Understanding Healthy Aging: Canadian Longitudinal Study on Aging:

Susan Kirkland, PhD
Professor and CLSA Co-Investigator
Dalhousie University

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Life expectancy at birth

Females: 83.3 years
Males: 78.8 years

At age 65: Women 21.6 years (86.6)
At age 65: Men 18.5 years (83.5)

* If born in 2007-2009

Source: CANSIM
Challenge: Live long AND well

Need to shift our focus:

- Mortality
- Morbidity
- Longevity
- Function
- Ability/Disability
- Well being
- Quality of life
- Autonomy/Independence

We require high quality data in order to understand and address evolving needs

CLSA!
CLSA Questionnaire Modules at Baseline
51,338 participants

Demographic/Lifestyle
- Age
- Gender
- Education
- Marital status
- Sexual orientation
- Language
- Ethnicity
- Wealth/income
- Veteran Identifier
- Smoking, alcohol
- Nutritional risk
- Physical activity
- Health care utilization
- Medication use
- Supplement use

Health
- General health
- Women’s health
- Chronic conditions
- Disease symptoms
- Sleep
- Oral health
- Injuries, falls
- Mobility
- Pain, discomfort
- Functional status
- ADL, IADL
- Cognition
- Depression
- PTSD
- Life Satisfaction

Social
- Social networks
- support
- participation
- inequality
- Online communication
- Care receiving
- Care giving
- Retirement status
- Labour force participation
- Retirement planning
- Transportation
- Mobility, Migration
- Built environments
- Home ownership
CLSA Data Collection

30,000 visit a Data Collection Site

Physical Assessments:
- Height, Weight, BMI
- Bone Density, Body Composition, Aortic Calcification
- Blood Pressure
- ECG
- Carotid Intimal-Medial Thickness
- Pulmonary Function
- Vision & Hearing
- Performance testing

Biospecimen Collection:
- Blood
- Urine

Cognitive Assessments:
- Neuropsychological Battery
  - Memory
  - Executive function
  - Reaction time
Only one open-ended question…

• All CLSA Participants asked:
  • “I have talked with many adults and learned something from each of them about what they think promotes healthy aging. What do you think makes people live long and keep well?”

• Answers recorded verbatim
• Presents a unique and unprecedented opportunity to advance our understanding of ‘healthy aging’ in the Canadian population.
Healthy Aging in the scientific literature

Successful aging
Optimal aging
Productive aging

1) Low probability of disease
2) High cognitive and physical capacity
3) Active engagement with life

• Shifts from negative to positive aspects of aging
• CLSA: “Healthy aging”
Lay definitions of healthy aging

- A growing body of evidence indicates that lay perspectives are an important aspect of ‘healthy aging’
- What people value or need for their own health
- Individual lay perspectives on ‘healthy aging’ are more diverse and multidimensional than researcher-driven definitions
- Use of lay definitions in research will help to advance theory and knowledge about ‘healthy aging’
But how can we make use this data?

- Shortest response: 1 word
- Longest response: 319 words
- Average length of response: 13 words
- Over 50,000 responses
Example Responses

• Eating well and keeping busy and active
• Having things to do and look forward to
• Look after your body eat well exercise have people who love you dog
• Accepting challenges ministering to other people staying current and up to date with news trends children not dwelling on the rough stuff accepting help when necessary and having a real contingent of girlfriends
• Its a mystery to me don't have a clue
Novel Methods in Text Mining

- Machine learning techniques can handle the enormous amount of unstructured text data.
- Opportunity to explore the use of novel natural language processing (text mining) techniques to characterize lay perspectives on healthy aging.
- Interdisciplinary team of epidemiologists, gerontologists, and computer scientists.
General Analytic Method

- Considers the data for recurring, co-occurring patterns and topic distributions
- Input is unstructured text
- Output is topics – a topic is a collection of words which have semantic relatedness
- Multiple approaches explored: LDA, TKM, ngrams…..
Language label correction

- Label correction results (used provided manual corrections instead of automatic clustering approach)
Phrase segmentation

- Using bi-gram frequency information to segment samples into phrases
- Most probable neighbouring words merge into bigrams
Phrase clustering using Word Mover's Distance

• Word Mover's Distance is a method that allows to assess the "distance" between two documents in a meaningful way.
Preliminary results on clustering

- Phrase clustering
- Concept clustering
Preliminary Results: Lay perspectives on healthy aging

- Topic 1: Being engaged/active in the community
- Topic 2: Exercise habits/lifestyle
- Topic 3: Taking care of self/luck/genes
- Topic 4: Positive outlook/happiness
- Topic 5: Social relationships/positive attitude
- Topic 6: Valuing what is most important/living in the present
- Topic 7: Social interaction/mental stimulation
- Topic 8: Keeping busy - mind/body active
- Topic 9: Living well/keeping young
- Topic 10: Eating healthy (veg/fruit)/environmental factors
Remaining Challenges, Next Steps

- Demonstrated that machine learning techniques will work with the data.

- Not yet convinced that we have arrived at a technique that adequately classifies lay perspectives of healthy aging.

- Exploratory - little to no existing literature on the most appropriate method.

- Lots of potential, but lots more work to be done.

- Stay tuned!
Healthy Aging Research Team

Dalhousie University, Canada
Susan Kirkland
Vlado Keselj
Sam Stewart
Dhivya Jayaraman
Yoko Ishigami Doyle
Kirstie Smith
Ashley-Ann Marcotte
Dijana Kosmajac
Viswanath
Muthukumaraswamy
Sathananth

University College London, UK
Matko Bosnjak
Georgetown University, US
Lindsay Kobayashi

Rudjer Boskovic Institute, Croatia
Tomislav Smuc
Tomislav Lipik
Matej Mihelcic
Damir Korencic

Simon Fraser University, Canada
Theodore Cosco
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Health PEI

Veterans Affairs Canada

Anciens Combattants Canada

Institut de recherche Centre universitaire de santé McGill

Research Institute McGill University Health Centre

Canadian Institutes of Health Research

British Columbia

Alberta

Newfoundland Labrador

Ontario

Nova Scotia

CIHR IRSC

Québec

Manitoba

Innovation.ca

Healthcare

BD

Christie

Innomed

Solutions Evolution cavity

Dell

Fisher Scientific

Part of Thermo Fisher Scientific

GE Healthcare

IntegenX

Labware

Leger

Maelstrom

McMaster Innovation Park

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Clisa elcv

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Etude longitudinale canadienne sur le vieillissement
Transforming Everyday Life into Extraordinary Ideas
susan.kirkland@dal.ca

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www.clsa-elcv.ca