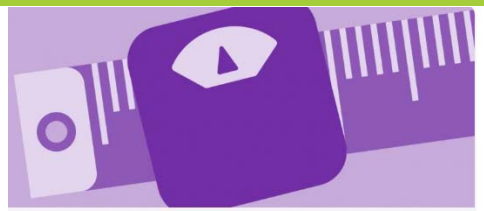
Alberta Health Services

CPTP Webinar Series
Oct. 29, 2019

Importance of lifestyle factors for cancer prevention

WCRF/AICR Third Expert Report
Diet, Nutrition, Physical Activity & Cancer



Be a healthy weight

Be physically active

Eat wholegrains, veg, fruit & beans

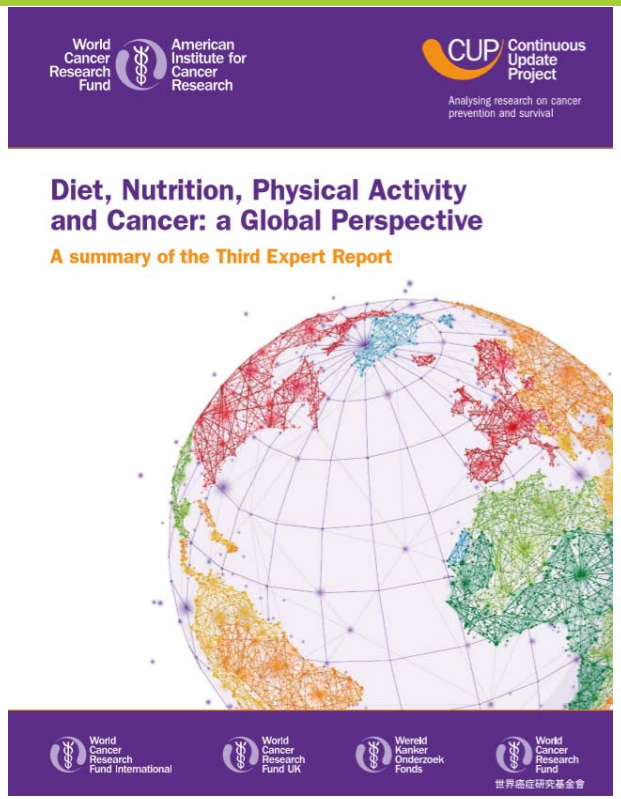
Limit "fast foods"

Limit red and processed meat

Limit sugar sweetened drinks

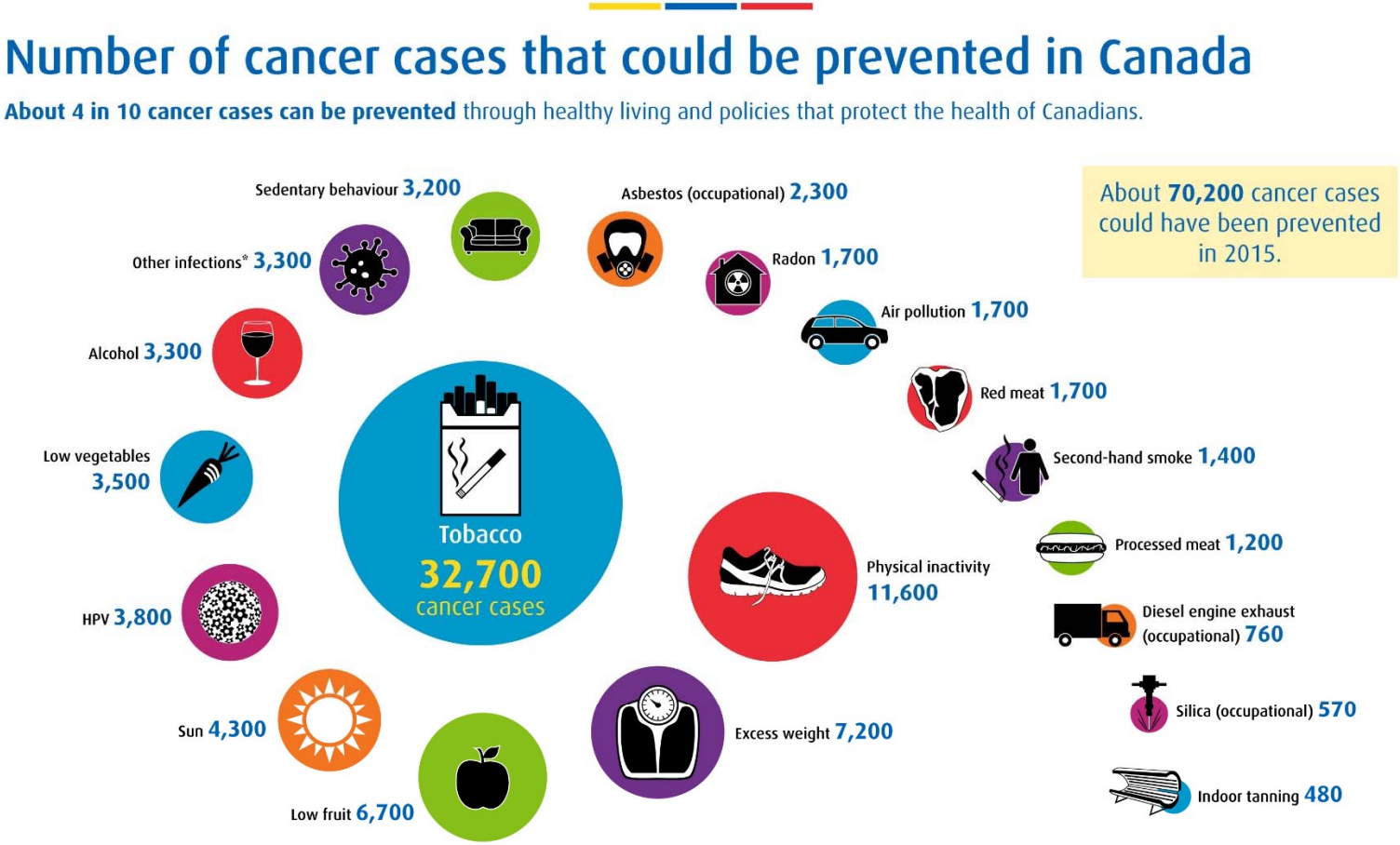
Limit alcohol consumption

Don't rely on supplements



Don’t smoke
Avoid tobacco exposure
Avoid excess sun exposure
Avoid specific chronic infections (HPV, HBV, H. Pylori)

COMPARE Study

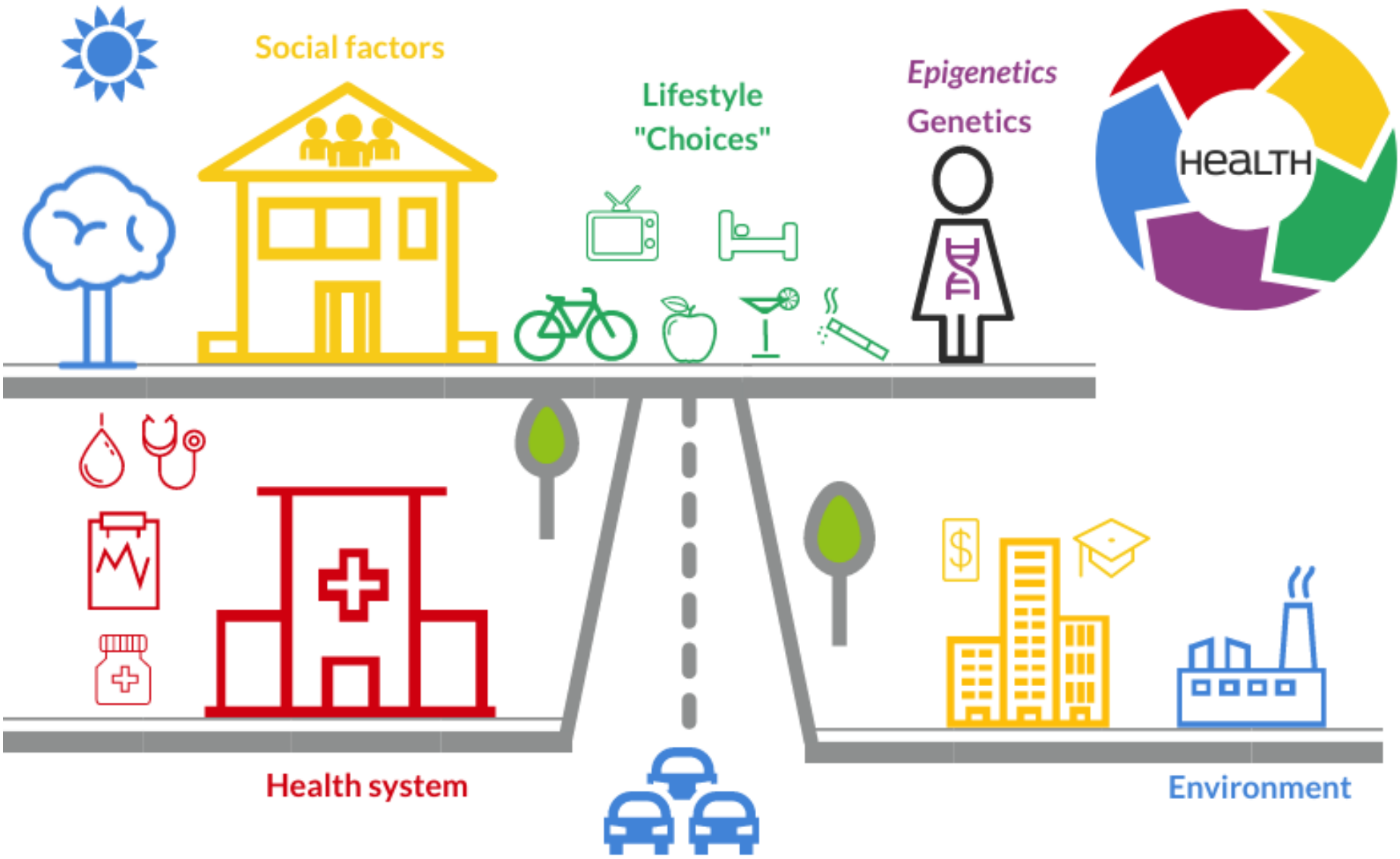


Prevention vs. Risk Reduction

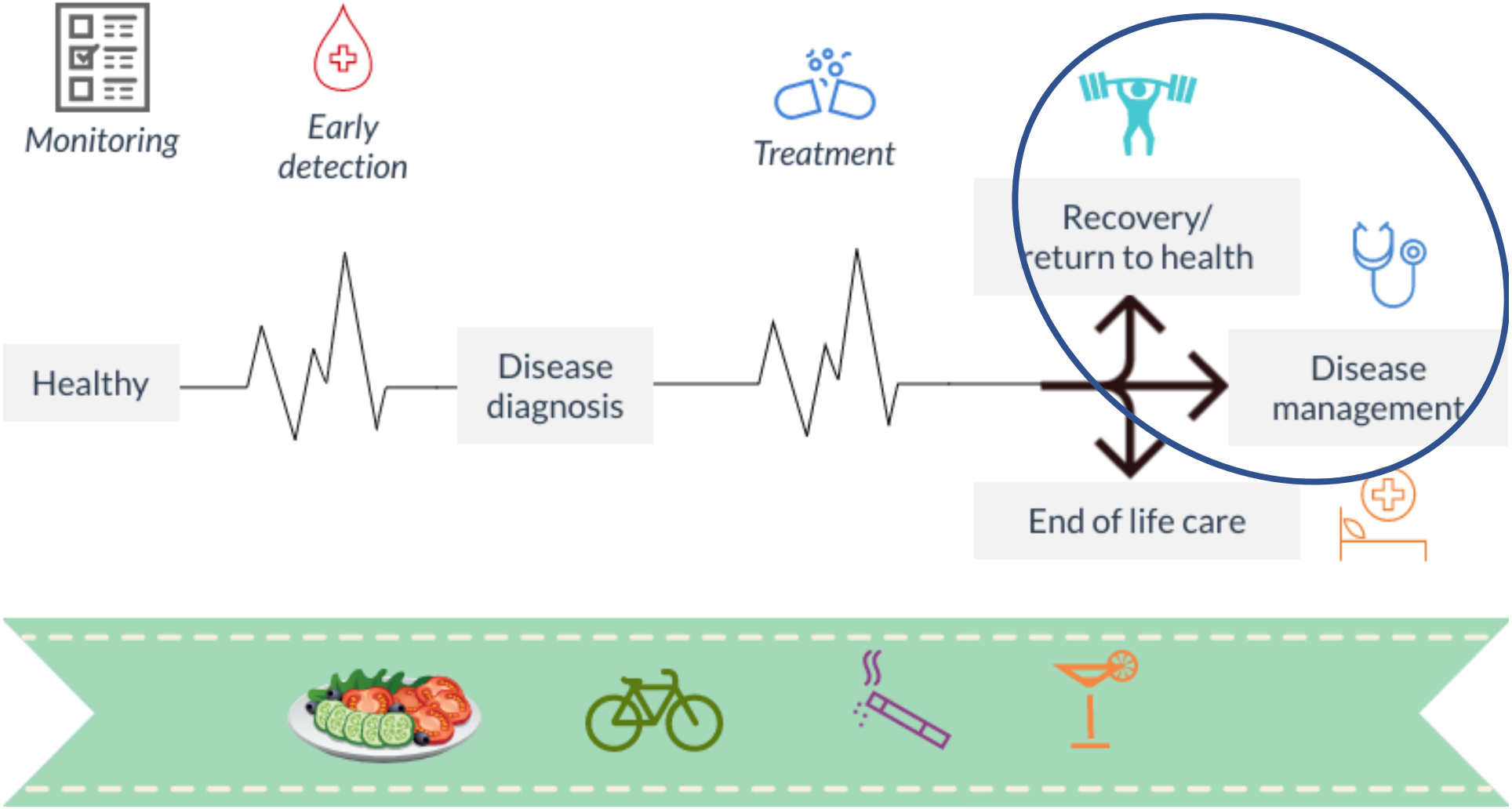
- We tend to use the term ‘prevention’
- More accurately, we are talking about ‘risk reduction’
- “The goal of the Recommendations is to help people make healthy choices in their daily lives to reduce the risk of cancer and other non-communicable diseases”

Understanding risk is complex

Exposures (life) is complex

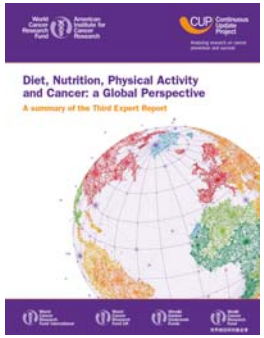


Lifestyle behaviours are important across the health spectrum

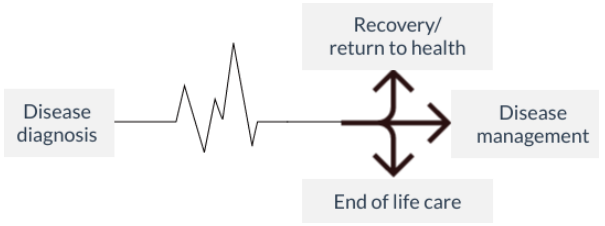


WCRF/AICR Third Expert Report
Areas where research is needed

- Impact of diet & physical activity throughout the life course on cancer risk
  - Intentional & unintentional changes throughout life (e.g. weight, body composition)
- Better characterization of diet, body composition & physical activity exposures
  - Difficult to measure accurately & precisely, need longitudinal data
  - Explore more holistic approaches & biomarkers



- Better characterization of cancer-related outcomes
  - Specific cancer features, treatment selection/response
  - Also non-cancer outcomes, due to long-term survival
- Stronger evidence for the impact of diet & physical activity on outcomes in cancer survivors
  - Also interaction with genetic, epigenetic & hormonal factors



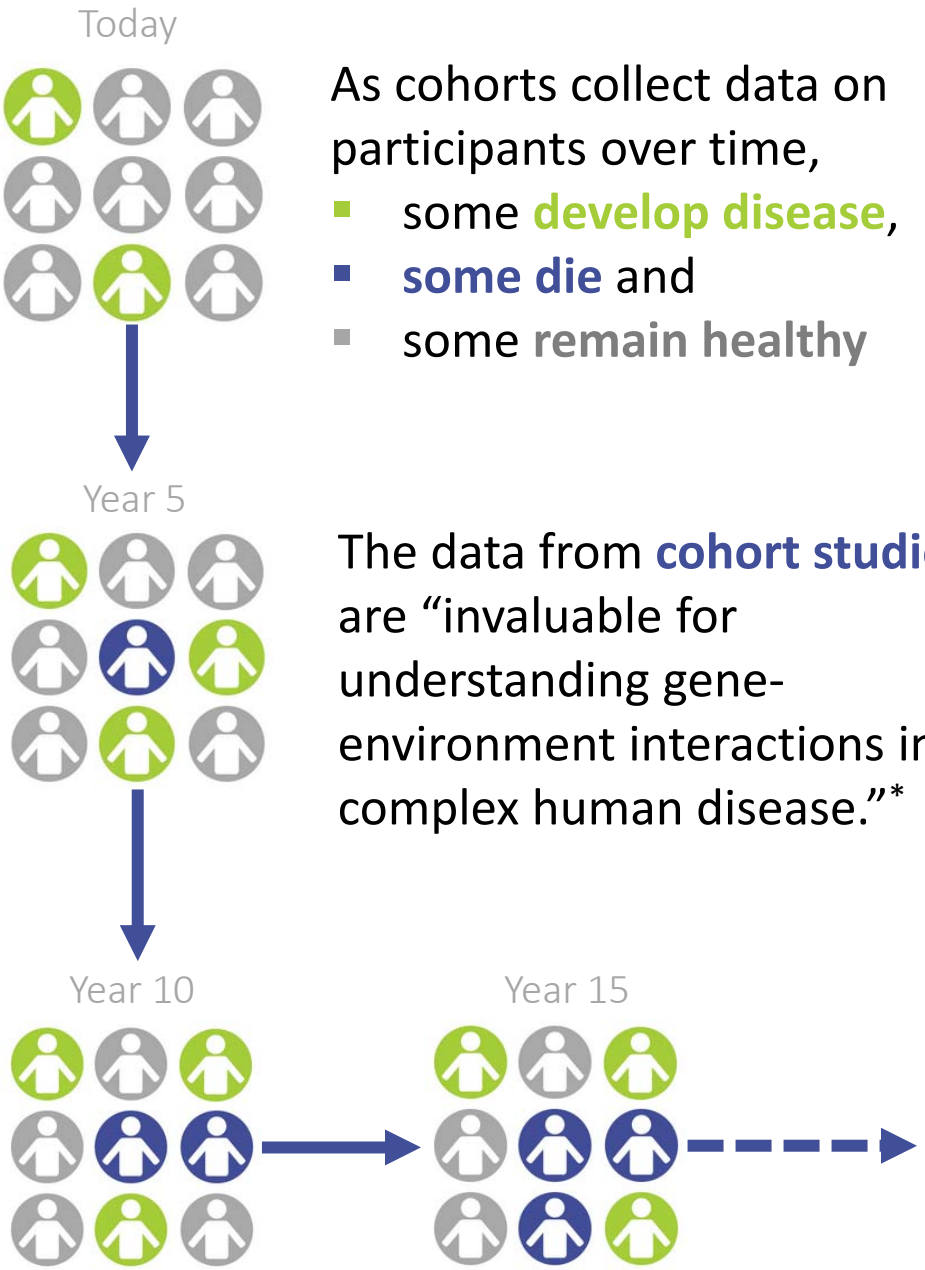
To answer these research questions, you need to …

Collect a wide variety of data

on a large number of people

and follow them over time

Large-scale population health studies **help assess disease risks**



As cohorts collect data on participants over time,

- some **develop disease**,
- **some die** and
- some **remain healthy**

The data from **cohort studies** are "invaluable for understanding gene-environment interactions in complex human disease."*

**Genes, environment and the value of prospective cohort studies,* Manolio TA, 2006

The Canadian Partnership for Tomorrow Project, a longitudinal cohort study

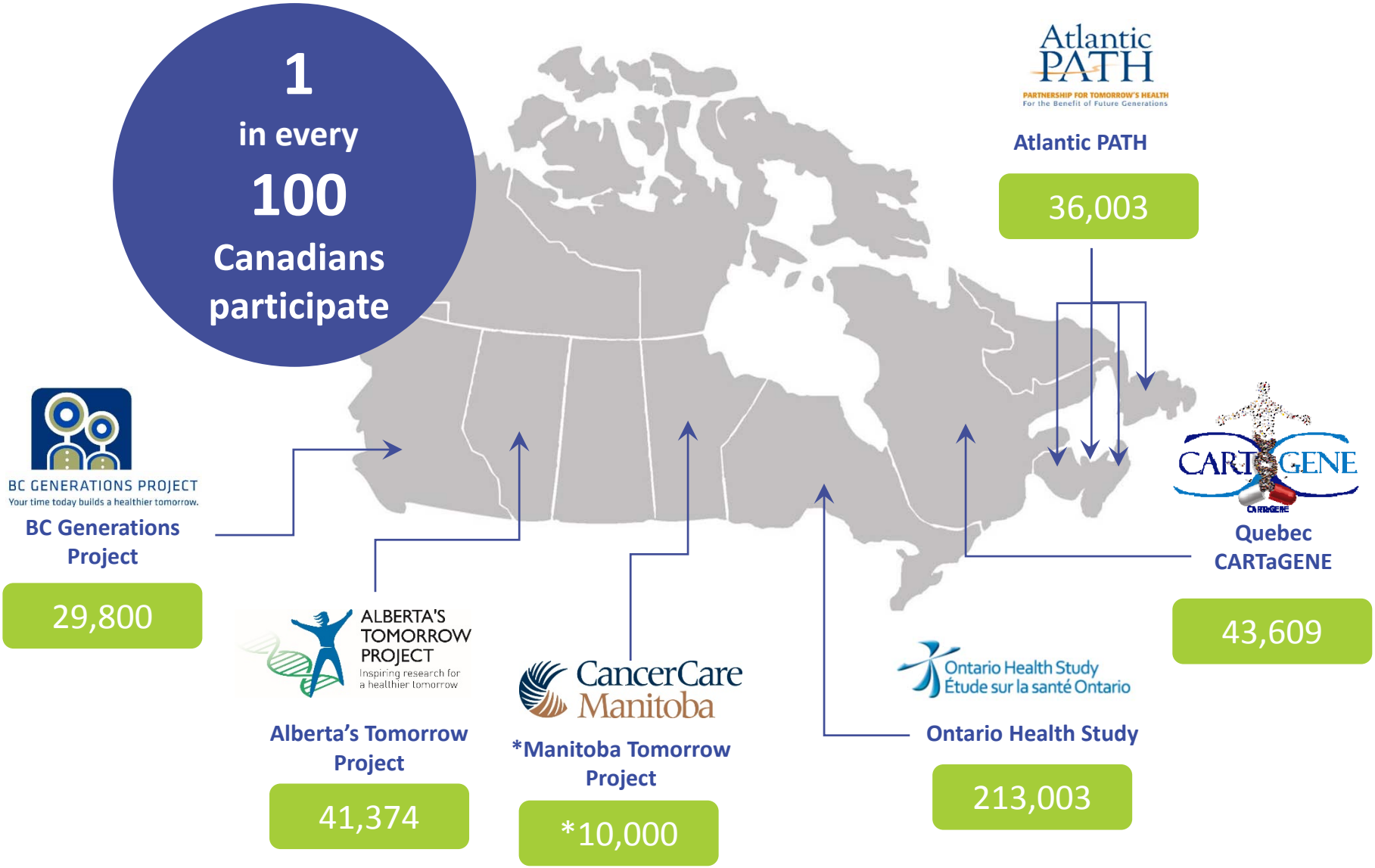
Canadian Partnership for Tomorrow Project

CPTP is a **population-health research platform** for assessing the effect of genetics, behaviour, family health history and environment on chronic diseases.

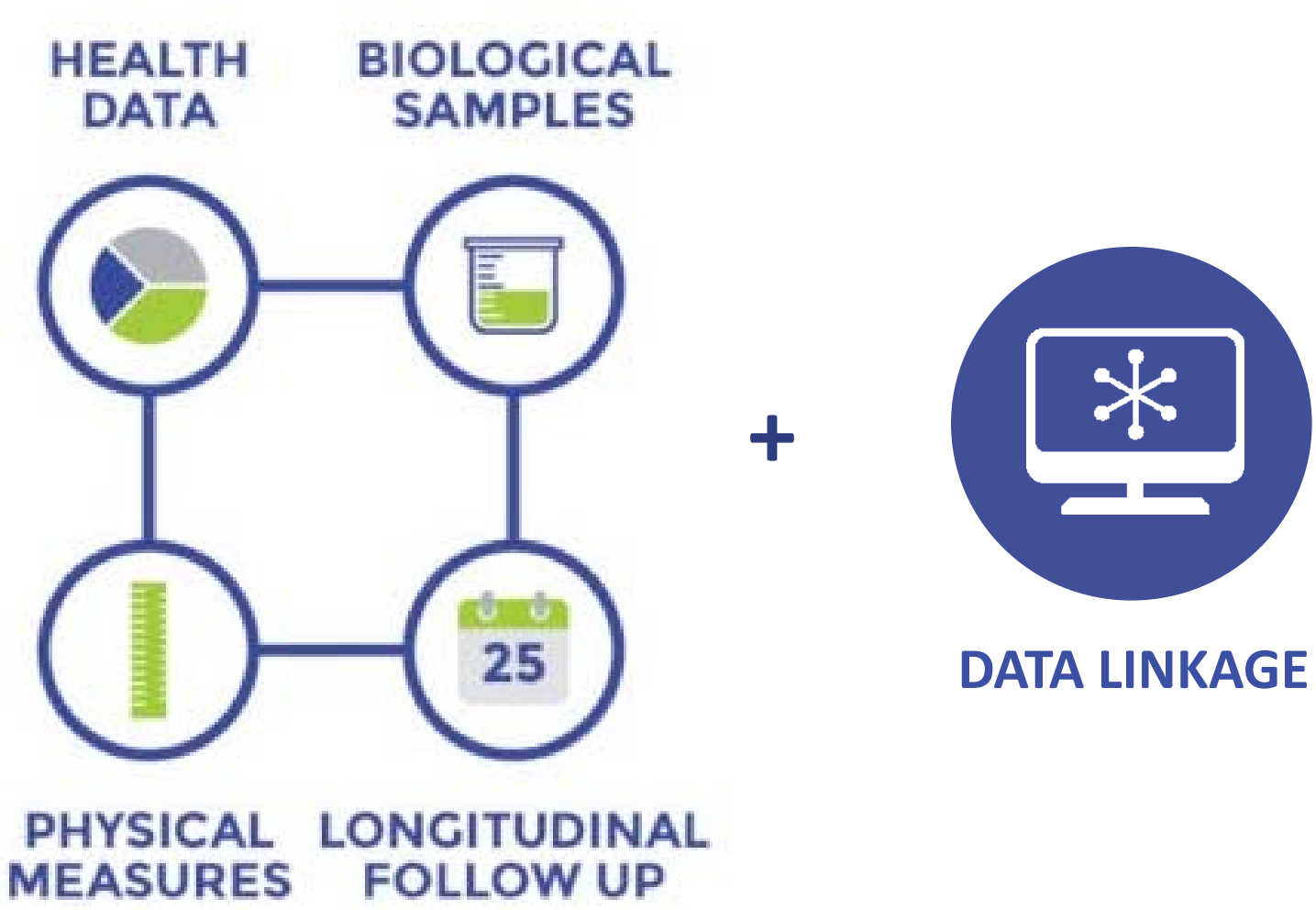
www.cptp.ca

Introductory webinar by Dr. Philip Awadalla (June 11, 2019)

Canadian Partnership for Tomorrow Project - +320,000 participants, 6 cohorts, 9 provinces

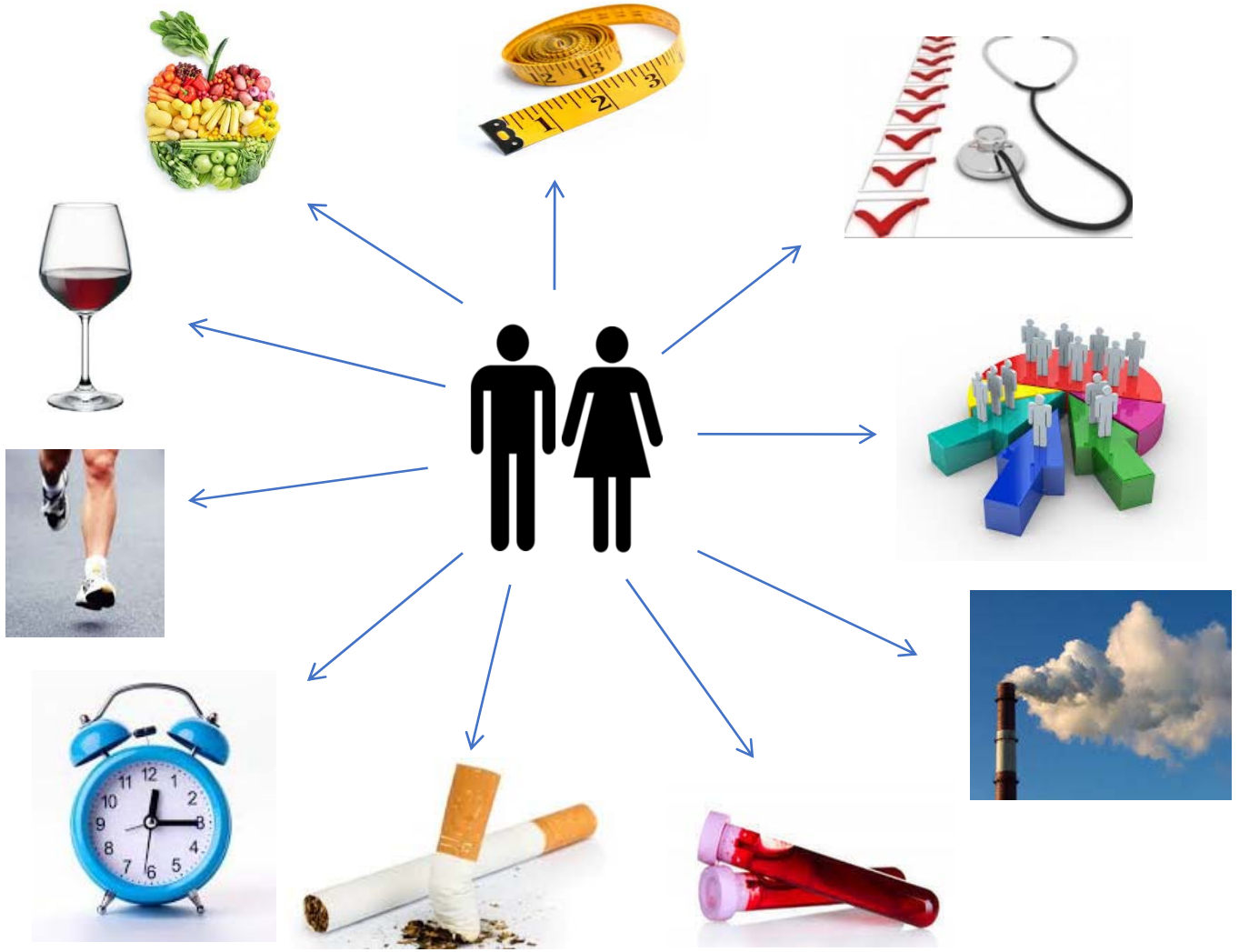


Canada's largest population health research platform



Questionnaire Health and Lifestyle Domains

These factors are often not captured in other databases such as health records



Biological samples and physical measurements

Biosamples

- Plasma
- Serum
- Red blood cells
- Buffy coat
- Dried blood spots*
- Urine
- Saliva
- Toenails*

Lab data*

- General hematology
- Clinical markers
- Lipid profile
- Hepatic & kidney function
- Electrolytes
- Thyroid function

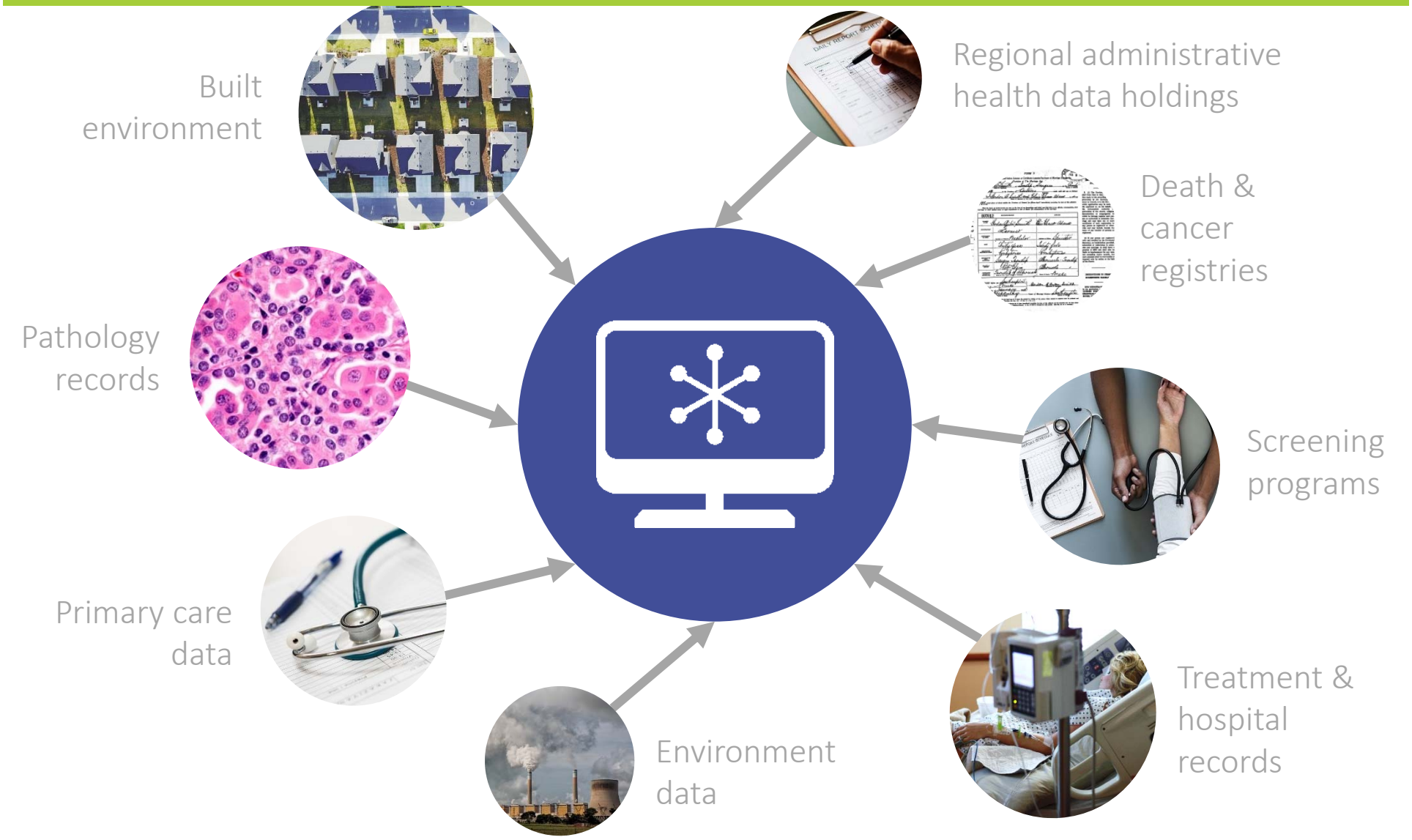
Physical Measurements

- Height
- Weight
- BMI
- Waist-hip circumference
- Body fat
- Grip strength
- Blood pressure
- Resting heart rate

**available in some cohorts*

Dummer et al. (2018) *CMAJ* 190:E710-717

Data linkage to understand environmental exposures, health outcomes, and health services



Who are the CPTP participants?

Data presented from baseline questionnaires

38% M
62% F

AGE

35-44 20%
45-54 31%
55-64 29%
≥65 15%

SMOKE

Never 52%
Former 36%
Current 13%

WEIGHT

Normal 39%
Overweight 35%
Obese 25%

High blood pressure 23%

Diabetes 7%

Arthritis 22%

Adapted from: Dummer et al. (2018) *CMAJ* PMID 29891475; Regional cohort profile papers also available

How is CPTP data being used to answer questions about cancer risk?

Dr. Rachel Murphy – Beyond smoking: Investigating risk factors for lung cancer in the Canadian Partnership for Tomorrow Project

- Not all people who smoke develop lung cancer and up to 1 in 4 lung cancers occur in people who have never smoked
- This suggests other factors must play a role

Canadian Partnership for Tomorrow Project

UBC

- This study will provide information on potential targets for lifestyle changes and strategies to prevent lung cancer with the ultimate goal of improving the lives of the many Canadians affected by this deadly disease.

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Dr. Darren Brenner – Examining the etiology of young-onset breast cancer in the Canadian Partnership for Tomorrow Project

- Despite a decrease in the number of breast cancer diagnoses in older women in recent years, diagnoses among women under the age of 50 have increased.
- Young women with breast cancer tend to have poorer survival (not routinely screened, so are often diagnosed with advanced-stage cancer).
- Genetics play a role, but generally only account for 5-10% of young-onset cases, suggesting lifestyle or environmental factors may be involved.

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Ontario Health Study
Étude sur la santé Ontario

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- Results from this project will improve our understanding of risk factors in younger women, leading to improved prevention strategies in young women at higher risk of breast cancer.

How is CPTP data being used to better understand risk factors?

Dr. Vikki Ho –
Occupational physical activity & lung cancer risk

- Physical activity can reduce risk of some cancers
- But there are different types of physical activity, e.g. activity at work and during recreation
- Recreational physical activity has been shown to reduce lung cancer risk
- But the impact of work activity is not well-established and some studies have actually found that people who have physically demanding jobs have a higher risk of lung cancer.

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CHUM

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- In this research, we will examine how lung cancer risk is associated with physical activity levels at work.

Dr. Vanessa DeClercq – Association between diet quality and adiposity in the Atlantic PATH cohort

- Life expectancy is lower and most chronic conditions are more common in the Atlantic region of Canada.
- Poor diet quality is associated with chronic conditions, and may be mediated through obesity.

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- Diet quality was different across the provinces, but overall participants did not consume enough fruit and vegetables.
- However they did report some healthy choices (e.g. eating whole grains more than refined grains, and eating at fast food restaurants ≤1 per month).
- BMI, body weight, % body fat, and fat mass index were also different among the provinces, and associated with meat/poultry, fish, snack food, sweeteners, diet soft drinks, and fast food restaurants.
- Although all four provinces are in the Atlantic region, diet quality varied greatly and was associated with adiposity.

nutrients

DeClercq et al. (2017) *Nutrients* PMID 29065471

Dr. Katerina Maximova – Dietary intakes of red and processed meat, vegetables and fruit, and fiber on cancer incidence

- Evidence suggests red and processed meat increase cancer risk, and that following a healthy diet is influenced by socioeconomic status.
- We need to understand the role of simultaneous exposure to food items recommended for cancer prevention, and understand the role of socioeconomic status in order to optimize future prevention efforts to reduce cancer burden.

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- The aim of the proposed study is to examine the co-occurrence of inadequate intakes of red and processed meat, vegetables and fruit, and fiber, and its impact on cancer incidence and related socioeconomic inequalities in cancer risk.

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How is CPTP data being use to assess the impact of lifestyle across the cancer spectrum

Dr. Winson Cheung –
Do early healthy lifestyle habits help a person survive treatment for cancer, and avoid a second cancer diagnosis?

Treatment response
Remission
Recurrence

Lifestyle → Cancer diagnosis → Clinical and treatment information

Alberta Health Services

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Alberta Cancer Registry

ARIA-MO (Medical Oncology)

"We can't prevent all cancers, but it would be nice to be able to tell patients one day if they're still better off through treatment and beyond because of earlier healthy habits."

Dr. Melanie Keats – Cardiovascular disease and physical activity in adult cancer survivors

- Relationship between cardiovascular disease (CVD) and physical activity in cancer survivors compared to age- and sex-matched participants who had not experienced cancer (controls).

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- Cancer survivors were more likely to have experienced a CVD event (30%) or factor (e.g. high blood pressure (60%) or diabetes (27%)).
- However, the risk of having a CVD risk factor was 35-45% lower for those who were moderately or highly active compared to those with the lowest physical activity.
  - For non-cancer controls, these odds were 25%-30% lower for moderately/highly active.
- Implications for cancer survivors is that physical activity is associated with lower CVD-related comorbidity, suggesting that interventions aimed at increasing activity should be implemented to improve long-term health outcomes.

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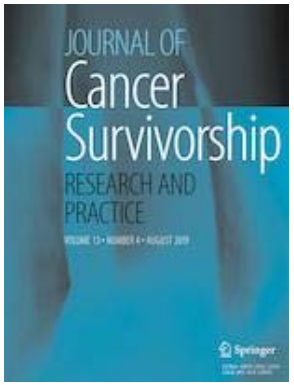
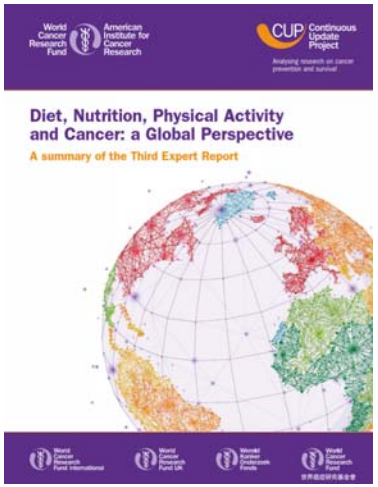


Keats et al. (2017) *J Cancer Survivorship* PMID 27854007

Importance of external factors

WCRF/AICR Third Expert Report
Importance of broader social, economic & environmental factors

- "Although well-informed choices are important in influencing personal risks of cancer and other disease, many factors ... are outside people's direct personal control."



- Need to consider the environment within which people make their choices.
  - Environmental, economic and social factors are all "upstream" determinants of behaviours and choices
  - These factors can also lead to health inequalities, because lower socio-economic groups are more likely to be affected by these upstream determinants

- *"Prevention must be a cornerstone of any cancer control plan and should encompass a multisectoral approach beyond health … to address the broader determinants of cancer … and the inequalities in cancer control that they lead to"*

Dr. Gavin McCormack – Residential relocation and walking study

- The built environment (e.g. neighborhood 'walkability') may help increase physical activity levels.
- Most of the evidence for this relationship has come from cross-sectional studies which can't provide evidence of temporality (cause-effect).
- This study will examine the extent to which changes in neighbourhood walkability, due to a participant's residential relocation (e.g. moving from a neighborhood with lower walkability to higher walkability), impacts their walking (both recreational and transportation).

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- This "natural experiment" will provide important causal evidence about the relationships between walkability and walking and provide evidence for planners and policymakers for creating pedestrian supportive neighbourhoods.

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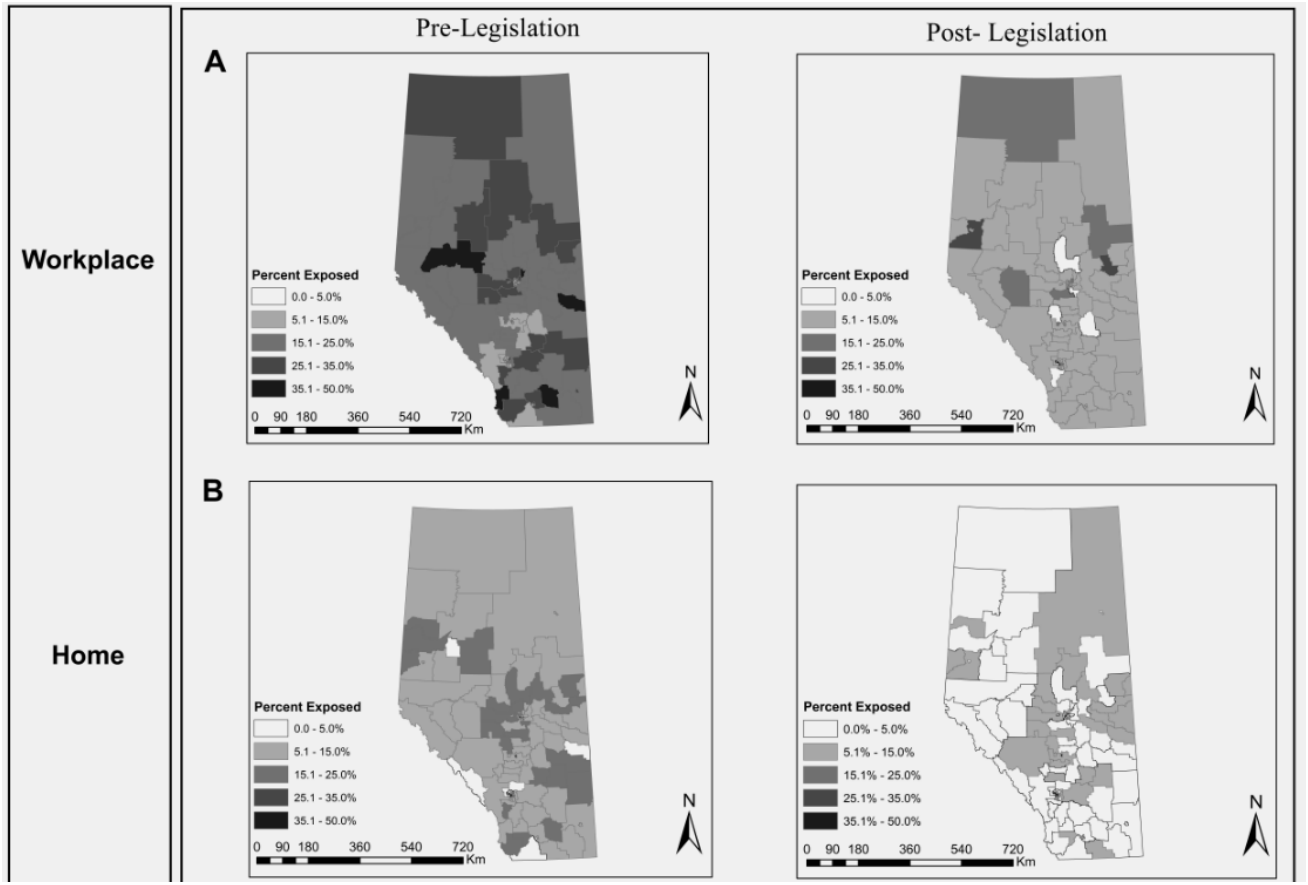
Linking to Policy
Reductions in secondhand smoke exposure among non-smokers post-legislation



2008 Alberta Tobacco Reduction Act prohibited smoking in public places and workplaces

Evaluated change in self-reported smoke exposure in the home and workplace in non-smokers before (≤2007) and after (≥2009) the legislation

Both home and workplace exposure ↓~50% following legislation

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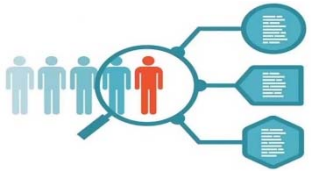
Haig et al. 2019 Tobacco Regulatory Science

Dr. Karen Kopciuk – Determinants of cancer stage at diagnosis

- Differences in individual (e.g. health habits, co-morbidities) and health system (e.g. screening, diagnostic delay, access to care) factors potentially affect cancer survival and mortality.
- Predictive models often account for patient risk factors, but many don't include information that may influence likelihood of early detection.
- This project will explore patient and system factors associated with stage of cancer at diagnosis using data from Alberta's Tomorrow Project to build models which will be validated in the BC Generations Project.



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CEPR | CANCER EPIDEMIOLOGY AND PREVENTION RESEARCH

- We will identify factors that can be used by screening programs to identify individuals who may benefit from individualized screening practices or from targeted prevention messages, thereby increasing the proportion of cases diagnosed at earlier stages.

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Examples across other chronic diseases

- Desbiens et al. (2019) **Fracture status in middle-aged individuals with early CKD: cross-sectional analysis of the CARTaGENE survey.** Osteoporosis Int PMID 30796539
- Hystad et al. (2019) **Green space associations with mental health and cognitive function – results from the Quebec CARTaGENE cohort.** Enviro Epi 3(1):e040
- Ye et al. (2018) **Changes in body mass index and incidence of diabetes: A longitudinal study of Alberta's Tomorrow Project Cohort.** Prev Med PMID 29117506
- DeClercq et al. (2018) **Differences in adiposity and diet quality among individuals with inflammatory bowel disease in Eastern Canada**. PLoS One PMID 30024912
- Drucker et al. (2017) **Atopic dermatitis and risk of hypertension, type-2 diabetes, myocardial infarction and stroke in a cross-sectional analysis from the Canadian Partnership for Tomorrow Project.** Br. J. Dermatol PMID 28617976
- Anand et al. (2016) **CAHHM Study Investigators Rationale, design, and methods for Canadian alliance for healthy hearts and minds cohort study (CAHHM) – a Pan Canadian cohort study.** BMC Public Health PMID 27464510

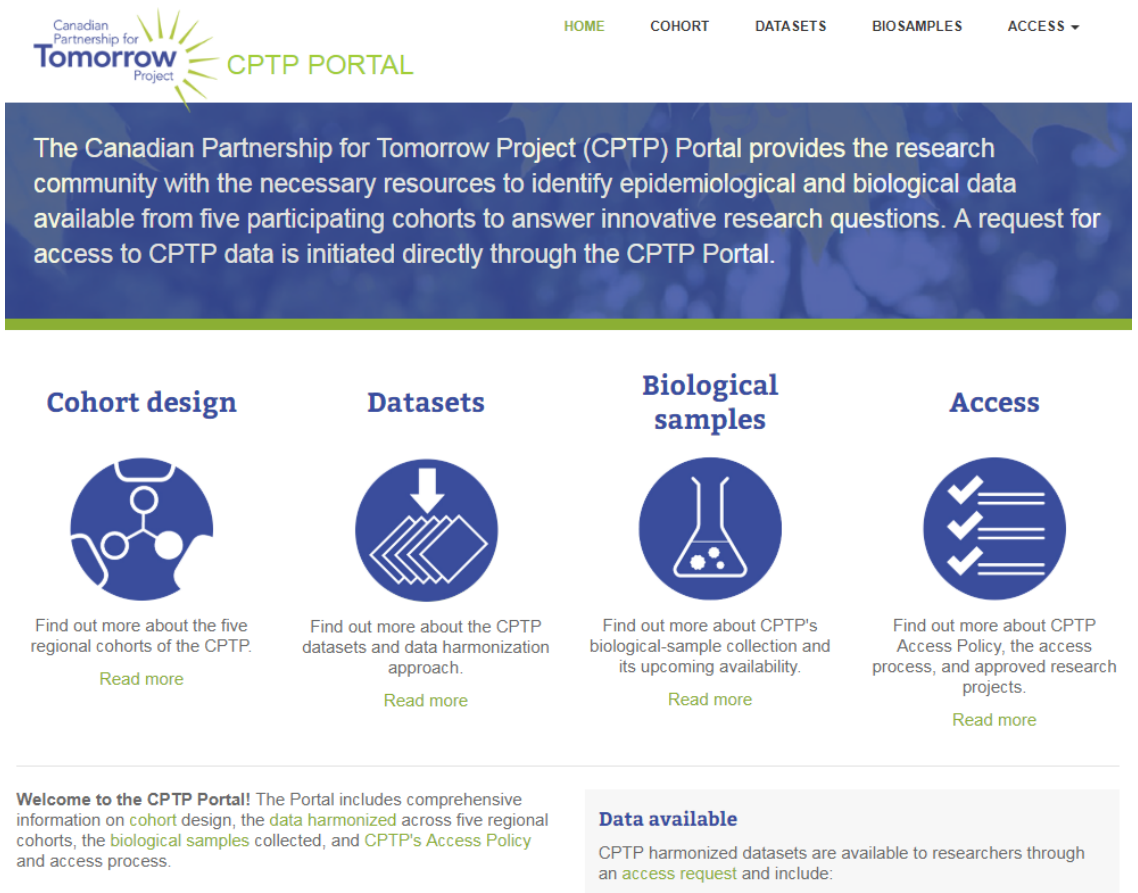
What's next for CPTP

- Baseline questionnaires completed 2015/2016 (recruitment ended)
- Most recent comprehensive follow-up health/lifestyle questionnaire completed in 2018
- Up next:
  - "Precinomics" – generating genotyped data in subset of samples across the CPTP cohorts
  - Occupational history questionnaire – BC, Ontario
  - Comprehensive diet and physical activity data collection - Alberta

How to access the data

Accessing the CPTP Data Portal

portal.partnershipfortomorrow.ca



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Canadian Partnership for Tomorrow Project

Thank you to the Tomorrow Project participants across the 6 regional cohorts who generously donate their time, information and biological samples. **The CPTP is a success because of the participants' ongoing commitment.**

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Thank you to our sponsors, partners, and staff

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Thank-you & Questions

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