POPULATION ANALYTICS IN AN AGING SOCIETY

CAnD3

Training Program Syllabus

Strength in numbers

CAnD3

CONSORTIUM ON
ANALYTICS FOR DATA-DRIVEN
DECISION-MAKING

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1.Program Description

The Consortium on Analytics and Data-Driven Decision-making (CAnD3)'s primary goal is to collaboratively develop, implement, and deliver an innovative training program – Population Analytics in an Aging Society – to equip the next generation of academic and applied population researchers with the knowledge, skills, and networks to support data-driven decision-making in aging societies. From its inception in 2020, CAnD3 has delivered our annual, international fellowship program anchored in interdisciplinary and intersectoral exchange to graduate students and post-doctoral researchers. The training modules cut across the following four population aging axes:

Family and Social Inclusion

This axis examines how families have changed over time, and how these changes affect family member's health, wealth, and happiness.

Migration and Ethnicity

This axis examines how migration, ethnicity and indigenous issues are interwoven in the increasing pace of globalisation that we have witnessed in the 21st century.

Education, Labour, and Inequality

This axis examines how critical institutions of education and work shape our lives, and their interplay with one of the most critical policy challenges of the past decades, namely the secular rise in inequality.
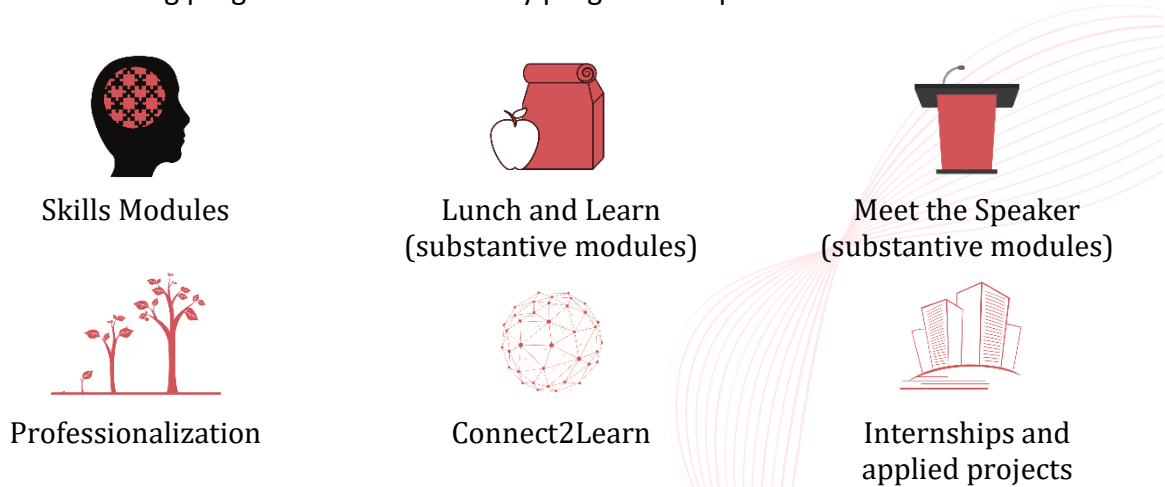
Well-Being and Autonomy

This axis examines how social and economic factors, as well as institutions and policies, shape individuals' vulnerability to and experience of well-being and autonomy.

The CAnD3 training program does not have an official grading system. Fellows are chosen based on their self-motivation and interest in the topics and objectives of the program, and complete synchronously and asynchronously delivered training modules, among other deliverables. In addition to learning exercises and activities, self and peer assessment are the primary mechanisms of learning evaluation.

2. Program Components & Learning Objectives

The CAnD3 training program consists of six key program components:

Skills Modules

Lunch and Learn
(substantive modules)

Meet the Speaker
(substantive modules)

Professionalization

Connect2Learn

Internships and
applied projects

In the duration of the 12-month training program, Fellows will achieve the following learning objectives:

Program components	Learning objectives
	Acquire knowledge in population aging from multiple disciplinary perspectives in relation to the four axes.
	Build basic skills in population data science and computational population social science.
	Gain an understanding of the data-to-decision-making processes in non-academic sectors.
	Build pan-Canadian, multidisciplinary, intersectoral, and international professional networks.
	Develop professional skills, such as group discussion and meeting facilitation (online and in-person).
	Apply knowledge, analysis, and skills to investigate real-world research questions and communicating results.

3. Training Modules

The training modules are categorized into Skills, Substantive, Professionalization, and Connect2Learn components. The modules are designed to foster international, multidisciplinary, and intersectoral knowledge exchange among the Fellows, partner institutions, team members, and the broader public.

Because the CAnD3 training program is co-constructed by its members and partners, module topics are subject to change as the program advances.

Figure 1. Breakdown of training module components based on what percentage of the program they make up.
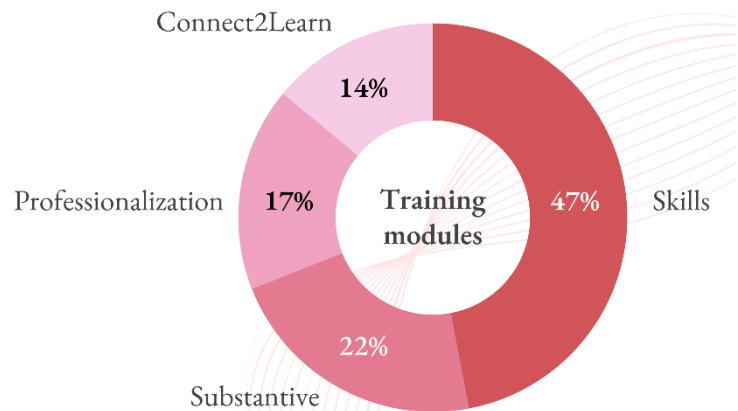
3.1 Skills Training

The primary aim of the skills modules is to cultivate and improve Fellows' research skills in addressing substantive population aging problems. Through these sessions, Fellows will be introduced to population research skills needed to understand, analyze and critique new and emerging sources of population data, and the application of these skills to ensure evidence-based decision-making in aging societies. These modules incorporate analytical exercises using some of the top data analysis tools such as R, STATA, and Python. The core skills modules include:

Research Replicability and Workflow management, Dr. Grant Gibson (CRCDN)

This module introduces Fellows to the world of reproducible research, an undertaught subject in academic programs. This module addresses the importance of proper data management and reproducibility for proper science. It also explains the mechanisms that journals use to evaluate reproducibility and how to satisfy these requirements (including in secure data environments). Lastly, it guides Fellows through the process of setting up a repository to manage their data and ongoing projects, as well as how to maintain a smooth workflow for both solo and collaborative projects.

As part of this module, Fellow will *write an effective program* (which is a quick data analysis using data provided by the instructor) and *exchange this program* with an assigned partner for a two-way reproducibility exercise. Fellows will then document their reproducibility attempt and experiences in a *reproducibility report*.

Data visualization with ggplot2, Dr. Tim Elrick (McGill University)

This module provides a beginner to intermediate introduction to data visualization in R using ggplot. It covers an introduction to ggplot grammar, aesthetic features, and how to create different graph types. Fellows will complete both asynchronous and synchronous, hands on ggplot data visualization exercises.

Directed Acyclic Graphs, Dr. Alissa Koski (McGill University)

Quantitative research often aims to establish or understand the relationship between variables while adjusting for all possible sources of bias. Directed Acyclic Graphs (DAGs) are visual and very intuitive tools which show how our variables of interest relate with each other and offer some insight on how our statistical decisions may impact our estimate. To gain a practical knowledge of DAGs, Fellows will individually make DAGs for their academic projects.

Python, Michael Parott (Columbia University) and Sakeef Karim (New York University)

Python is a clear and powerful programming language that is becoming increasingly popular among social science researchers. As a general-purpose language, it is flexible and can be put to a variety of uses. This module will introduce the basic features of Python and familiarize learners with basic data management and analysis functions. Fellows will be guided through asynchronous and synchronous exercises in Python.

Inclusion, Diversity, Equity, and Access (IDEA): From Measurement to Action, multiple speakers

This module introduces IDEA (inclusion, diversity, equity, access) and the nuances of using these concepts in data analysis. The overarching goal of the module is to initiate interest in not only including such variables in research, but to think about the potential role they play in modifying the effects of other important variables. This is a timely and very relevant topic as gender-based analysis+ is now being required for consideration during budget decision-making in Canada.

Fellows will be engaged with asynchronous materials, synchronous materials and exercises which would provide them with comprehensive information and necessary skills to incorporate IDEA to their research. Fellows will write two policy briefs as part of the exercises associated with this module; one on international policies supporting IDEA, and another one presenting a short quantitative analysis and visualisation (using Stata or R Studio) applying the principles of Gender-Based Analysis+, as an example of a concrete application of IDEA concepts being mobilised in support of decision-making in the Government of Canada.

Systematic Literature Review, Leanne Idzerda (Public Health Agency of Canada)

This module is designed to provide a general introduction to conducting systematic reviews in population research, highlighting their relevance for research, applied research, and data-driven decision-making. Fellows will be guided through each stage of conducting a systematic review and will be ultimately challenged with developing a research question suited for a systematic review.

Causal inference, multiple speakers

This module introduces causal inference and its relevance to population research and data-driven decision-making. Its main goal is to introduce approaches used to establish causal relationships within the framework of regression analysis. The methods to be discussed are commonly used in several fields of research, including economics, sociology, epidemiology, and political science. Therefore, many examples from different empirical fields will be explored. Fellows are asked on reflect on ways a causal inference framework may be applied to their research.

Social Media Analysis, Dr. Monica Alexander (University of Toronto) and CAnD3 alums

The explosion in global social media activity and corresponding data availability have been important factors in the expansion of computational social science in recent years, with various agencies and organizations exploring the potential of these data in research and decision-making. This module is intended to provide Fellows with an opportunity to dip their toes into this emerging field. The ethical and analytical challenges of using this data will also be discussed. This module features a "choose your own adventure" type exercise using data from Twitter.

Machine Learning, Michael Parott (Columbia University) and Sakeef Karim (New York University)

This module is designed to provide Fellows with exposure to Machine Learning through a basic introduction to supervised and unsupervised methods and an opportunity to consider and explore a couple of the myriad of applications of machine learning approaches to research with both traditional population data (census, survey, administrative) and more recent Big Data sources (social media, cell phone, Internet/Internet of Things). Fellows will complete a series of applied machine learning exercises.

3.2 Substantive Training: Lunch and Learns and Meet the Speakers

The Lunch and Learn (L&L) series is the substantive component of training modules, occurring on the second Wednesday of each month in the training year. It takes the form of research presentations spanning timely and relevant topics in population dynamics and population aging, particularly the program's four axes.

Figure 2. *Sample of Lunch and Learn series posters.*

The series introduces Fellows to policy-relevant issues and questions in population research across disciplines and contexts, and how the various disciplines respond to these questions. Fellows convene with the L&L speaker(s) immediately after the L&L presentation for the Meet the Speaker session. The Meet the Speaker session provides a unique opportunity for Fellows to engage further with the speaker(s) on their presentation and research. Examples of the L&L topics covered by the program include:

Internalized Colorism and Psychobiological Distress among Black Americans
Dr. Alexis Dennis (McGill University)

Using Data to Understand Racial Health Inequities: Considering the motivations, challenges, and skepticism
Dr. Arjumand Siddiqi (University of Toronto)

Canadian Longitudinal Study on Aging Panel: Unlocking insights on aging in communities and over the life course
Dr. Christina Wolfson (McGill University), Dr. Mélanie Levasseur (University of Sherbrooke), Dr. Parminder Raina (McMaster University), and Dr. Divya Joshi (McMaster University)

US State Policy Polarization and Population Health
Dr. Jennifer Karas Montez (Syracuse University)

Long-Term Life Care at Home: Research to Drive the Future of Aging in Canada
Justine Giosa (SE Health) and Dr. Margaret Saari (SE Health)

See the [full list](#) of past L&L topics and speakers.

3.2 Professionalization Training

The professionalization sessions give Fellows the practical skills they will need to navigate through their career and studies. These sessions are focused on building Fellows' hard and soft skills to sharpen their leadership, communication, and organizational skills. The topics covered include, but are not limited to:

- Effective time management
- Navigating group dynamics
- Formal presentations
- Focus group facilitation
- Tips for a successful interview
- Career development

3.3 Connect2Learn

Figure 3. Sample of Connect2Learn session posters.

Connect2Learn sessions, often led by CAnD3 Partners, facilitate intersectoral exchange and learning among all CAnD3 consortium members (Partners and Fellows alike), on core topics of interest influencing decision making such as *"Data ethics," "Integrated policy frameworks,"* and *"How to tell a data story."* The *"Integrated policy frameworks* module is led by our Partners at the Policy Community Partnerships Office, while *"How to tell a data story"* is led by our Partners at Statistics Canada.

4. Other program expectations and deliverables

4.1 ePortfolio

During the CanD3 training program year, Fellows develop and refine an ePortfolio: a digital repository showcasing their experiences and competencies (knowledge, skills, and networks), the artifacts that demonstrate their best work, and reflections on their CAnD3 training year. It is otherwise known as a personal/professional website. The completed CAnD3 ePortfolio highlight and showcase who they are as a developing scholar, researcher, and practitioner in their field, as well as their competencies for supporting data-driven decision-making in aging societies.

4.2 Experiential Learning

Experiential Learning opportunities allow CAnD3 Fellows to apply the skills they've acquired throughout the Training Program, their studies, and careers to real-world contexts. Fellows may choose to complete a paid internship with a CAnD3 partner or an applied research project.

Internship opportunities

Fellows who are interested in an internship will be matched through a competitive process with a CAnD3 partner, taking into account each Fellow's research interests and skills and the partner's research and decision-making needs. Our partners will provide challenges, research questions,

data, context, scope, links to decision-making, and key deliverable requirements for each internship.

Applied research projects

An applied research project explores the application of research findings to applied and/or decision-making contexts in public, private or civic sectors. Fellows can develop their own project from their existing program of research or choose among those projects offered by CAnD3 Partners.

4.3 Dragon's Den ideation and presentation

In the CAnD3 adaptation of the Canadian TV show, Dragon's Den, Fellows convert their research findings into a limited number of data visualizations and 'pitch' the story of their visualizations to judges and other CAnD3 members in 2 minutes. The goal of this exercise is to give Fellows an avenue to practice and apply some of the skills introduced by the training program to their research, and then share their findings with an audience of non-specialists. This exercise may be completed in groups.

The CAnD3 team at the 2022 CAnD3 Keynote Address.