

# Multimorbidity Prevalence and Patterns in Ontario Older Adults Receiving Home Care Services

David Kanters<sup>1</sup>, Amanda Growden<sup>2</sup>, Kathryn Fisher<sup>2</sup>, Lauren Griffith<sup>1</sup>

<sup>1</sup>McMaster University Department of Clinical Epidemiology and Biostatistics

<sup>2</sup>McMaster University School of Nursing



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# Background

- **Multimorbidity** is the presence of multiple chronic conditions in one patient where one is not considered the primary diagnosis.
  - It is commonly observed among older adults
- Improved understanding of multimorbidity patterns can inform:
  - Health policy
  - Resource use
  - Design of health services and interventions targeted towards personalized and holistic health care

# Objectives

- Various methods are used to identify chronic condition groupings and no single method is recognized as the standard
- It is unclear if the resulting groupings differ across these methods
- Objectives:
  - Estimating the prevalence of common chronic conditions and groupings
  - Compare the results of four different, commonly-used methods for identifying chronic condition groupings

# Sample

- Older adults (>65 years old) receiving long-stay home care services in Ontario (>30 days)
- InterRAI Home Care (2007-2012) Dataset
- Most recent assessment included
- Demographics
  - Participants: 319,694
  - Mean age (SD): 82 (8)
  - Gender: 36% Male

# Self-Reported Chronic Conditions

- Cerebrovascular Accident
- Congestive Heart Failure
- Coronary Heart Disease
- Hypertension
- Irregular Pulse
- Peripheral Vascular Disease
- Alzheimers + Dementia
- Parkinsonism
- Arthritis
- Hip Fracture
- Other Fracture
- Osteoporosis
- Cataracts
- Any Psychiatric Diagnosis
- Cancer
- Diabetes

Included conditions had a prevalence >1%

# Methods

- Explore gender differences in condition prevalence
- Identify chronic condition groupings using four methods:
  1. Prevalence of single conditions, pairs, and triplets
  2. Exploratory Factor Analysis (EFA)
  3. Latent Class Analysis (LCA)
  4. Cluster Analysis
- Used half the dataset to develop models and half to validate

# Methods

## 1. Prevalence

- Most commonly-used analysis of chronic condition patterns
- Simple to understand and calculate

## 2. Exploratory Factor Analysis

- Also commonly-used analysis for chronic condition patterns
- Analysis of the correlations between a set of conditions
- The underlying factor structure identifies condition groupings

# Methods

## 3. Latent Class Analysis

- Identifies groups of participants as opposed to groups of conditions
- Method for identifying latent classes of participants based on their individual chronic conditions

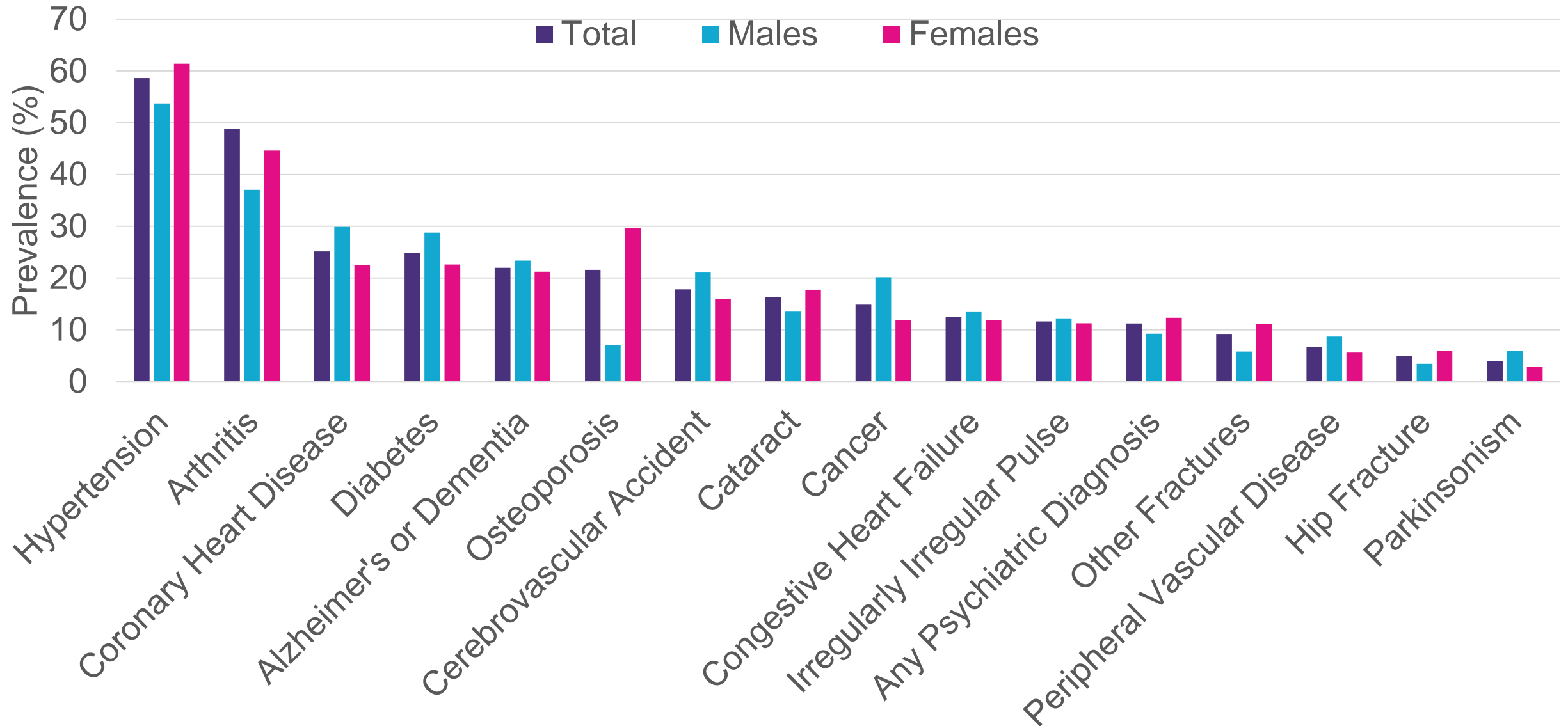
## 4. Cluster Analysis

- Begins with individuals or small clusters of individuals
- Clusters successively joined based on similarity of conditions
- Continues until one large cluster is reached
- Clusters are evaluated to identify chronic condition groupings



# Results

Figure 1: Sample Prevalence of Chronic Conditions



# Results

*Table 1: Frequency of Five Most Common Chronic Condition Pairs*

Chronic Condition Pair	N	%
Hypertension and Arthritis	9502	13
Hypertension and Alzheimer's/Dementia	4304	6
Hypertension and Diabetes	3822	5
Hypertension and Cancer	3302	4
Arthritis and Osteoporosis	2931	4

Frequency of participants with two chronic conditions: 72,598

*Table 2: Exploratory Factor Analysis: Rotated Factor Pattern*

Condition	Factor				
	1	2	3	4	5
<b>Cong. Heart Failure</b>	<b>0.84</b>	<b>-0.12</b>	<b>0.10</b>	<b>0.06</b>	<b>0.07</b>
<b>Irregular Pulse</b>	<b>0.82</b>	<b>0.04</b>	<b>-0.05</b>	<b>-0.05</b>	<b>0.07</b>
<b>CHD</b>	<b>0.68</b>	<b>-0.24</b>	<b>0.27</b>	<b>0.04</b>	<b>0.05</b>
<b>PVD</b>	<b>0.56</b>	<b>-0.28</b>	<b>0.25</b>	<b>0.24</b>	<b>0.10</b>
<b>Hip Fracture</b>	<b>-0.07</b>	<b>0.78</b>	<b>-0.04</b>	<b>-0.11</b>	<b>0.03</b>
<b>Osteoporosis</b>	<b>-0.13</b>	<b>0.74</b>	<b>-0.12</b>	<b>0.38</b>	<b>-0.11</b>
<b>Other Fracture</b>	<b>-0.12</b>	<b>0.73</b>	<b>-0.03</b>	<b>0.19</b>	<b>0.09</b>
<b>Hypertension</b>	<b>0.11</b>	<b>-0.02</b>	<b>0.79</b>	<b>0.20</b>	<b>0.06</b>
<b>Cerebrovasc. Acc.</b>	<b>0.11</b>	<b>-0.12</b>	<b>0.60</b>	<b>-0.28</b>	<b>-0.22</b>
<b>Diabetes</b>	<b>0.12</b>	<b>-0.50</b>	<b>0.59</b>	<b>0.04</b>	<b>0.16</b>
<b>Parkinsonism</b>	<b>-0.31</b>	<b>-0.16</b>	<b>-0.45</b>	<b>-0.12</b>	<b>-0.43</b>
<b>Arthritis</b>	<b>0.08</b>	<b>0.16</b>	<b>0.03</b>	<b>0.82</b>	<b>-0.07</b>
<b>Cataract</b>	<b>0.01</b>	<b>0.04</b>	<b>0.02</b>	<b>0.64</b>	<b>0.02</b>
<b>Cancer</b>	<b>-0.19</b>	<b>-0.29</b>	<b>-0.29</b>	<b>-0.15</b>	<b>0.84</b>
<b>Any Psych.</b>	<b>-0.32</b>	<b>-0.17</b>	<b>-0.16</b>	<b>0.10</b>	<b>-0.53</b>
<b>Alz &amp;/or Dementia</b>	<b>-0.25</b>	<b>-0.05</b>	<b>-0.13</b>	<b>-0.50</b>	<b>-0.61</b>

# Results

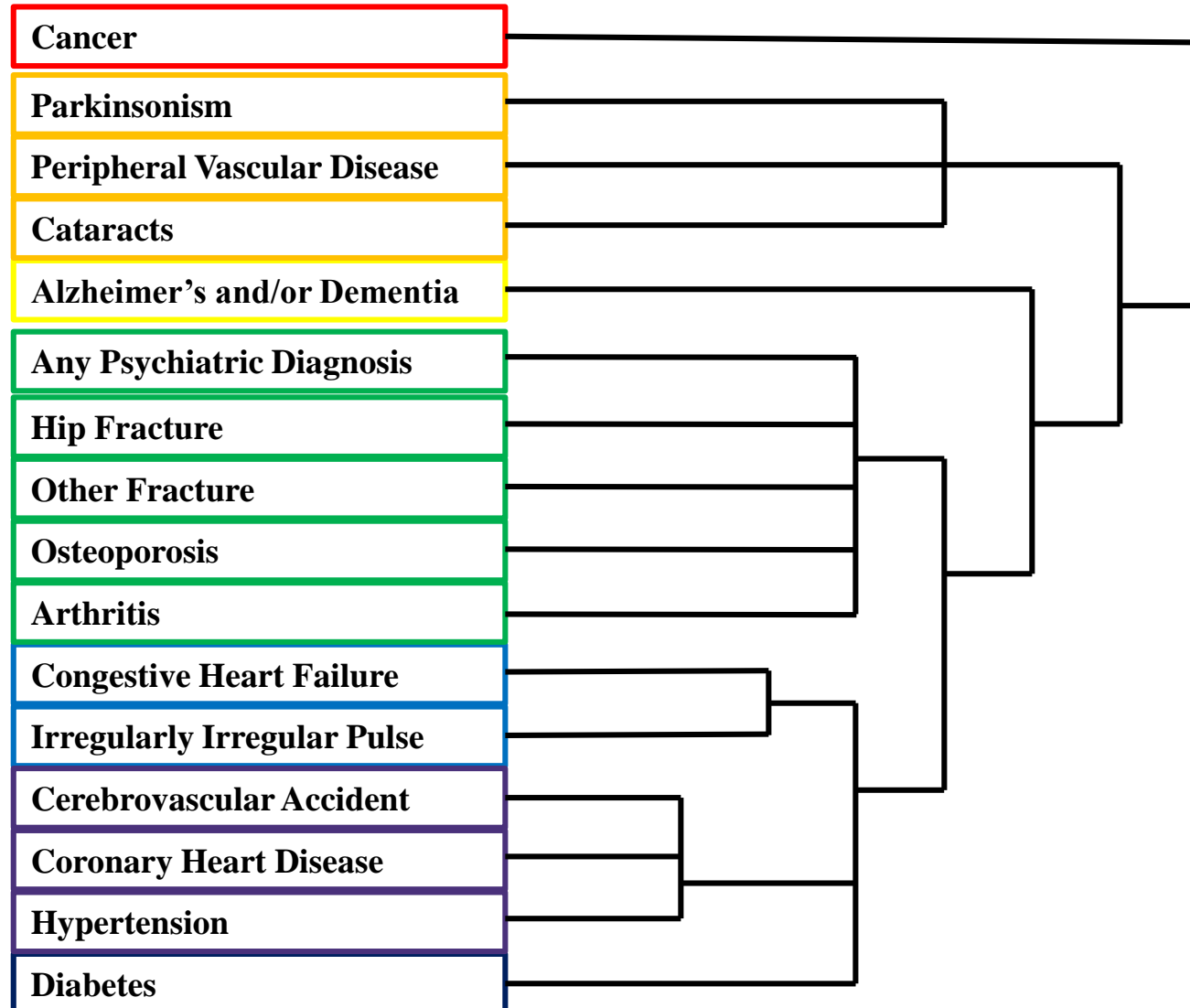
- Confirmatory factor analysis used to assess EFA model fit
  - Acceptable fit was found (RMSEA=0.05,  $p < 0.01$ )
  - Low likelihood of observed results due to chance

Table 3: Seven-Latent-Class Model of Chronic Condition Clusters, Coloured by Probability for Each Cluster

<b>Class</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>Probability</b>	<b>0.06</b>	<b>0.23</b>	<b>0.15</b>	<b>0.16</b>	<b>0.08</b>	<b>0.21</b>	<b>0.12</b>
CVA	0.03	0.11	0.12	0.12	0.31	0.32	0.19
CHF	0.02	0.03	0.07	0.08	0.40	0.03	0.45
CHD	0.11	0.09	0.21	0.16	0.68	0.27	0.48
HTN	0.36	0.32	0.69	0.57	0.85	0.77	0.60
Irr. Pulse	0.05	0.05	0.08	0.11	0.33	0.07	0.27
PVD	0.01	0.01	0.07	0.03	0.23	0.07	0.14
Alz./Dem.	0.03	0.43	0.08	0.16	0.15	0.25	0.14
Parkinsons	0.01	0.08	0.02	0.03	0.03	0.03	0.02
Arthritis	0.20	0.33	1.00	0.60	0.79	0.28	0.34
Hip Frac.	0.01	0.03	0.01	0.16	0.07	0.04	0.03
Oth. Frac.	0.03	0.05	0.04	0.29	0.15	0.06	0.03
Osteoporosis	0.06	0.15	0.24	0.60	0.36	0.08	0.04
Cataracts	0.07	0.08	0.24	0.22	0.34	0.14	0.12
Psychiatric	0.04	0.14	0.10	0.12	0.16	0.12	0.05
Cancer	1.00	0.05	0.12	0.09	0.12	0.10	0.13
Diabetes	0.15	0.08	0.26	0.10	0.39	0.44	0.37

# Results

Figure 2: Tree Diagram of Chronic Condition Groupings from Cluster Analysis



# Conclusions

- Results show consistency across 3 methods.
- Prevalence of pairs & triplets of conditions reflected single condition prevalence.
- Five groups of conditions:
  - Cardiovascular Disease
  - Osteoporosis & Fractures
  - Stroke, Hypertension, & Diabetes
  - Arthritis & Cataracts
  - Cancer
- Groups were clinically meaningful and consistent with reported literature.

# Conclusions

- EFA is simple to perform and interpret, making it the preferred approach.
- LCA results provide insight on the patterns of chronic conditions likely to be found in individuals.
- Cluster analysis is computationally intensive but does not yield different results – simpler methods are preferred.



# Limitations

- Limited dataset, some common conditions unavailable for analysis (e.g., COPD)
- Chronic condition patterns in long-stay homecare patients may be different than the general population of older adults
- Chronic condition data is self-reported

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Co-Authors:

Kathryn Fisher

McMaster University School of Nursing

Lauren Griffith

McMaster University Department of Clinical Epidemiology and Biostatistics

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