Validation of incident long-term care admissions in Ontario using administrative data

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Introduction – Canadian demographics

- Demographic shift towards aging population
  - 20% increase in Canadian seniors from 2011 to 2016 (5.9 million people)[1]
  - More seniors (16.9%) than children (16.6%) in Canada[1]
  - 12+ million seniors by 2061[1]
- Planning of health care services such as long-term care (LTC) is necessary to meet the needs of this growing demographic

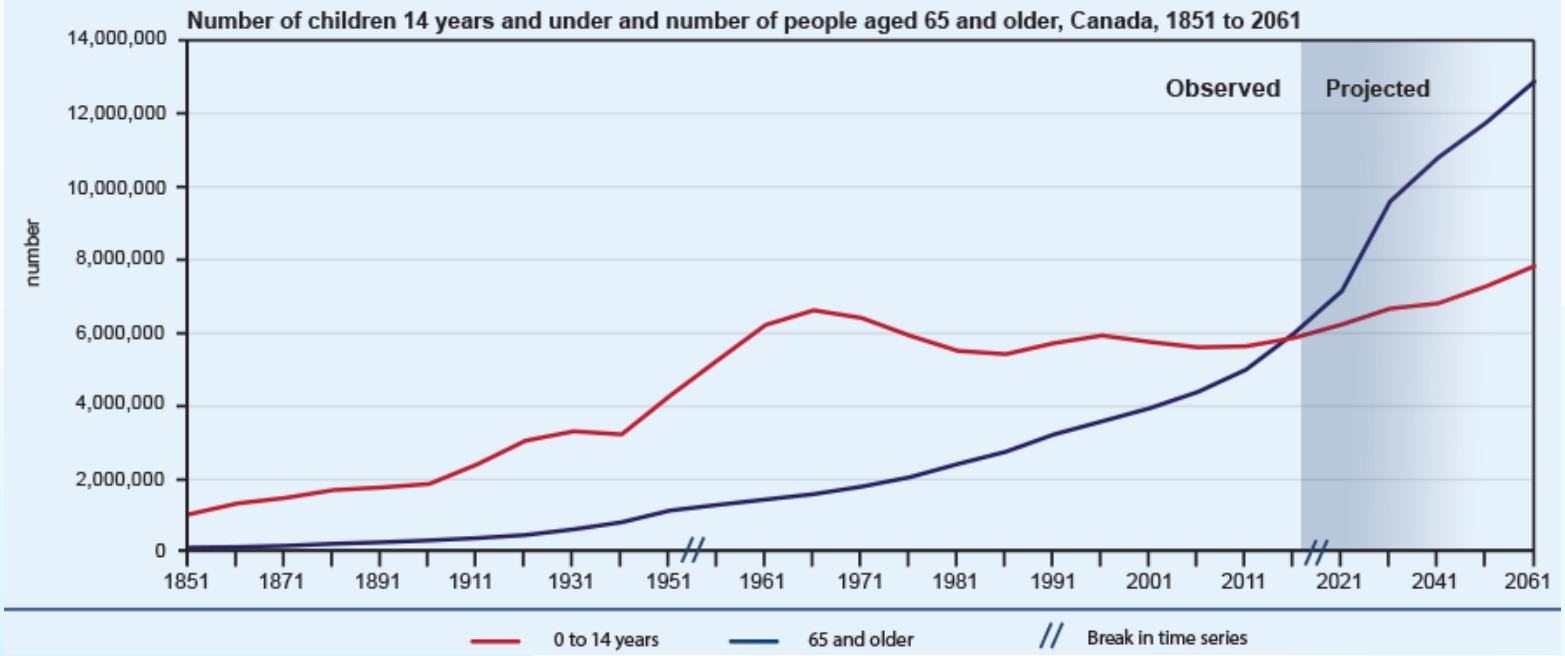

Table from: Statistics Canada. 2017. *Age and sex, and type of dwelling data: Key results from the 2016 Census*. Statistics Canada Catalogue no. 11-001-X. Ottawa.

Introduction – Long-term care (LTC)

- Long-term care (LTC) statistics:
  - ~40% of the population will receive care in a nursing home prior to death[2,3]
  - Canadian seniors average 1.57 episodes of care in a nursing home (equivalent to 674 days)[4]
  - Average lifetime cost: $127,000 CAD (or £71,400)[5]
- The planning of LTC delivery is important to policymakers
- In Ontario:
  1. Long wait lists for LTC
  2. Higher level of need for people requiring LTC (e.g. higher MAPLE scores)

  * *Staffing and funding for LTC services have not increased in parallel with these needs*

Introduction – Long-term care (Ontario)

- Heath administrative data from the Institute for Clinical Evaluative Sciences (ICES) can be used to study LTC utilization trends
  - ***Example****: Tanuseputro et al. (2017) observed that public LTC facilities with a for-profit status had higher hospitalization and mortality rates versus not-for-profit facilities*[6]
- Canadian Continuing Care Reporting System (CCRS)
  - **Description**: Clinical and demographic information for all individuals residing in a publicly-funded LTC facility in Ontario

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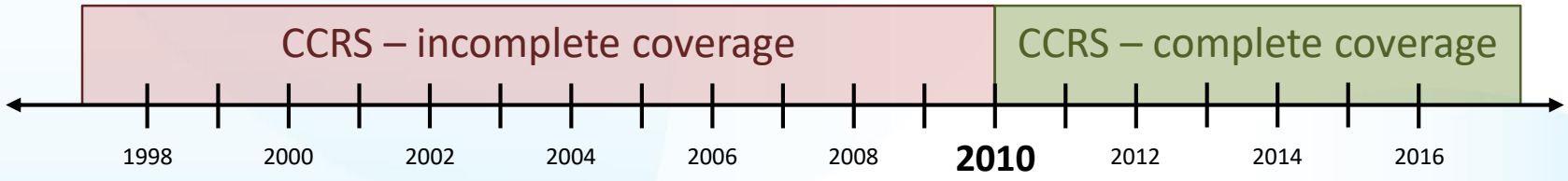

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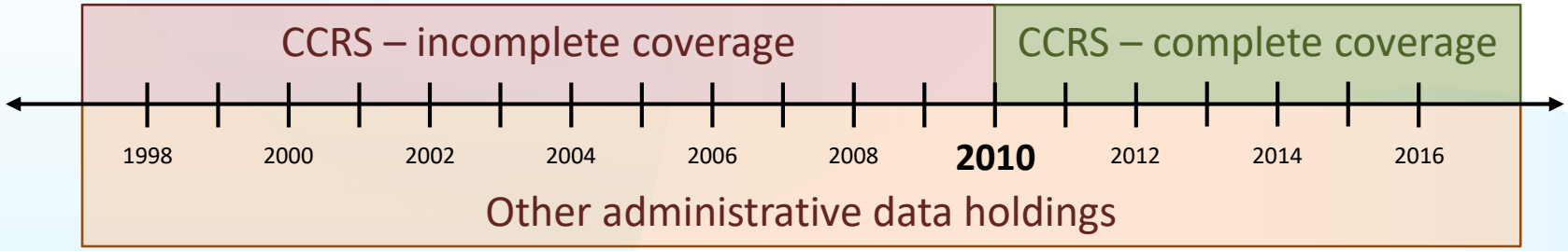


- **Solution:** Create an algorithm to predict the LTC residency status of an individual prior to 2010 using data from other health administrative databases
  - ***Examples****: diabetes*[7]*, dementia*[8]

Objectives

1. To create an algorithm that identifies incident admissions into publicly-funded long-term care (LTC) homes in Ontario prior to 2010 using prescription drug claims and/or physician billing claims data.
2. To describe the incidence and characteristics of new LTC residents of publicly-funded LTC homes in Ontario, by year, from 2001 to 2015.

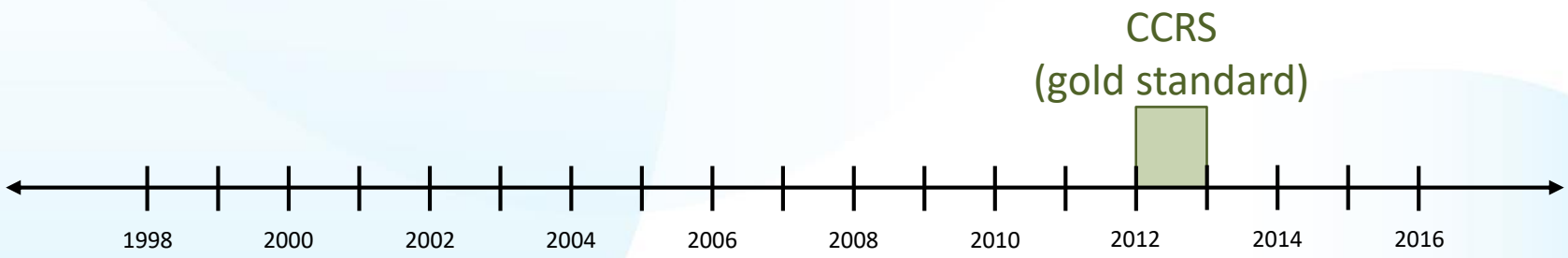
Methods – Data sources

- **Data sources:**
  - *Continuing Care Reporting System (CCRS)*
    - Clinical and demographic information for LTC residents
  - *Ontario Drug Benefit (ODB) database*
    - Prescription drug data on all persons aged 65+ years
  - *Ontario Health Insurance Plan (OHIP) claims database*
    - Physician billing claims data
  - *Registered Persons Database (RPDB)*
    - Demographic data on all persons covered by OHIP
  - *Ontario population estimates (POP)*
    - Mid-year estimates of the Ontario population
  - *Discharge abstract database (DAD)*
    - Hospitalization discharge data

- **Study period:** April 1, 1999 to March 31, 2016

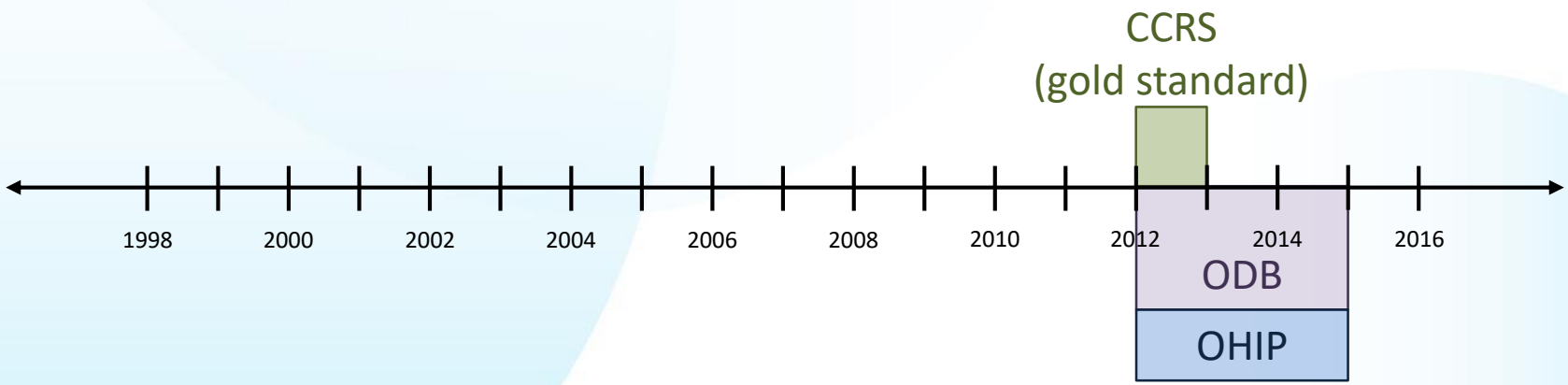
Methods – Validation study (Obj. 1)

- **Time period:** April 1, 2012 to March 31, 2013
- **Inclusion criteria:** Ontario residents aged 65 years and older
- **Exclusions:**
  1. Not eligible for OHIP
  2. Did not use the health care system in the previous 5 years
  3. Missing sex
  4. Age greater than 104 years
  5. Already a LTC resident (look-back 2 years prior)
- **Incident LTC admission status:** CCRS (gold standard)



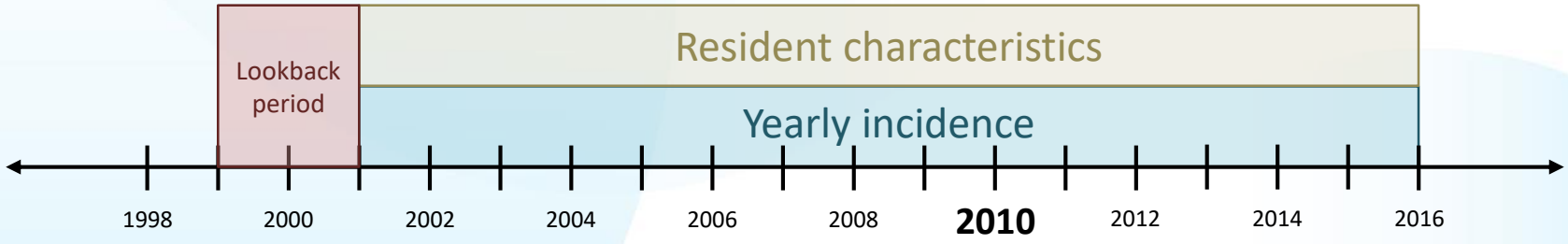
Methods – Validation study (Obj. 1)

- **Algorithm**
  1. Drug claims (ODB) billed in a LTC facility
  2. Physician billing claims (OHIP) for (i) Non-emergency LTC inpatient services (W fee code) and (ii) billed from a Nursing Home or a Home for the Aged
  - Tested different combinations of ODB and/or OHIP claims
    - ***Example****: 2 claims within 365 days of one another that can be both ODB claims, both OHIP claims, or one ODB and one OHIP claim*
- **Measures of algorithm performance:** Sensitivity, specificity, positive predictive value, negative predictive value



Methods – Incident LTC admission trends (Obj. 2)

- **Time period:** April 1, 1999 to March 31, 2016
- **Long-term trends:**
  1. Yearly incidence, 2001 to 2015
  2. Incident LTC resident characteristics, 2001 to 2015 (2-year lookback)
     - Age
     - Sex
     - Functional status
     - 16 multimorbid conditions (e.g. dementia)

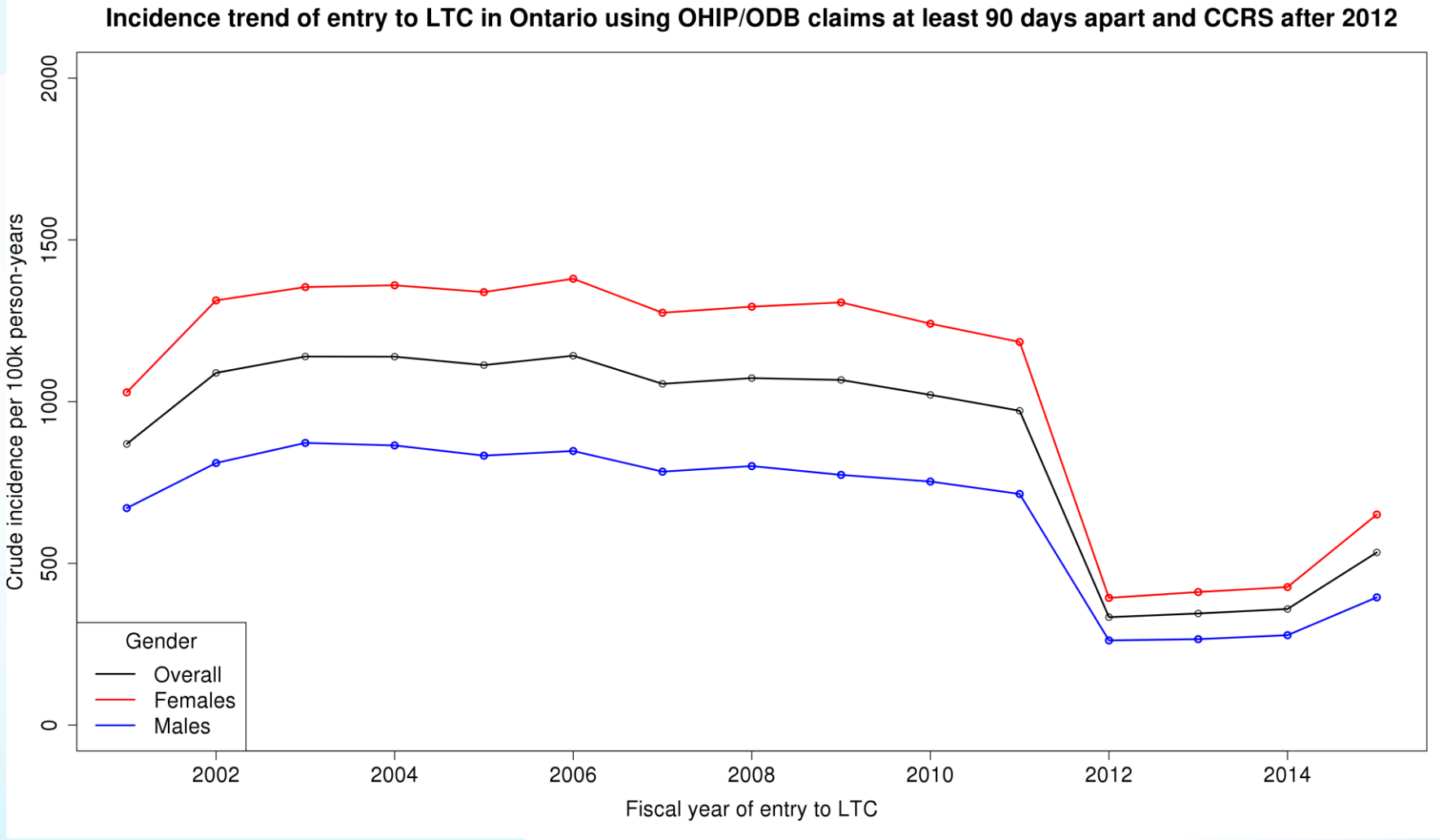


Results – Validation study (Obj. 1)

Definition	ODB only	OHIP only	ODB and OHIP	ODB and/or OHIP
1 claim				
2 claims within 30 days				
2 claims within 60 days				
2 claims within 90 days				✓
2 claims within 182 days				
2 claims within 365 days				

Sensitivity=94.528
Specificity=99.918
PPV=96.264
NPV=99.878

Results – Incident long-term care trends (Obj. 2)



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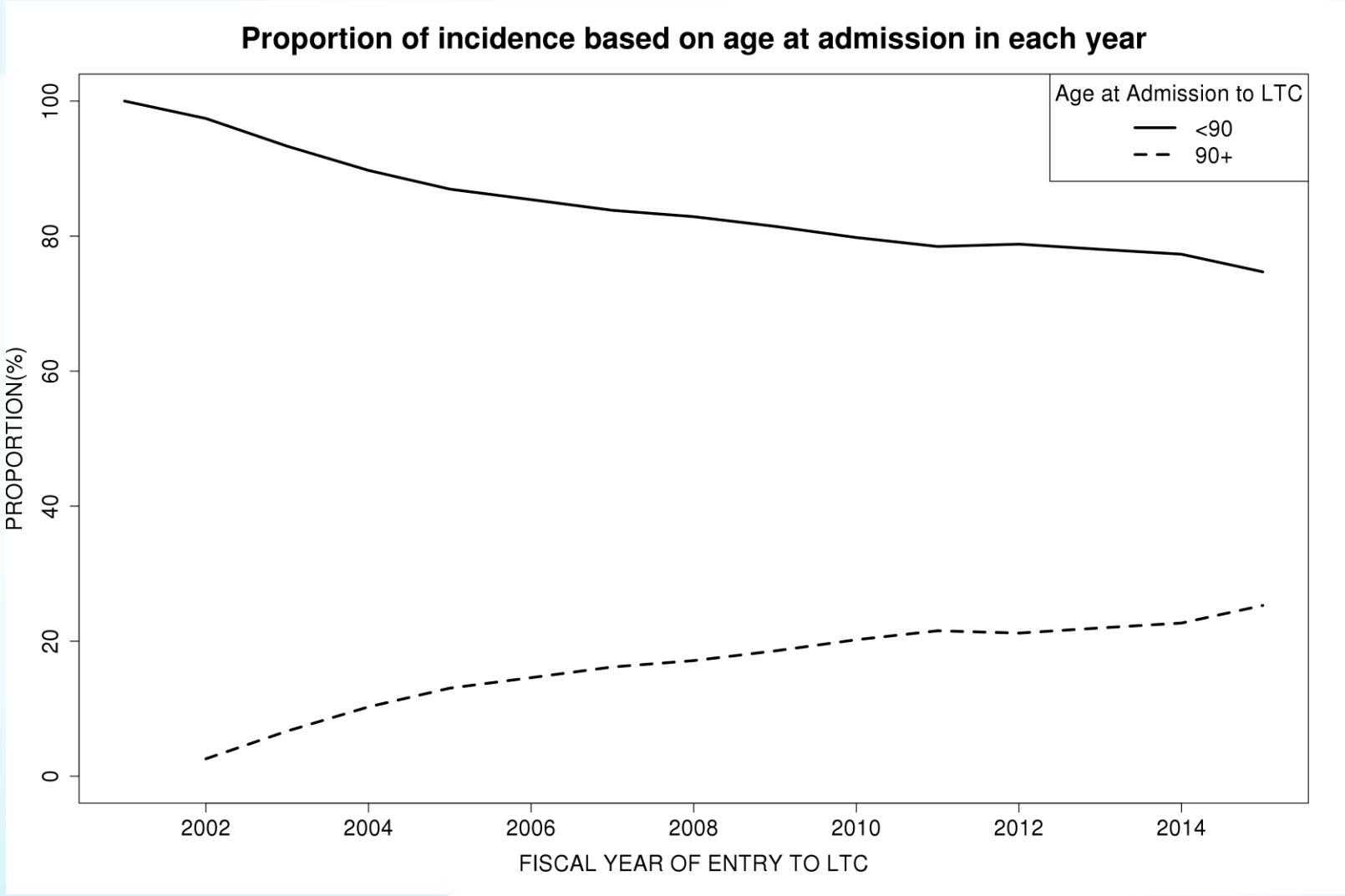

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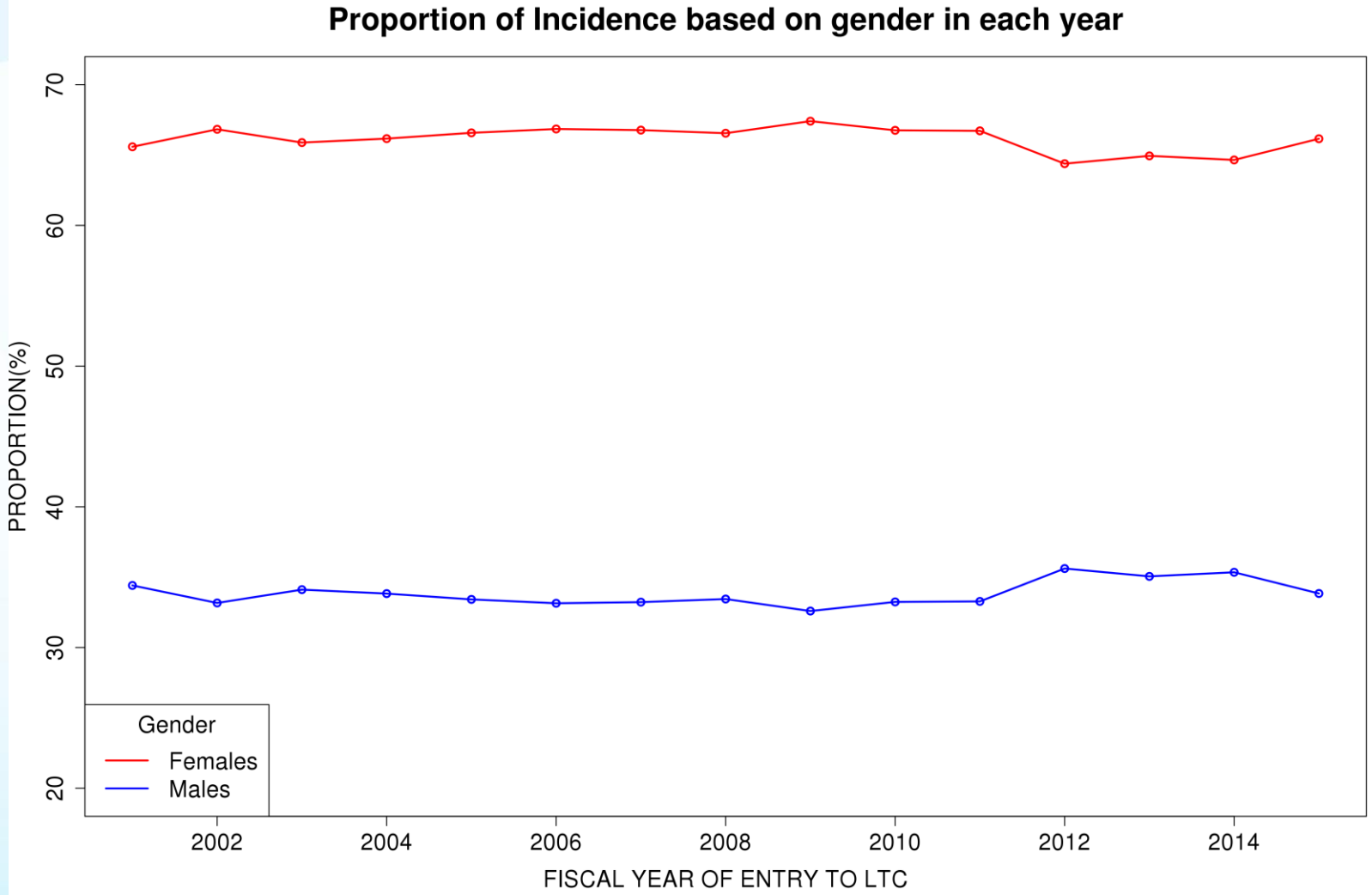

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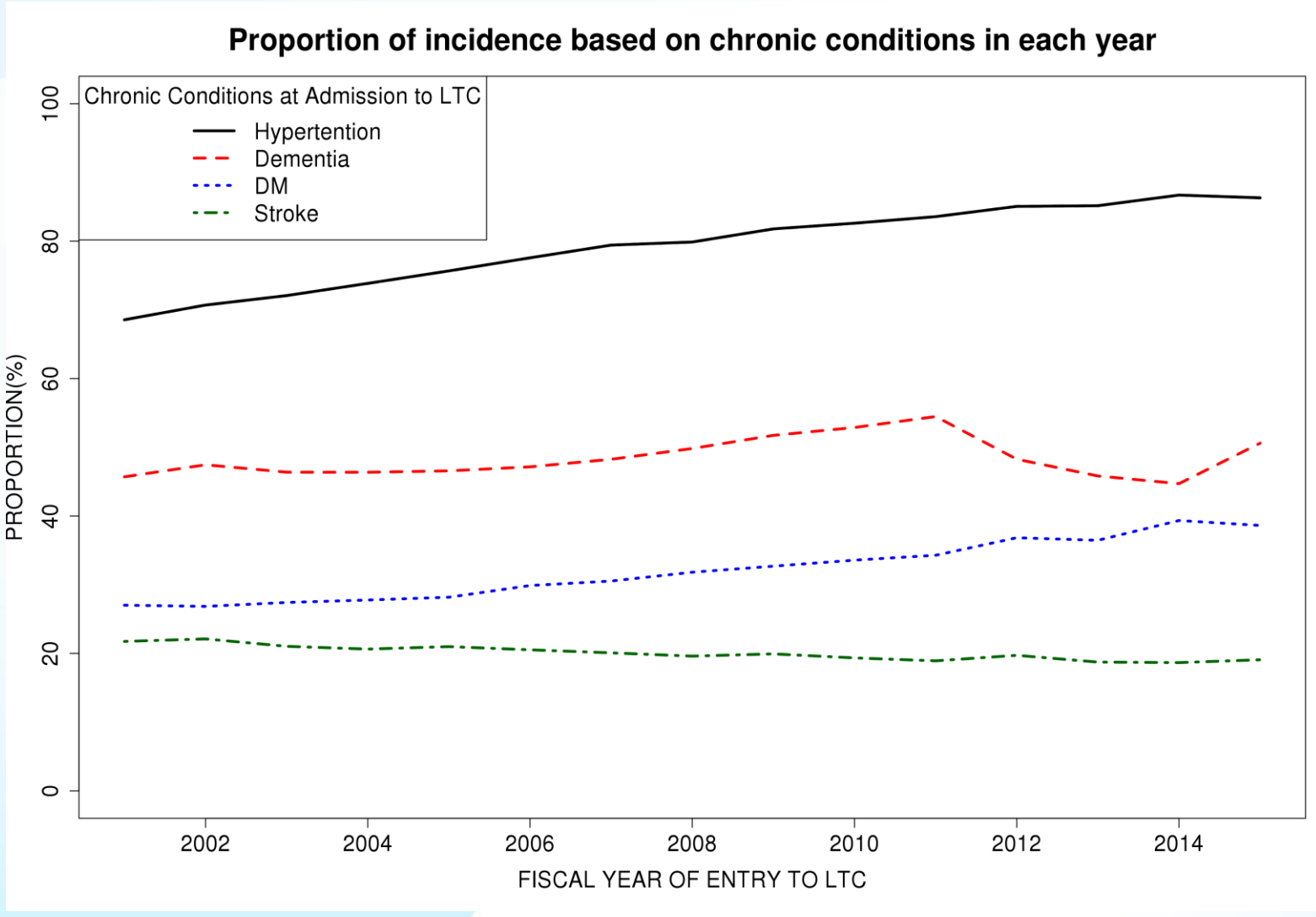

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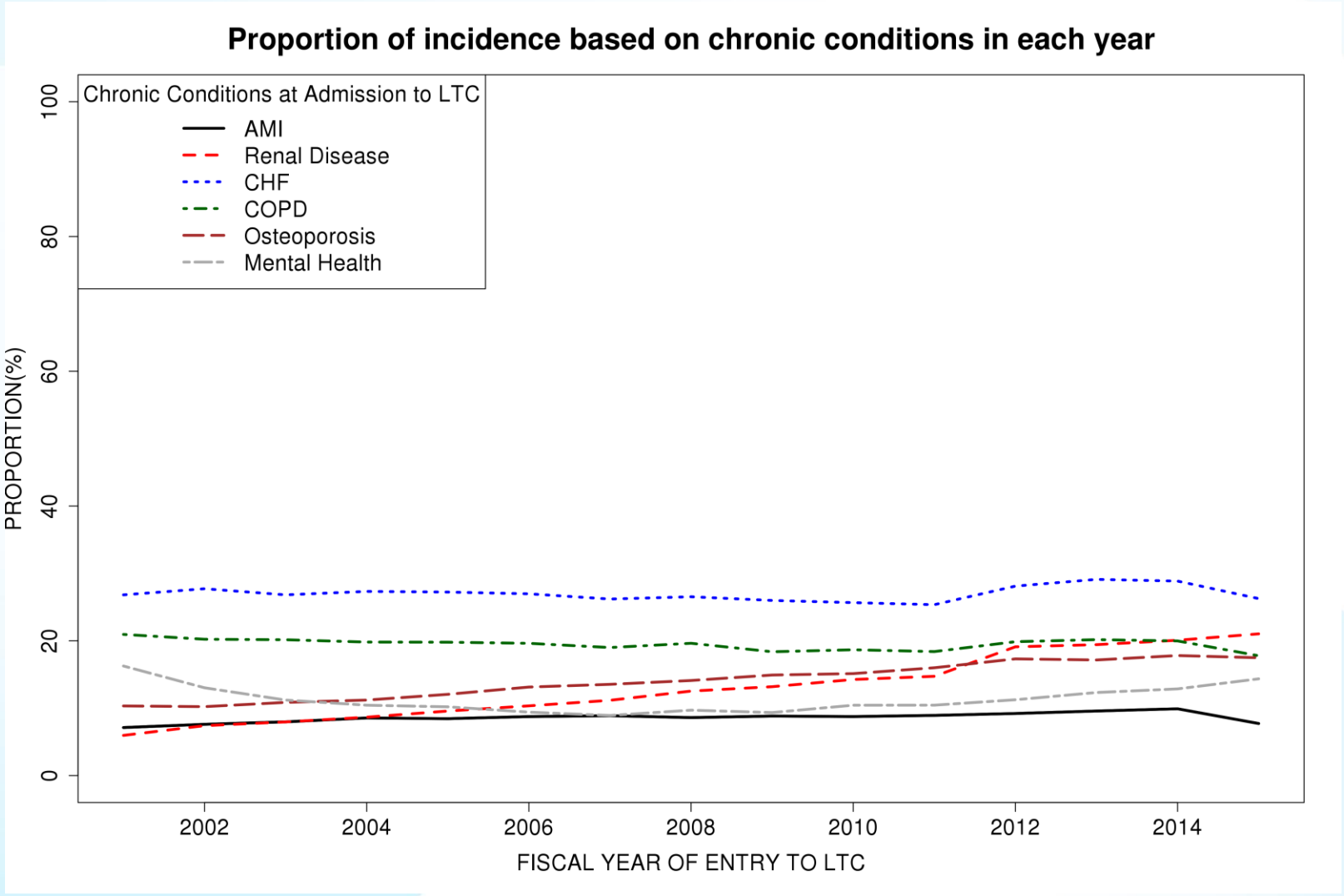

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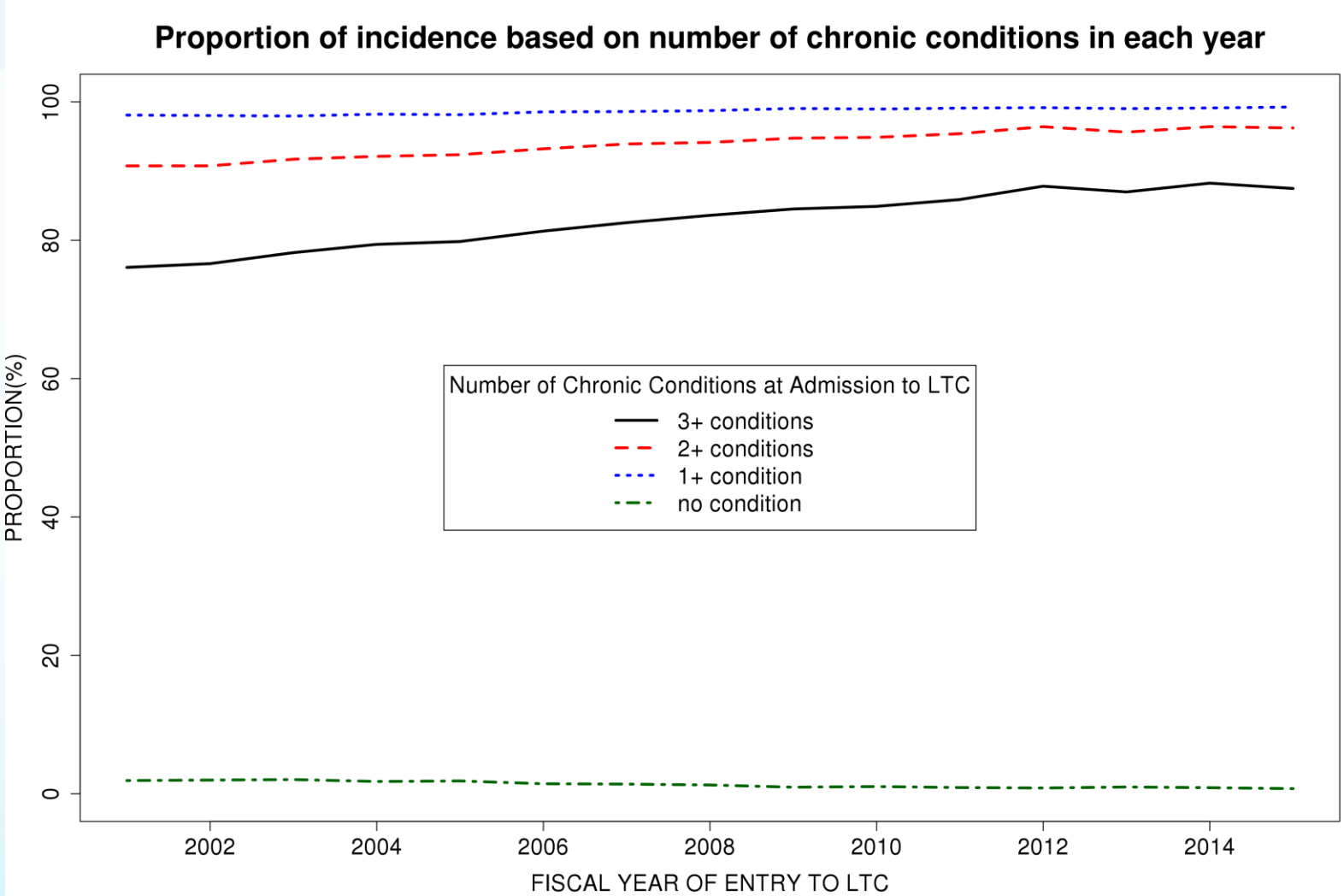

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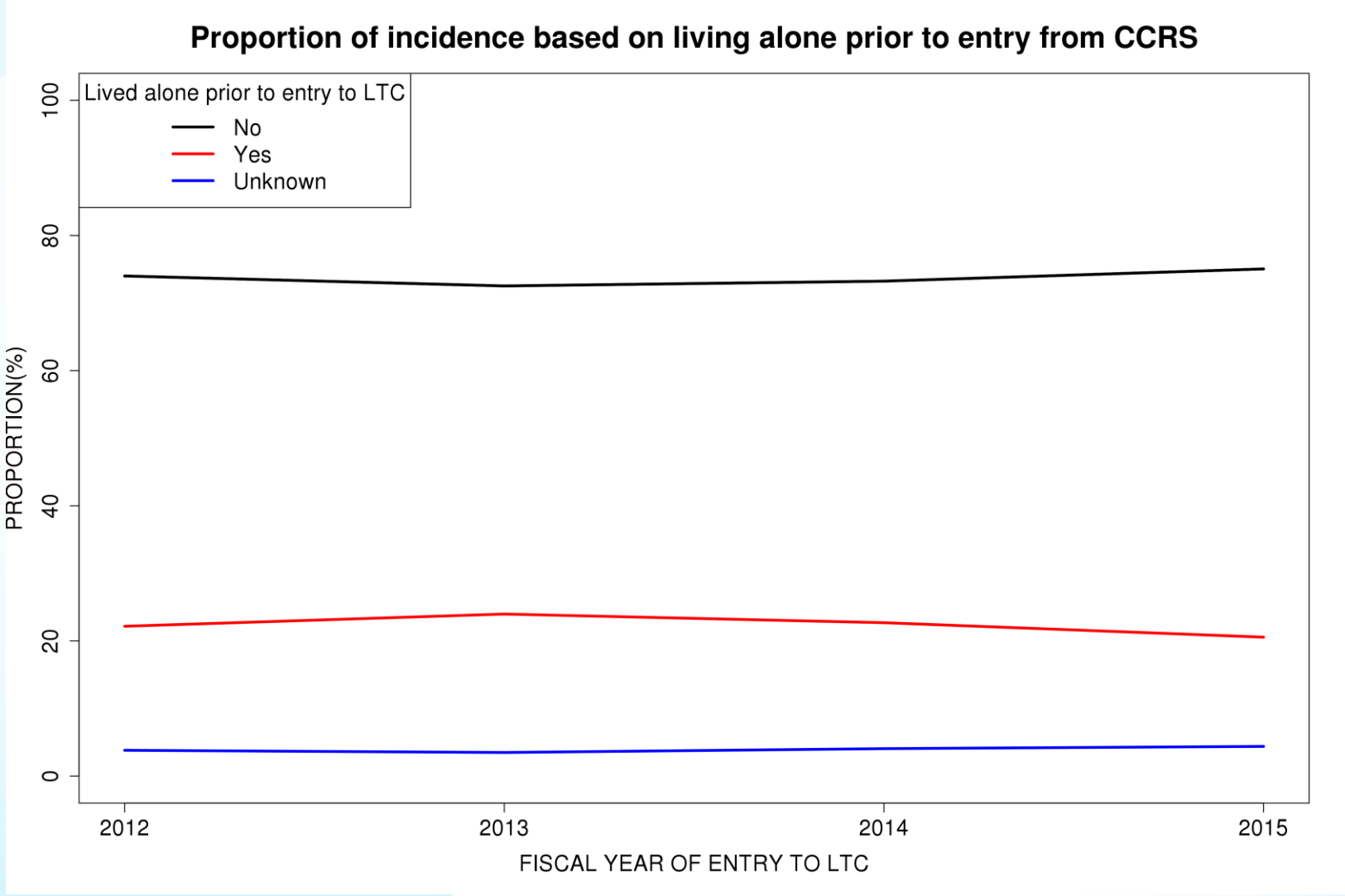

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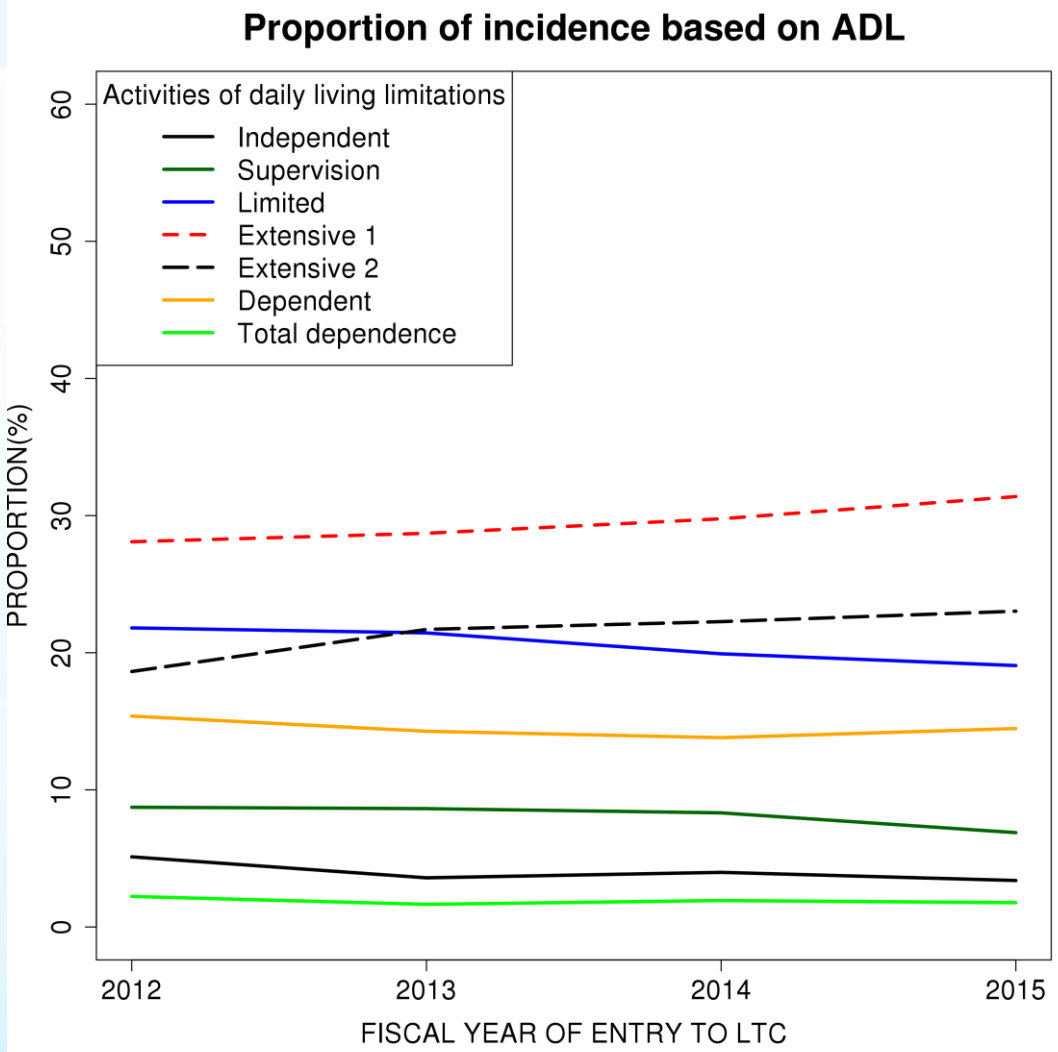

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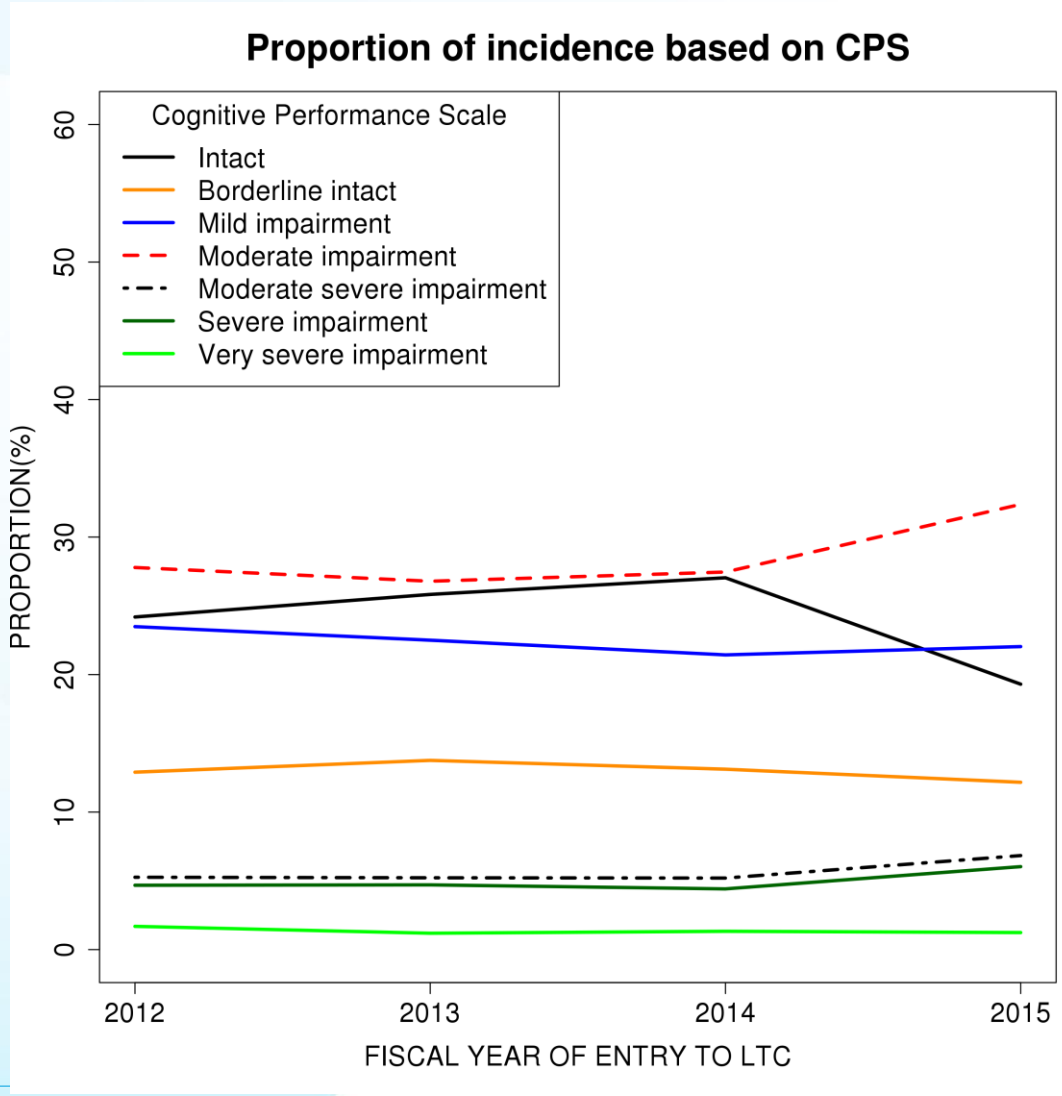

Conclusions / Next steps

Conclusions:

- Aging population in Canada, an increasing demand for LTC services
- Necessity of having information regarding LTC entry prior to 2010 (when CCRS data is available)
- Developing a high-performing algorithm for capturing LTC entry incidence
- Exploring the trend of different factor at the entry over time to better plan for LTC services

Next Steps:

- Validating the departure of LTC residents
  - ❑ Helps us to measure LTC length of stay
  - ❑ Length of stay is a stronger factor for making decisions regarding the improvement of LTC services.

Project team

- **Nassim Mojaverian,** Institute for Clinical Evaluative Sciences (ICES)
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- **Natasha Lane**, University of Toronto
- **Peter Tanuseputro**, Bruyère Research Institute & Ottawa Hospital Research Institute
- **Walter Wodchis**, Institute of Health Policy Management and Evaluation, University of Toronto

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- Jun Guan, Institute for Clinical Evaluative Sciences
- Luke Mondor, Institute for Clinical Evaluative Sciences

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Thank You

Additional

Gender	fiscal_year	Person-years	Incident Cases	Population	Crude Rate	LCI	UCI
B	2001	1,438,390	12,502	1446503	869.17	854.00	884.54
F	2001	797,168	8,200	802242	1028.64	1006.50	1051.15
M	2001	641,222	4,302	644261	670.91	651.01	691.26
B	2002	1,489,379	16,218	1499040	1088.91	1072.21	1105.80
F	2002	825,551	10,839	831778	1312.94	1288.34	1337.90
M	2002	663,829	5,379	667262	810.30	788.79	832.25
B	2003	1,544,066	17,595	1550364	1139.52	1122.75	1156.49
F	2003	856,110	11,593	860479	1354.15	1329.61	1379.03
M	2003	687,957	6,002	689885	872.44	850.51	894.80
B	2004	1,587,114	18,078	1598839	1139.05	1122.50	1155.78
F	2004	879,725	11,962	887076	1359.74	1335.48	1384.33
M	2004	707,389	6,116	711763	864.59	843.05	886.53
B	2005	1,634,104	18,187	1645853	1112.96	1096.85	1129.26
F	2005	904,566	12,109	912040	1338.65	1314.91	1362.71
M	2005	729,538	6,078	733813	833.13	812.32	854.34
B	2006	1,676,952	19,152	1689427	1142.07	1125.95	1158.36
F	2006	927,904	12,804	935732	1379.88	1356.08	1404.00
M	2006	749,048	6,348	753695	847.48	826.75	868.58
B	2007	1,723,324	18,182	1737816	1055.05	1039.77	1070.50
F	2007	952,367	12,141	961068	1274.82	1252.25	1297.71
M	2007	770,957	6,041	776748	783.57	763.94	803.59
B	2008	1,758,007	18,860	1768923	1072.81	1057.55	1088.23
F	2008	970,299	12,552	977325	1293.62	1271.09	1316.45
M	2008	787,708	6,308	791598	800.80	781.16	820.81
B	2009	1,814,424	19,361	1826125	1067.06	1052.08	1082.20
F	2009	998,738	13,051	1006318	1306.75	1284.42	1329.36
M	2009	815,686	6,310	819807	773.58	754.61	792.91
B	2010	1,870,962	19,103	1882626	1021.03	1006.60	1035.61
F	2010	1,027,681	12,753	1035152	1240.95	1219.50	1262.68
M	2010	843,282	6,350	847474	753.01	734.60	771.76
B	2011	1,965,394	19,100	1971313	971.82	958.08	985.70
F	2011	1,075,907	12,744	1080256	1184.49	1164.01	1205.24
M	2011	889,487	6,356	891057	714.57	697.11	732.36
B	2012	2,055,395	6,860	2061519	333.76	325.90	341.75
F	2012	1,122,679	4,417	1126337	393.43	381.92	405.21
M	2012	932,716	2,443	935182	261.92	251.64	272.52
B	2013	2,141,422	7,391	2150762	345.14	337.32	353.10
F	2013	1,166,552	4,800	1171933	411.47	399.91	423.28
M	2013	974,869	2,591	978829	265.78	255.64	276.21
B	2014	2,195,649	7,882	2211606	358.98	351.10	367.00
F	2014	1,193,743	5,096	1202618	426.89	415.25	438.78
M	2014	1,001,905	2,786	1008988	278.07	267.84	288.59
B	2015	2,281,250	12,181	2290111	533.96	524.52	543.53
F	2015	1,237,851	8,059	1243216	651.05	636.91	665.42
M	2015	1,043,398	4,122	1046895	395.06	383.09	407.30

Additional

Age at admission							
adm_year	N Obs	Mean	Median	Std Dev	Lower Quartile	Upper Quartile	Quartile Range
2001	12502	80.213806	81	5.846403	76	85	9
2002	16218	80.896288	82	5.954275	77	86	9
2003	17595	81.161353	82	6.231025	77	86	9
2004	18078	81.707213	82	6.316351	78	87	9
2005	18187	82.009292	83	6.531465	78	87	9
2006	19152	82.353018	83	6.629069	78	87	9
2007	18182	82.680948	83	6.757054	78	88	10
2008	18860	82.762566	84	6.988203	78	88	10
2009	19361	83.107278	84	7.044179	79	88	9
2010	19103	83.29566	84	7.251073	79	89	10
2011	19100	83.458168	84	7.323616	79	89	10
2012	6860	83.312391	84	7.38794	79	89	10
2013	7391	83.195102	84	7.697289	78	89	11
2014	7882	83.369957	84	7.65424	78	89	11
2015	12181	83.732206	85	7.784392	79	90	11

Additional

Incident cases #230652

The eligible cohort #3531085