

Supplementary Content**End-of-life cancer care: a cohort study of immigrants and long-term residents in Ontario, Canada**

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Supplementary table 1. Data sources

Data element	Data source
Baseline characteristics	
Study population	Registrar General of Ontario Vital Statistics Database
Immigrant status and related data	Immigration, Refugees and Citizenship Canada Permanent Resident Database
Age, sex, community of residence	Registered Persons Database
Community size, neighbourhood income quintile	Statistics Canada Postal Code Conversion File
Cancer type	Ontario Cancer Registry
Charlson score	Canadian Institute for Health Information Discharge Abstract Database
Indicators	
Death in acute care hospital or bed	Canadian Institute for Health Information Discharge Abstract Database
New hospitalization within 30 days of death	Canadian Institute for Health Information Discharge Abstract Database
ICU admission within 30 days of death	Canadian Institute for Health Information Discharge Abstract Database
≥ 1 ED visit within 30 days of death	National Ambulatory Care Reporting System
Chemotherapy within 2 weeks of death	Ontario Health Insurance Plan Physician Claims database
Home visits within 6 months of death	Ontario's Home Care Database
Physician house call within 2 weeks of death	Ontario Health Insurance Plan Physician Claims database

Supplementary table 2. Quality indicator rates by ethnicity and immigrant status, 2004-2015

Indicator	Ethnic Group								All Immigrants*	Long-term Residents	p-value†
	Black	East Asian	Latin American	South Asian	Southeast Asian	West Asian/Arab	White-Eastern European	White-Western European			
	n (%)										
Population size, n	1052	2987	670	2180	1129	1028	2499	1418	13 085	229 471	
Death in acute care hospital or bed‡	623 (59.2)	1846 (61.8)	367 (54.8)	1353 (62.1)	681 (60.3)	632 (61.5)	1259 (50.4)	659 (46.5)	7493 (57.3)	111 544 (48.6)	<0.001
New hospitalization within 30 days of death	585 (64.6)	1855 (69.1)	369 (61.8)	1269 (66.8)	695 (68.9)	632 (68.5)	1327 (58.4)	731 (55.6)	7532 (64.3)	121 559 (57.4)	<0.001
Eligible, n	906	2686	597	1899	1008	922	2272	1314	11 707	211 618	
ICU admission within 30 days of death‡	124 (11.8)	306 (10.2)	72 (10.7)	293 (13.4)	146 (12.9)	140 (13.6)	223 (8.9)	134 (9.4)	1455 (11.1)	19 097 (8.3)	
≥ 1 ED visit within 30 days of death	566 (62.5)	1580 (58.8)	335 (56.1)	1189 (62.6)	631 (62.6)	573 (62.1)	1248 (54.9)	699 (53.2)	6882 (58.8)	113 674 (53.7)	<0.001
Eligible, n	906	2686	597	1899	1008	922	2272	1314	11 707	211 618	
Chemotherapy within 2 weeks of death‡	44 (4.2)	94 (3.1)	21 (3.1)	105 (4.8)	52 (4.6)	33 (3.2)	84 (3.4)	60 (4.2)	497-502 (3.80-3.84)	7527 (3.3)	0.001
Home visit within 6 months of death by a:											
Registered nurse	697 (67.0)	1787 (60.3)	457 (69.1)	1420 (66.3)	735 (65.9)	712 (69.8)	1712 (69.0)	1008 (71.8)	8606 (66.5)	147 512 (64.8)	<0.001
Personal support worker	461 (44.3)	1032 (34.8)	295 (44.6)	923 (43.1)	408 (36.6)	438 (42.9)	927 (37.4)	599 (42.7)	5126 (39.6)	93 866 (41.3)	<0.001
Eligible, n	1040	2964	661	2143	1116	1020	2480	1404	12 947	227 553	
For palliative care (fiscal year 2005+ only)	446 (46.3)	1190 (44.5)	314 (51.5)	909 (46.0)	460 (44.7)	494 (52.2)	1157 (50.4)	665 (51.7)	5685 (47.8)	92 849 (45.9)	<0.001
Eligible, n	964	2674	610	1976	1028	946	2297	1287	11 897	202,492	
Physician house call within 2 weeks of death	187 (25.0)	517 (22.8)	147 (30.2)	412 (25.9)	170 (20.4)	220 (28.3)	603 (30.4)	380 (32.5)	2661 (26.7)	50 860 (27.3)	0.21

Eligible, n	748	2271	487	1591	833	777	1982	1169	9948	186 113	
Aggressive care§	172 (19.0)	442 (16.5)	103 (17.3)	383 (20.2)	211 (20.9)	192 (20.8)	326 (14.3)	198 (15.1)	2050 (17.5)	29 087 (13.7)	<0.001
Eligible, n	906	2686	597	1899	1008	922	2272	1314	11 707	21 1618	
Supportive care	469 (48.7)	1252 (46.8)	333 (54.6)	962 (48.7)	479 (46.6)	518 (54.8)	1224 (53.3)	715 (55.6)	6006 (50.5)	101 347 (50.0)	0.36
Eligible, n	964	2674	610	1976	1028	946	2297	1287	11 897	202 492	

* Includes 122 immigrants whose ethnicity could not be classified. A range is reported for chemotherapy within 2 weeks of death to suppress a count of < 6 in the unknown ethnicity group.

†p-value is for all immigrants versus long-term residents.

‡ Eligible population is the entire population.

§ Aggressive care is defined as having ≥2 emergency department visits, ≥2 new hospitalizations or an ICU admission within 30 days of death.

|| Supportive care is defined as having ≥1 physician house call within 2 weeks of death, or ≥1 palliative nursing or personal support worker home visit within 6 months of death.

ED, emergency department; ICU, intensive care unit.

Supplementary table 3. Logistic regression models for aggressive care*

		Univariate			Ethnic groups vs long-term residents			Immigrants vs long-term residents			Ethnic groups only		
		OR†	95% CI		OR†	95% CI		OR†	95% CI		OR†	95% CI	
			Lower	Upper		Lower	Upper		Lower	Upper		Lower	Upper
Ethnicity	White-Eastern European	1.05	0.93	1.18	0.90	0.79	1.01	na	na	na	0.94	0.75	1.16
	White-Western European	1.11	0.95	1.29	0.99	0.85	1.15	na	na	na	Ref	-	-
	Latin American	1.32	1.06	1.63	1.12	0.90	1.38	na	na	na	1.15	0.87	1.51
	East Asian	1.25	1.13	1.38	1.13	1.02	1.25	na	na	na	1.12	0.91	1.37
	Black	1.47	1.25	1.74	1.19	1.00	1.41	na	na	na	1.20	0.94	1.53
	South Asian	1.58	1.42	1.77	1.35	1.20	1.52	na	na	na	1.31	1.07	1.62
	Southeast Asian	1.65	1.42	1.92	1.38	1.19	1.62	na	na	na	1.37	1.08	1.72
	West Asian/Arab	1.66	1.41	1.94	1.41	1.20	1.66	na	na	na	1.46	1.15	1.85
	All immigrants	1.33	1.27	1.40	na	na	na	1.15	1.09	1.21	na	na	na
	Long-term residents	Ref	-	-	Ref	-	-	Ref	-	-	na	na	na
Age (per year)		0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Sex	Men	1.30	1.27	1.33	1.31	1.28	1.35	1.31	1.28	1.35	1.24	1.11	1.38
	Women	Ref	-	-	Ref	-	-	Ref	-	-	Ref	-	-
Charlson score	1+	0.94	0.91	0.97	1.00	0.96	1.04	1.00	0.97	1.04	0.95	0.81	1.11
	0 or missing	Ref	-	-	Ref	-	-	Ref	-	-	1.00	-	-
Cancer type	Breast	0.70	0.67	0.74	0.77	0.72	0.81	0.77	0.73	0.81	0.78	0.63	0.96
	Colorectal	0.93	0.89	0.97	0.98	0.94	1.02	0.98	0.94	1.02	0.82	0.67	0.99
	Prostate	0.62	0.59	0.66	0.67	0.63	0.71	0.67	0.63	0.71	0.51	0.37	0.70
	Other	1.03	1.01	1.06	1.03	1.00	1.06	1.03	1.00	1.06	1.02	0.90	1.16
	Lung	Ref	-	-	Ref	-	-	Ref	-	-	Ref	-	-
Neighbourhood income quintile	1 (lowest)	1.08	1.04	1.12	1.05	1.01	1.10	1.06	1.01	1.10	1.05	0.88	1.26
	2	1.05	1.01	1.09	1.03	0.99	1.07	1.03	0.99	1.07	1.11	0.92	1.33
	3	1.06	1.02	1.10	1.03	0.99	1.08	1.04	0.99	1.08	1.01	0.84	1.22
	4	1.04	1.003	1.09	1.02	0.98	1.06	1.02	0.98	1.06	1.03	0.85	1.25
	5	Ref	-	-	Ref	-	-	Ref	-	-	Ref	-	-
Community size	< 10 000	1.20	1.16	1.24	1.25	1.20	1.30	1.25	1.20	1.30	1.04	0.67	1.62

	10 000-99 999	1.17	1.13	1.21	1.25	1.20	1.30	1.25	1.19	1.30	1.27	0.82	1.98
	≥ 100 000	Ref	-	-	Ref	-	-	Ref	-	-	Ref	-	-
Health region	Erie St.Clair	1.03	0.97	1.10	0.95	0.89	1.02	0.95	0.89	1.02	0.94	0.66	1.34
	South West	1.13	1.06	1.20	1.02	0.96	1.08	1.02	0.96	1.09	0.94	0.65	1.38
	Waterloo	1.05	0.98	1.12	1.01	0.94	1.08	1.01	0.95	1.08	1.16	0.86	1.56
	Wellington												
	Hamilton Niagara Haldimand Brant	0.94	0.89	0.99	0.94	0.89	0.99	0.94	0.89	0.99	1.12	0.87	1.44
	Central West	1.25	1.16	1.34	1.15	1.07	1.23	1.16	1.08	1.25	1.34	1.09	1.66
	Mississauga Halton	1.00	0.94	1.07	0.98	0.92	1.05	0.98	0.92	1.05	1.04	0.85	1.28
	Toronto Central	Ref	-	-	Ref	-	-	Ref	-	-	Ref	-	-
	Central	1.17	1.10	1.24	1.16	1.09	1.23	1.16	1.09	1.23	1.20	1.01	1.43
	Central East	1.10	1.04	1.16	1.03	0.97	1.09	1.04	0.98	1.10	1.30	1.08	1.57
	South East	1.14	1.07	1.22	0.98	0.91	1.05	0.98	0.92	1.06	1.17	0.59	2.32
	Champlain	0.95	0.90	1.01	0.88	0.83	0.93	0.88	0.83	0.94	1.03	0.80	1.34
	North Simcoe Muskoka	1.11	1.03	1.19	0.96	0.89	1.04	0.96	0.89	1.04	1.33	0.76	2.35
	North East	1.14	1.07	1.21	0.95	0.88	1.01	0.95	0.88	1.02	1.06	0.47	2.41
North West	0.90	0.81	0.99	0.82	0.74	0.90	0.82	0.74	0.90	1.11	0.41	2.98	
Year of death	2004	1.00	0.94	1.07	0.97	0.91	1.04	0.97	0.91	1.04	0.92	0.70	1.20
	2005	0.95	0.89	1.01	0.93	0.87	0.99	0.93	0.87	0.99	0.90	0.69	1.18
	2006	0.95	0.89	1.01	0.92	0.87	0.98	0.92	0.87	0.98	1.05	0.82	1.35
	2007	0.99	0.93	1.06	0.97	0.91	1.03	0.97	0.91	1.03	1.03	0.80	1.31
	2008	1.02	0.96	1.08	1.00	0.94	1.06	1.00	0.94	1.06	0.88	0.69	1.12
	2009	0.99	0.93	1.05	0.97	0.91	1.03	0.97	0.91	1.03	0.96	0.76	1.22
	2010	0.97	0.91	1.03	0.95	0.89	1.01	0.95	0.89	1.01	0.90	0.70	1.14
	2011	0.98	0.92	1.04	0.97	0.91	1.03	0.97	0.91	1.03	0.86	0.68	1.09
	2012	0.99	0.93	1.06	0.97	0.92	1.04	0.97	0.92	1.04	1.04	0.83	1.30
	2013	0.96	0.90	1.03	0.95	0.89	1.02	0.95	0.89	1.02	0.94	0.72	1.22
	2014	0.94	0.88	1.01	0.94	0.88	1.01	0.94	0.88	1.01	0.94	0.73	1.22
2015	Ref	-	-	Ref	-	-	Ref	-	-	Ref	-	-	
Education	> Secondary school	na	na	na	na	na	na	na	na	na	1.05	0.94	1.17
	Secondary school or less	na	na	na	na	na	na	na	na	na	Ref	-	-

Language ability	Neither English or French	na	na	na	na	na	na	na	na	na	0.97	0.87	1.09
	English and/or French	na	na	na	na	na	na	na	na	na	Ref	-	-
Time since immigration	< 5 years	na	na	na	na	na	na	na	na	na	1.04	0.88	1.23
	5-10 years	na	na	na	na	na	na	na	na	na	0.99	0.86	1.13
	> 10 years	na	na	na	na	na	na	na	na	na	Ref	-	-
Immigration category	Economic	na	na	na	na	na	na	na	na	na	1.03	0.91	1.18
	Refugee or other	na	na	na	na	na	na	na	na	na	0.98	0.85	1.13
	Family	na	na	na	na	na	na	na	na	na	Ref	-	-

* Aggressive care is defined as having ≥ 2 emergency department visits, ≥ 2 new hospitalizations or an ICU admission within 30 days of death. Ethnic groups are listed in order of increasing receipt of aggressive care versus long-term residents. Immigrants of unknown ethnicity are excluded from analyses.

† Boldface type indicates significant values at $p < 0.05$.

CI=confidence interval, na=not applicable, OR=odds ratio.

Supplementary table 4. Logistic regression models for supportive care*

		Univariate			Ethnic groups vs long-term residents			Immigrants vs long-term residents			Ethnic groups only		
		OR†	95% CI		OR†	95% CI		OR†	95% CI		OR†	95% CI	
			Lower	Upper		Lower	Upper		Lower	Upper		Lower	Upper
Ethnicity	Southeast Asian	0.87	0.77	0.99	0.75	0.66	0.85	na	na	na	0.68	0.57	0.81
	Black	0.94	0.83	1.07	0.82	0.72	0.93	na	na	na	0.73	0.61	0.87
	East Asian	0.89	0.82	0.96	0.89	0.82	0.96	na	na	na	0.78	0.67	0.90
	South Asian	0.95	0.87	1.03	0.93	0.85	1.02	na	na	na	0.82	0.70	0.96
	White-Eastern European	1.14	1.05	1.24	1.00	0.91	1.08	na	na	na	0.86	0.74	1.01
	West Asian/Arab	1.22	1.07	1.38	1.07	0.93	1.22	na	na	na	0.94	0.79	1.14
	Latin American	1.20	1.03	1.41	1.11	0.94	1.31	na	na	na	0.97	0.79	1.19
	White-Western European	1.25	1.12	1.39	1.16	1.03	1.30	na	na	na	Ref	-	-
	All immigrants	1.02	0.8	1.06	na	na	na	0.95	0.91	0.98	na	na	na
	Long-term residents	Ref	-	-	Ref	-	-	Ref	-	-	na	na	na
Age (years)		0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.99	0.99	0.99
Sex	Men	0.92	0.90	0.93	0.92	0.90	0.93	0.92	0.90	0.93	0.84	0.78	0.91
	Women	Ref	-	-	Ref	-	-	Ref	-	-	Ref	-	-
Charlson score	1+	0.89	0.87	0.91	0.95	0.93	0.97	0.95	0.93	0.97	1.03	0.92	1.16
	0 or missing	Ref	-	-	Ref	-	-	Ref	-	-	Ref	-	-
Cancer type	Breast	1.04	1.01	1.08	0.98	0.94	1.01	0.98	0.94	1.01	1.01	0.86	1.18
	Colorectal	0.92	0.89	0.95	0.99	0.96	1.02	0.99	0.96	1.02	1.03	0.90	1.19
	Prostate	0.84	0.80	0.87	1.01	0.98	1.05	1.01	0.98	1.05	1.08	0.89	1.32
	Other	0.85	0.83	0.87	0.84	0.83	0.86	0.84	0.83	0.86	0.82	0.74	0.90
	Lung	Ref	-	-	Ref	-	-	Ref	-	-	Ref	-	-
Neighbourhood income quintile	1 (lowest)	0.74	0.72	0.76	0.74	0.72	0.76	0.74	0.72	0.76	0.84	0.74	0.96
	2	0.84	0.82	0.87	0.85	0.83	0.87	0.85	0.82	0.87	0.82	0.71	0.93
	3	0.87	0.85	0.90	0.88	0.86	0.91	0.88	0.86	0.91	0.96	0.83	1.10
	4	0.93	0.91	0.96	0.93	0.90	0.95	0.93	0.90	0.95	0.91	0.79	1.05

	5	Ref	-	-	Ref	-	-	Ref	-	-	Ref	-	-
Community size	< 10,000	0.89	0.87	0.91	0.93	0.91	0.96	0.93	0.91	0.96	1.05	0.76	1.46
	10,000-99,999	0.95	0.93	0.98	0.99	0.96	1.02	0.99	0.96	1.02	0.94	0.67	1.32
	≥ 100,000	Ref	-	-	Ref	-	-	Ref	-	-	Ref	-	-
Health region	Erie St.Clair	1.37	1.30	1.43	1.34	1.28	1.41	1.35	1.28	1.41	1.33	1.03	1.72
	South West	0.88	0.84	0.92	0.89	0.85	0.93	0.89	0.85	0.93	0.97	0.75	1.26
	Waterloo Wellington	1.84	1.75	1.93	1.83	1.74	1.92	1.83	1.74	1.92	1.79	1.42	2.26
	Hamilton Niagara Haldimand Brant	1.24	1.19	1.28	1.24	1.19	1.29	1.24	1.19	1.29	1.18	0.97	1.42
	Central West	0.92	0.87	0.97	0.87	0.83	0.92	0.87	0.82	0.92	0.93	0.79	1.10
	Mississauga Halton	1.27	1.21	1.32	1.20	1.15	1.26	1.20	1.14	1.25	1.19	1.03	1.38
	Toronto Central	Ref	-	-	Ref	-	-	Ref	-	-	Ref	-	-
	Central	1.02	0.98	1.07	1.01	0.97	1.06	1.01	0.97	1.05	1.02	0.90	1.16
	Central East	1.02	0.98	1.06	1.03	0.99	1.07	1.03	0.99	1.07	0.96	0.83	1.10
	South East	0.88	0.84	0.93	0.90	0.86	0.95	0.91	0.86	0.95	0.65	0.39	1.08
	Champlain	1.47	1.41	1.53	1.45	1.39	1.51	1.45	1.39	1.51	1.61	1.33	1.96
	North Simcoe Muskoka	1.29	1.23	1.36	1.30	1.23	1.37	1.30	1.23	1.37	1.24	0.80	1.94
	North East	0.96	0.91	1.00	0.97	0.93	1.02	0.97	0.93	1.02	1.44	0.77	2.71
North West	0.63	0.59	0.67	0.62	0.58	0.67	0.62	0.58	0.67	1.53	0.72	3.23	
Year of death	2005	0.59	0.57	0.62	0.56	0.54	0.59	0.56	0.54	0.59	0.62	0.51	0.77
	2006	0.67	0.64	0.70	0.64	0.61	0.67	0.64	0.61	0.67	0.56	0.46	0.67
	2007	0.67	0.65	0.70	0.65	0.62	0.67	0.65	0.62	0.67	0.62	0.51	0.74
	2008	0.67	0.64	0.69	0.64	0.61	0.67	0.64	0.61	0.67	0.62	0.52	0.74
	2009	0.70	0.67	0.73	0.67	0.64	0.70	0.67	0.65	0.70	0.73	0.61	0.87
	2010	0.74	0.71	0.77	0.72	0.69	0.75	0.72	0.69	0.75	0.77	0.64	0.91
	2011	0.77	0.74	0.80	0.75	0.72	0.78	0.75	0.72	0.78	0.89	0.75	1.05
	2012	0.77	0.74	0.81	0.76	0.72	0.79	0.76	0.72	0.79	0.86	0.73	1.02
	2013	0.85	0.81	0.89	0.85	0.81	0.89	0.85	0.81	0.89	0.73	0.60	0.88
	2014	0.92	0.87	0.96	0.91	0.87	0.96	0.91	0.87	0.96	0.87	0.72	1.06
	2015	Ref	-	-	Ref	-	-	Ref	-	-	Ref	-	-

Education	> Secondary school	na	na	na	na	na	na	na	na	na	1.04	0.95	1.13
	Secondary school or less	na	na	na	na	na	na	na	na	na	Ref	-	-
Language ability	Neither English or French	na	na	na	na	na	na	na	na	na	1.01	0.92	1.10
	English and/or French	na	na	na	na	na	na	na	na	na	Ref	-	-
Time since immigration	< 5 years	na	na	na	na	na	na	na	na	na	0.85	0.75	0.97
	5-10 years	na	na	na	na	na	na	na	na	na	0.98	0.88	1.10
	> 10 years	na	na	na	na	na	na	na	na	na	Ref	-	-
Immigration category	Economic	na	na	na	na	na	na	na	na	na	1.02	0.92	1.14
	Refugee or other	na	na	na	na	na	na	na	na	na	1.03	0.92	1.15
	Family	na	na	na	na	na	na	na	na	na	Ref	-	-

* Supportive care is defined as ≥ 1 physician house call within 2 weeks of death, or ≥ 1 palliative nursing or personal support worker home visit within 6 months of death. Ethnic groups are listed in order of increasing receipt of supportive care versus long-term residents. Immigrants of unknown ethnicity are excluded from analyses. Deaths in 2004 are excluded as home care data is only available from April 2005.

† Boldface type indicates significant values at $p < 0.05$.

CI, confidence interval; na, not applicable; OR, odds ratio.