Appendix 1 (as supplied by the authors)

Supplement: Association Between Ethnicity and End-of-life Care

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Appendix to: Yarnell CJ, Fu L, Bonares MJ, et al. Association between Chinese or South Asian ethnicity and end-of-life care in Ontario, Canada. *CMAJ* 2020. doi: 10.1503/cmaj.190655.

Surname Algorithm Sensitivity Analysis Calculations

The surname algorithm was designed to identify people with South Asian (India, Pakistan, Bangladesh and Sri Lanka) or Chinese (Taiwan, Hong Kong, or China) origins.

Both ethnicity cohorts are specific but not sensitive such that some Chinese and South Asian decedents are included in the general population cohort. Here we calculate the maximum proportion of those decedents dying in ICU for each ethnicity that would render our results statistically not significant.

We can use the sensitivities of the surname algorithms to estimate the number of decedents misclassified. The sensitivity for identifying decedents of Chinese ethnicity is 80.2% and we identified 18,959 decedents of Chinese ethnicity, so we estimate 4,681 misclassified decedents of Chinese ethnicity. Similarly, for decedents of South Asian ethnicity the sensitivity is 50.4% and the identified number is 11,406, so we estimate 11,225 misclassified decedents of South Asian ethnicity.

We want to calculate the rate of death in ICU among misclassified decedents that would reduce the overall exposure group rate of death in ICU close enough to the general population rate that the 95% confidence interval overlaps the rate for the general population. For event rate r in correctly classified decedents, number n of correctly classified decedents, number m of misclassified decedents, and threshold T where the overall rate is low enough that the 95% confidence interval overlaps the general population rate, we are solving the following equation for event rate s in misclassified decedents: $\frac{rn+sm}{n+m} < T$.

For Chinese decedents we find that $s < 0$ showing that for the estimated number of misclassified Chinese decedents, even if none of those decedents died in the intensive care unit the unadjusted result would still retain statistical significance. For South Asian decedents we find that s = 3.2% and so the proportion of decedents dying in ICU among the miscategorized South Asian decedents must be 3.2% or less in order to invalidate the finding of statistical significance. This is very different from the baseline rate and therefore quite unlikely.

We also performed a graphical sensitivity analysis as a plot of the expected p-value (greater than or equal to vs less than 0.05) in a heat map according to sensitivity of the algorithm (in case sensitivity has shifted somewhat since initial validation) and proportion of misclassified decedents dying in ICU.

```
library(dplyr)
library(tidyr)

##
## Attaching package: 'tidyr'
```

```
## The following object is masked from 'package:magrittr':
##
##     extract

# Make a data frame SA (sensitivity analysis).

K = 400 #number of sensitivities to trial
low_sens = 0.25 # low threshold of sensitivity to trial
high_sens = 1 # high threshold of sensitivity to trial
M = 400 #number of different proportions in misclassified group to trial

N <- c(General = 936829, Chinese = 18952, SouthAsian = 11398)
D <- c(General = 95100, Chinese = 2578, SouthAsian = 2105)

Calculate_Pval <- function(SA, N, D, Ethnicity, Sensitivity, Proportion){
  for (i in 1:dim(SA)[1]){
    for (j in 1:dim(SA)[2]){

      m <- ifelse(Ethnicity == "Chinese", 2, 3)

      n = N[c(1,m)]
      d = D[c(1,m)]

      t_sa <- round(n[2]/Sensitivity[i])
      d_sa <- round(d[2] + t_sa*(1-Sensitivity[i])*Proportion[j])

      n[2] <- t_sa # new number of decedents of that ethnicity
      n[1] <- n[1] + N[m] - t_sa # the decedents come from general population

      d[1] <- d[1] + D[m] - d_sa  #new rate of decedents in ICU in general po
pulation
      d[2] <- d_sa

      SA[i,j] <- prop.test(d,n, alternative = "less", conf.level = 0.975)$p.v
alue

    }
  }
      names(SA)    <- Proportion
      SA <- mutate(SA, Sensitivity = Sensitivity) %>%
        gather(key = "Proportion", value = "Pvalue", -Sensitivity) %>%
        mutate(Proportion = as.numeric(Proportion))
      SA
}


plot_HeatMap <- function(Ethnicity, D, N, K, M, low_sens, high_sens){

  Sensitivity = seq(from = low_sens, to = high_sens, length = K)
```

```r
  Proportion = seq(from = 0, to = 0.20, length = M)

  SA <- as.data.frame(matrix(nrow = K, ncol = M))

  HeatMap <- Calculate_Pval(SA, N, D, Ethnicity, Sensitivity, Proportion)

  m <- ifelse(Ethnicity == "Chinese", 2, 3)
  x_sens <- D[m]/N[m]
  y_sens <- c(0.802, 0.504)[m-1]
  ggplot(data = HeatMap, aes(x = Proportion, y = Sensitivity, fill = Pvalue))
+
      geom_tile() +
      scale_fill_gradient(low = "blue", high = "orange") +
      geom_hline(yintercept=y_sens, size = 1, color = "white") +
      geom_vline(xintercept=x_sens, size = 1, color = "white") +
      annotate("label", y = y_sens+0.05, x = 0.08, label = "Previously valida
ted sensitivity") +
      annotate("label", y = low_sens+0.05, x = 0.16, label = "Observed propor
tion") +
      labs(title = paste(
          "P-value of Difference in Proportion Dying in ICU for", Ethnicity,
"Decedents"),
          subtitle = ("Heatmap according to sensitivity and proportion of mis
classified decedents dying in ICU"),
          x = "Proportion of Misclassified Decedents Dying in ICU",
          y = "Sensitivity of Surname Algorithm") +
    theme_minimal()

  }

plot_HeatMap("Chinese", D, N, K, M, low_sens, high_sens)

plot_HeatMap("South Asian", D, N, K, M, low_sens, high_sens)
```

Figure E1

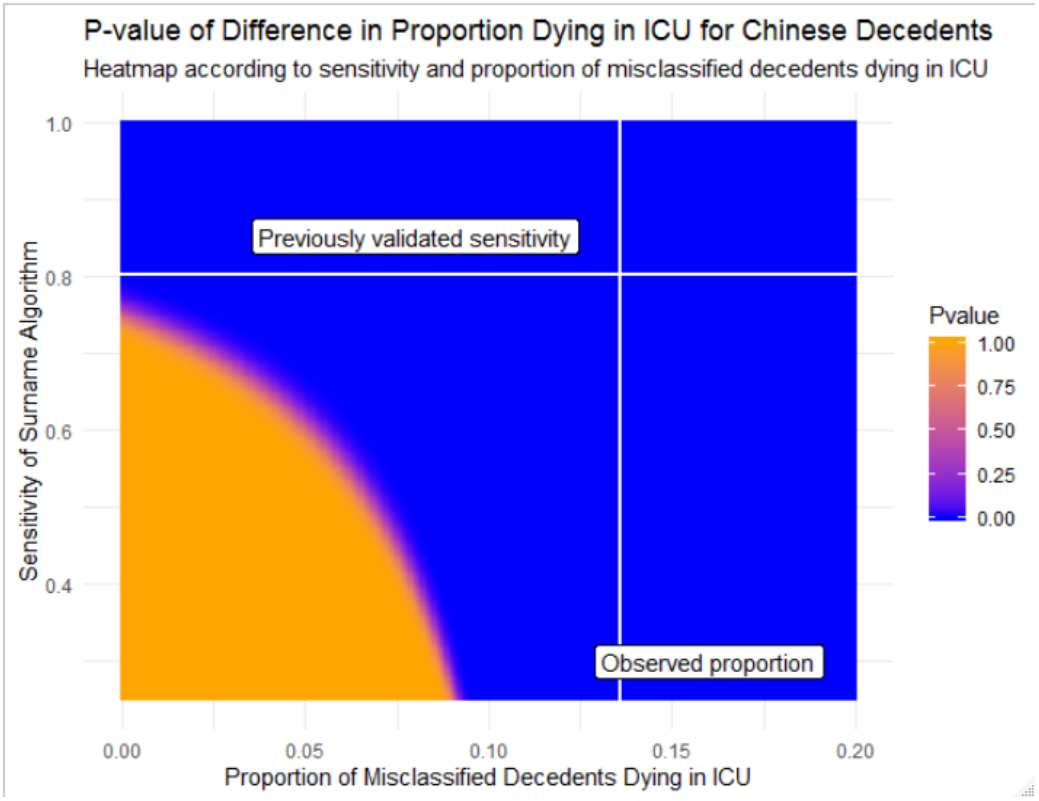
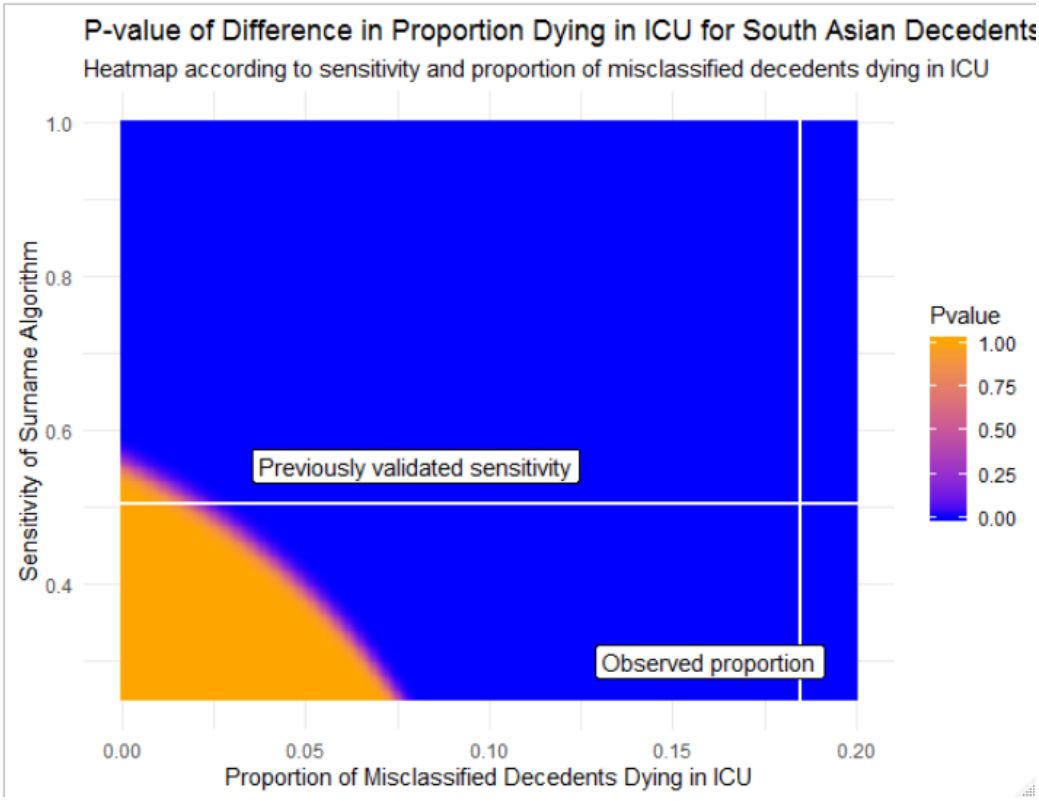

P-value of Difference in Proportion Dying in ICU for Chinese Decedents
Heatmap according to sensitivity and proportion of misclassified decedents dying in ICU
Previously validated sensitivity
Observed proportion
Sensitivity of Surname Algorithm
1.0
0.8
0.6
0.4
0.00
0.05
0.10
0.15
0.20
Proportion of Misclassified Decedents Dying in ICU
Pvalue
1.00
0.75
0.50
0.25
0.00

Figure E2


P-value of Difference in Proportion Dying in ICU for South Asian Decedents
Heatmap according to sensitivity and proportion of misclassified decedents dying in ICU
Sensitivity of Surname Algorithm
1.0
0.8
0.6
0.4
Previously validated sensitivity
Observed proportion
0.00
0.05
0.10
0.15
0.20
Proportion of Misclassified Decedents Dying in ICU
Pvalue
1.00
0.75
0.50
0.25
0.00

Data Availability and Patient Consent

The data for these linked databases is available through the Institute for Clinical Evaluative Sciences (ICES). This is a unique organization which has a special status regarding privacy. It is known as a provincially "prescribed entity" with respect to patient health information (see https://www.ices.on.ca/Data-and-Privacy/Privacy-at-ICES).

Administrative Data Codes

Palliative care provision

- Outpatient physician billings for palliative care:
  - Ontario Health Insurance Plan (OHIP) database codes
    - A945: Special palliative care consultation in clinic, office, home; minimum 50min
    - K023: Palliative care support in half hour increments; may be used to add time for longer consultations following a code for A945, or for any PC support visit. Exclude if patient is in hospital, long-term care (LTC), complex continuing care (CCC), or rehabilitation
    - G512: Weekly care case management from palliative primary care management (Monday–Sunday)
    - G511: Telephone services to patient receiving PC at home (max. 2/week)
    - B966: Travel premium for palliative care (billed with B998/B996)
    - B998: Home visit for palliative care between 07:00 and 24:00
    - B997: Home visit for palliative care between 24:00 and 07:00
    - K700: Palliative care outpatient case conference
  - Home-based physician home visits for palliative care (subset of OHIP codes):
    - B966: Travel premium for palliative care (billed with B998/B996)
    - B998: Home visit for palliative care between 07:00 and 24:00
    - B997: Home visit for palliative care between 24:00 and 07:00
    - G511: Telephone services to patient receiving PC at home (max. 2/week)
- Hospital admissions for palliative care:
  - Canadian Institute for Health Information Discharge Abstract Database (CIHI-DAD):
    - ICD-10 Code: Z51.5 and ICD-9 Code: V66.7: Any diagnosis of "palliative" as the main or contributing reason for admission OR
    - PATSERV = 58: main patient service of "palliative care" was responsible for care
    - PRVSERV[1-8] or INSERV[1-20] = 00121: "palliative medicine" was a provider who provided service, or an intervention service code of palliative medicine was provided
  - OHIP billing codes for inpatient physician services:
    - C945: Special palliative care consult (minimum 50min); K023 may be used to add time for longer consultations following a code for C945, or may be billed alone
    - C882: Family medicine palliative care, non-emergency (routine) hospital inpatient service

        - C982: Specialist palliative care, non-emergency (routine) hospital inpatient service
        - K023: Palliative care support in half hour increments, if patient was in hospital during date of claim
- Emergency department visits for palliative care:
    - National Ambulatory Care Reporting System (NACRS)
        - PRVSERV [1-10] = 00121: Provider service code of palliative medicine
        - CONSULTSERV1 to CONSULTSERV3 = 00121: Consult service of palliative medicine was called
- Home Care:
    - Resident Assessment Instrument—Contact Assessment (RAI-CA) (available 2010):
        - B2c = 1: Referral to initiate/continue palliative care
        - B4 = 12: Expected place of stay during service of Hospice facility or Palliative Care Unit
    - RAI-Home Care (available 2007):
        - P2S = 1 or 2: Hospice care was provided with complete or partial adherence
        - CC3f goals of care = palliative care
    - Home Care Database (HCD) (available 2005):
        - SRC_admission = 95: Service recipient code (i.e. classification) of end of life on admission
        - Service_RPC = 95: Service care goal of end of life; patient provided service under end-of-life designation OR
        - Residence_type = 2000: Staying in hospice or palliative care unit while receiving service
        - SRC_discharge = 95: Service recipient code of end of life on discharge
- Long-term care (LTC) facilities
    - OHIP billing codes:
        - K023: Palliative care support in half hour increments if delivered in LTC
        - W872: Family physician palliative care subsequent visit
        - W972: Specialist physician palliative care subsequent visit
    - Continuing Care Reporting System (CCRS):
        - CCRS_P1AO = 1: Received hospice care in last 14 days
- Complex Continuing Care (CCC):
    - OHIP billing codes:
        - K023: Palliative care support in half hour increments if delivered in CCC
        - W882: Family physician palliative care subsequent visit
        - CCRS_P1AO = 1: Received hospice care in last 14 days

CPR Codes

The codes used for cardiopulmonary resuscitation were Canadian Classification of Health Interventions codes 1HZ30JN and 1HZ30JY.

Intensive Care Unit Codes

Codes used to define location of death as intensive care unit:

- 10—Medical Intensive Care Nursing Unit (“MICU”)
- 20—Surgical Intensive Care Nursing Unit
- 25—Trauma Intensive Care Nursing Unit
- 30—Combined Medical/Surgical Intensive Care Nursing Unit (“MSICU”)
- 35—Burn Intensive Care Nursing Unit
- 40—Cardiac Intensive Care Nursing Unit
- 45—Coronary Intensive Care Nursing Unit
- 50—Neonatal Intensive Care Nursing Unit
- 60—Neurosurgery Intensive Care Nursing Unit
- 70—Pediatric Intensive Care Nursing Unit
- 80—Respirology Intensive Care Nursing Unit
- 90—Step-down Medical Unit
- 95—Step-down Surgical Unit
- 98—Provincially defined

Categorization of causes of death

Using ORGD.

- Cancer: Cancer of oesophagus, Cancer of stomach, Cancer of colon, rectum, anus (APHEO), Cancer of liver & intrahepatic bile ducts, Cancer of gallbladder, Cancer of pancreas, Cancer of larynx, Cancer of lung & bronchus, Cancer of skin, Cancer of breast (APHEO), Cancer of cervix uteri (APHEO), Cancer of corpus & uterus, NOS (APHEO), Cancer of ovary, Cancer of prostate, Cancer of kidney (APHEO), Cancer of bladder, Cancer of brain, nervous system (APHEO), Cancer of lymph, blood & related, Benign neoplasms, in situ and uncertain, Cancer of the oral cavity & pharynx (APHEO)
- Sepsis: Intestinal infectious diseases, Tuberculosis, Vectorborne diseases and rabies, Meningitis, Septicemia, Influenza and pneumonia
- Cardiovascular: Chronic rheumatic heart disease, Hypertensive disease, Ischaemic heart disease, Pulmonary heart disease and related, Nonrheumatic valve disorders, Cardiomyopathy, Cardiac arrest, Cardiac arrhythmias, Heart failure and complications, Cerebrovascular diseases, Atherosclerosis, Aortic aneurysm and dissection
- Other: all others.

Terminology Used in this Manuscript: Race versus Ethnicity

In this manuscript we refer to Chinese or South Asian *ethnicity* as opposed to Chinese or South Asian *race*. The concepts of race and ethnicity are related yet distinct constructs that draw together and correlate with elements of culture, biology, geography, history, nationality, language, and religion. The nuanced differences between the terms are relevant to epidemiologic research (see Lin & Kelsey, 2000). In this manuscript we employ the term *ethnicity* because the original surname algorithm was validated against responses to the questions "To what ethnic groups did your ancestors belong?" and "People living in Canada come from many different cultural and racial backgrounds. Are you…?" in the Canadian Community Health Survey (see Shah et al 2010).

Reference: Lin SS, Kelsey JL. Use of Race and Ethnicity in Epidemiologic Research: Concepts, Methodological Issues, and Suggestions for Research. Epidemiologic Reviews. 2000;22(2):187-202.

Shah BR, Chiu M, Amin S, Ramani M, Sadry S, Tu JV. Surname lists to identify South Asian and Chinese ethnicity from secondary data in Ontario, Canada: a validation study. BMC Medical Research Methodology. 2010;10(42):

Ontario Demographics

Source: Statistics Canada 2016 Census.

url: https://www.fin.gov.on.ca/en/economy/demographics/census/cenhi16-9.html

In 2016, 3,885,585 (29.3%) of people in Ontario identified as visible minorities. Among people who identified as visible minorities, the identified groups were (in decreasing size): South Asian (29.6%), Chinese (19.4%), Black (16.2%), Filipino (8.0%), Arab (5.4%), Latin American (5.0%), and West Asian (4.0%).

Analysis Plan

Originally drafted July 3 2018.

Background

A recent retrospective decedent cohort study in Ontario, Canada described differences in end-of-life care between recently immigrated and longstanding resident patients, which may represent disparities and suboptimal end-of-life care. However, the association between ethnicity and end-of-life care and how it may influence the observed association with immigration status is unknown. Therefore we seek to measure the extent to which end-of-life care differences between recently immigrated and longstanding decedent patients vary by hospital.

Research Question

What is the association between ethnicity and end-of-life care in Ontario, Canada? How do data about ethnicity change the observed findings regarding end-of-life care to recently immigrated patients?

Population

Inclusion: All decedents who died in Ontario between April 1, 2004, and March 31, 2015. (Note previous version had a typo referring to all decedents who died in hospital. The study was always intended to be all decedents.)

Exclusion: Decedents with less than 6 months of enrolment in the provincial health care plan.

Primary Exposure: Ethnicity as gauged by the probabilistic ethnicity linkage database ETHNIC (Chinese, South Asian, or Other).

Secondary exposure: Immigration status by linkage to Immigration, Refugees and Citizenship Canada data. Variables

Variables

Baseline variables for all patients: Age, gender, income quintile (postal code algorithm), metropolitan influence zone, cause of death, ethnicity (East Asian Chinese, South Asian, other), immigration status.

Baseline variables for recently immigrated patients: Year of arrival, duration of time in Canada, global region of birth, English language ability on arrival, education level on arrival, immigration class.

Primary outcome: Proportion of decedents dying in intensive care as opposed to elsewhere.

Secondary outcomes: 1) Location of death: proportion of decedents dying at home, in hospital, in longterm care, in other locations. 2) Care received: Proportion of decedents

receiving palliative care, ICU admission, CPR, mechanical ventilation, dialysis, percutaneous tracheostomy, percutaneous gastrostomy in the final 6 months of life.

Analysis

Primary analysis:

1) Unadjusted: Compare proportion dying in ICU for each of the three major ethnicity groups (Other, Chinese, South Asian); stratify results by age group, gender, income quintile, metropolitan influence zone, category of cause of death (cardiac, sepsis, cancer, other), immigration status.

2) Adjusted: Modified Poisson regression model on location of death comparing ICU to all other locations, adjusting for patient-level covariates available for all patients.

Secondary analysis:

1) Multiple modified Poisson regression comparing each non-ICU location of death (home, hospital, longterm care, other) to all other locations of death.

2) Modified Poisson regression model on binary secondary outcomes (above) adjusting for patient-level covariates available for all patients.

Primary analysis, recent immigrant subset: Using only recently immigrated patients, modified Poisson regression model on location of death comparing ICU to all other locations, adjusting for covariates available for all patients and covariates available only in recently immigrated patient population.

Secondary analysis, recent immigrant subset: Using only recently immigrated patients, modified Poisson regression model on each binary "care received" secondary outcome, adjusting for covariates available for all patients and covariates available only in recently immigrated patient population.

Sensitivity analysis: Doublecheck ethnicity data among recently immigrated patients by measuring how many patients that come from South Asia are classified as South Asian ethnicity (and the converse – how many patients NOT from South Asia are classified as South Asian ethnicity) and the same for Chinese ethnicity.

Interaction analyses

Added post-hoc on October 1 2018.

1) Modified Poisson regression model on location of death comparing ICU to all other locations, adjusting for patient-level covariates available for all patients AND including interaction terms for ethnicity X immigration status (ie. 6 interaction terms for each combination of immigration status and ethnicity).

2) Modified Poisson regression model on location of death comparing ICU to all other locations, adjusting for patient-level covariates available for all patients AND including

interaction terms for ethnicity X age (ie. 12 interaction terms for each combination of immigration status and age category).

If not possible to do these analyses with Modified Poisson regression, then use logistic regression.

Analysis of Recent Immigrant Decedents

This table shows the results of the Poisson regression model used on only the patients who were classified as recently immigrated with location of death as the outcome.

Table E1

	Number of Recently Immigrated Canadian Decedents (%)			
	General Population (N = 34,380)	**Chinese Ethnicity (N = 7,527)**	**Unadjusted Absolute Difference (95% CI)**	**Adjusted Relative Risk (95% CI)**
Location of Death				
ICU	5,299 (15%)	1,084 (14%)	-1.0% (-1.9 to -0.1%)	1.08 (0.97, 1.20)
Hospital	11,963 (35%)	3,239 (43%)	7.0% (8.2 to 9.5%)	1.04 (0.99, 1.10)
Long-term Care	2,670 (8%)	666 (9%)	1.1% (0.4 to 1.8%)	1.05 (0.90, 1.23)
Home	11,685 (34%)	2,106 (28%)	-6.0% (-7.1 to -4.9%)	0.91 (0.85, 0.98)
Other	2,763 (8%)	432 (6%)	-2.3% (-2.9 to -1.7%)	0.93 (0.79, 1.11)

	General Population (N = 34,380)	**South Asian Ethnicity (N = 5,646)**	**Unadjusted Absolute Difference (95% CI)**	**Adjusted Relative Risk (95% CI)**
Location of Death				
ICU	5,299 (15%)	1,042 (19%)	3.0% (2.0 to 4.1%)	0.93 (0.86, 0.99)
Hospital	11,963 (35%)	2,076 (37%)	2.0% (0.6 to 3.3%)	1.02 (0.97, 1.06)
Long-term Care	2,670 (8%)	275 (5%)	-2.9 % (-3.5 to -2.3%)	0.91 (0.79, 1.06)
Home	11,685 (34%)	1,663 (30%)	-4.5% (-5.8 to -3.2%)	0.99 (0.94, 1.05)
Other	2,763 (8%)	590 (10%)	2.4% (1.6 to 3.3%)	1.18 (1.06, 1.30)

Adjusted Analyses of Location of Death and Care Received in Final 6 Months

Table 1: Adjusted Poisson Regression Model: ICU Location of Death

Characteristic	Relative Risk (95% CI)
Ethnicity	
Chinese	1.21 (1.15, 1.27)
South Asian	1.25 (1.20, 1.30)
General population	(ref)
Age group	
41-60	1.02 (0.99, 1.05)
61-80	0.89 (0.86, 0.91)
80 or older	0.34 (0.33, 0.35)
40 or younger	(ref)
Gender	
Male	1.10 (1.09, 1.11)
Female	(ref)
Income Quintile	
2nd	1.03 (1.00, 1.06)
3rd	0.99 (0.96, 1.02)
4th	0.99 (0.96, 1.02)
5th	1.00 (0.96, 1.03)
1st	(ref)
Urbanicity	
Moderate	1.14 (1.09, 1.20)
Strong	1.29 (1.24, 1.34)
Weak	1.12 (1.07, 1.16)
None	(ref)
Cause of Death	
Cancer	0.39 (0.38, 0.40)
Cardiovascular	1.15 (1.14, 1.17)
Sepsis	2.15 (2.10, 2.19)
Other	(ref)
Immigration Status	
Longstanding resident	1.23 (1.20, 1.26)
Recent immigrant	(ref)

Table 2: Adjusted Poisson Regression Model: Hospital non-ICU Location of Death

Characteristic	Relative Risk (95% CI)
Ethnicity	
Chinese	1.11 (1.09, 1.13)
South Asian	1.03 (1.01, 1.06)
General population	(ref)
Age group	
41-60	1.93 (1.88, 1.99)
61-80	2.58 (2.51, 2.66)
80 or older	2.63 (2.55, 2.72)
40 or younger	(ref)
Gender	
Male	1.05 (1.05, 1.06)
Female	(ref)
Income Quintile	
2nd	1.02 (0.99, 1.04)
3rd	0.97 (0.95, 1.00)
4th	0.95 (0.93, 0.97)
5th	0.92 (0.90, 0.94)
1st	(ref)
Urbanicity	
Moderate	0.87 (0.84, 0.90)
Strong	0.99 (0.96, 1.02)
Weak	0.93 (0.90, 0.96)
None	(ref)
Cause of Death	
Cancer	1.35 (1.34, 1.36)
Cardiovascular	0.84 (0.83, 0.85)
Sepsis	1.41 (1.39, 1.43)
Other	(ref)
Immigration Status	
Longstanding resident	1.04 (1.03, 1.06)
Recent immigrant	(ref)

Table 3: Adjusted Poisson Regression Model: Home Location of Death

Characteristic	Relative Risk (95% CI)
Ethnicity	
Chinese	0.83 (0.80, 0.87)
South Asian	0.88 (0.85, 0.90)
General population	(ref)
Age group	
41-60	0.84 (0.82, 0.85)
61-80	0.70 (0.69, 0.72)
80 or older	0.95 (0.93, 0.97)
40 or younger	(ref)
Gender	
Male	0.88 (0.87, 0.88)
Female	(ref)
Income Quintile	
2nd	0.97 (0.94, 1.00)
3rd	1.03 (1.00, 1.06)
4th	1.06 (1.02, 1.09)
5th	1.09 (1.06, 1.13)
1st	(ref)
Urbanicity	
Moderate	1.07 (1.03, 1.12)
Strong	0.90 (0.87, 0.93)
Weak	0.99 (0.95, 1.03)
None	(ref)
Cause of Death	
Cancer	0.80 (0.79, 0.81)
Cardiovascular	0.98 (0.97, 0.99)
Sepsis	0.53 (0.52, 0.55)
Other	(ref)
Immigration Status	
Longstanding resident	0.89 (0.87, 0.90)
Recent immigrant	(ref)

Table 4: Adjusted Poisson Regression Model: Longterm Care Location of Death

Characteristic	Relative Risk (95% CI)
Ethnicity	
Chinese	0.97 (0.91, 1.03)
South Asian	0.69 (0.64, 0.75)
General population	(ref)
Age group	
41-60	2.76 (2.54, 3.00)
61-80	3.92 (3.62, 4.26)
80 or older	4.32 (3.96, 4.70)
40 or younger	(ref)
Gender	
Male	0.99 (0.97, 1.01)
Female	(ref)
Income Quintile	
2nd	1.02 (0.96, 1.09)
3rd	0.95 (0.90, 1.00)
4th	0.93 (0.88, 0.99)
5th	0.92 (0.87, 0.97)
1st	(ref)
Urbanicity	
Moderate	0.85 (0.79, 0.92)
Strong	1.38 (1.31, 1.46)
Weak	1.38 (1.30, 1.47)
None	(ref)
Cause of Death	
Cancer	2.20 (2.15, 2.24)
Cardiovascular	0.64 (0.63, 0.66)
Sepsis	0.51 (0.47, 0.54)
Other	(ref)
Immigration Status	
Longstanding resident	0.95 (0.92, 0.99)
Recent immigrant	(ref)

Table 5: Adjusted Poisson Regression Model: Other Location of Death

Characteristic	Relative Risk (95% CI)
Ethnicity	
Chinese	1.04 (0.98, 1.11)
South Asian	1.21 (1.14, 1.28)
General population	(ref)
Age group	
41-60	0.55 (0.53, 0.57)
61-80	0.34 (0.33, 0.35)
80 or older	0.17 (0.17, 0.18)
40 or younger	(ref)
Gender	
Male	1.34 (1.32, 1.36)
Female	(ref)
Income Quintile	
2nd	1.04 (1.01, 1.06)
3rd	1.05 (1.02, 1.09)
4th	1.05 (1.02, 1.09)
5th	1.03 (0.99, 1.06)
1st	(ref)
Urbanicity	
Moderate	1.22 (1.17, 1.27)
Strong	0.92 (0.89, 0.96)
Weak	0.96 (0.92, 0.99)
None	(ref)
Cause of Death	
Cancer	0.53 (0.51, 0.55)
Cardiovascular	2.49 (2.45, 2.53)
Sepsis	0.90 (0.85, 0.95)
Other	(ref)
Immigration Status	
Longstanding resident	1.06 (1.03, 1.10)
Recent immigrant	(ref)

Table 6: Adjusted Poisson Regression Model: ICU Admission

Characteristic	Relative Risk (95% CI)
Ethnicity	
Chinese	1.05 (1.01, 1.09)
South Asian	1.21 (1.17, 1.24)
General population	(ref)
Age group	
41-60	1.11 (1.08, 1.13)
61-80	1.10 (1.08, 1.13)
80 or older	0.52 (0.51, 0.54)
40 or younger	(ref)
Gender	
Male	1.14 (1.13, 1.15)
Female	(ref)
Income Quintile	
2nd	1.01 (0.99, 1.04)
3rd	0.98 (0.96, 1.01)
4th	0.98 (0.96, 1.01)
5th	0.95 (0.93, 0.98)
1st	(ref)
Urbanicity	
Moderate	0.92 (0.88, 0.95)
Strong	1.01 (0.98, 1.04)
Weak	0.92 (0.89, 0.95)
None	(ref)
Cause of Death	
Cancer	0.59 (0.58, 0.60)
Cardiovascular	1.15 (1.14, 1.16)
Sepsis	1.67 (1.64, 1.69)
Other	(ref)
Immigration Status	
Longstanding resident	1.13 (1.11, 1.15)
Recent immigrant	(ref)

Table 7: Adjusted Poisson Regression Model: Hospital Admission

Characteristic	Relative Risk (95% CI)
Ethnicity	
Chinese	1.05 (1.04, 1.06)
South Asian	1.03 (1.02, 1.04)
General population	(ref)
Age group	
41-60	1.41 (1.39, 1.43)
61-80	1.65 (1.63, 1.67)
80 or older	1.51 (1.49, 1.54)
40 or younger	(ref)
Gender	
Male	1.03 (1.03, 1.04)
Female	(ref)
Income Quintile	
2nd	1.01 (1.00, 1.02)
3rd	0.99 (0.98, 1.01)
4th	0.98 (0.97, 1.00)
5th	0.97 (0.96, 0.98)
1st	(ref)
Urbanicity	
Moderate	0.97 (0.95, 0.99)
Strong	1.04 (1.03, 1.06)
Weak	0.99 (0.97, 1.01)
None	(ref)
Cause of Death	
Cancer	1.25 (1.24, 1.25)
Cardiovascular	0.90 (0.90, 0.91)
Sepsis	1.22 (1.21, 1.22)
Other	(ref)
Immigration Status	
Longstanding resident	1.03 (1.03, 1.04)
Recent immigrant	(ref)

Table 8: Adjusted Poisson Regression Model: Mechanical Ventilation

Characteristic	Relative Risk (95% CI)
Ethnicity	
Chinese	1.15 (1.10, 1.20)
South Asian	1.27 (1.23, 1.31)
General population	(ref)
Age group	
41-60	1.03 (1.01, 1.06)
61-80	0.95 (0.93, 0.98)
80 or older	0.37 (0.36, 0.38)
40 or younger	(ref)
Gender	
Male	1.11 (1.10, 1.12)
Female	(ref)
Income Quintile	
2nd	1.00 (0.98, 1.03)
3rd	0.96 (0.94, 0.99)
4th	0.97 (0.94, 1.00)
5th	0.95 (0.92, 0.98)
1st	(ref)
Urbanicity	
Moderate	1.19 (1.14, 1.24)
Strong	1.39 (1.34, 1.44)
Weak	1.12 (1.08, 1.16)
None	(ref)
Cause of Death	
Cancer	0.45 (0.44, 0.46)
Cardiovascular	1.03 (1.02, 1.05)
Sepsis	1.82 (1.78, 1.85)
Other	(ref)
Immigration Status	
Longstanding resident	1.22 (1.20, 1.25)
Recent immigrant	(ref)

Table 9: Adjusted Poisson Regression Model: Dialysis

Characteristic	Relative Risk (95% CI)
Ethnicity	
Chinese	1.18 (1.09, 1.27)
South Asian	1.46 (1.36, 1.57)
General population	(ref)
Age group	
41-60	1.49 (1.40, 1.59)
61-80	1.53 (1.45, 1.63)
80 or older	0.50 (0.47, 0.54)
40 or younger	(ref)
Gender	
Male	1.30 (1.27, 1.33)
Female	(ref)
Income Quintile	
2nd	1.04 (1.00, 1.08)
3rd	1.00 (0.96, 1.04)
4th	1.02 (0.97, 1.07)
5th	0.99 (0.95, 1.03)
1st	(ref)
Urbanicity	
Moderate	1.18 (1.12, 1.25)
Strong	1.27 (1.21, 1.34)
Weak	1.22 (1.17, 1.28)
None	(ref)
Cause of Death	
Cancer	0.30 (0.29, 0.31)
Cardiovascular	0.83 (0.81, 0.85)
Sepsis	1.64 (1.57, 1.71)
Other	(ref)
Immigration Status	
Longstanding resident	1.29 (1.24, 1.35)
Recent immigrant	(ref)

Table 10: Adjusted Poisson Regression Model: Percutaneous Feeding Tube

Characteristic	Relative Risk (95% CI)
Ethnicity	
Chinese	1.27 (1.19, 1.36)
South Asian	1.48 (1.37, 1.59)
General population	(ref)
Age group	
41-60	1.15 (1.07, 1.23)
61-80	1.22 (1.15, 1.30)
80 or older	0.66 (0.62, 0.71)
40 or younger	(ref)
Gender	
Male	1.27 (1.24, 1.30)
Female	(ref)
Income Quintile	
2nd	1.00 (0.96, 1.04)
3rd	0.97 (0.93, 1.01)
4th	0.96 (0.92, 1.00)
5th	0.94 (0.90, 0.98)
1st	(ref)
Urbanicity	
Moderate	1.20 (1.14, 1.27)
Strong	1.60 (1.53, 1.68)
Weak	1.28 (1.22, 1.35)
None	(ref)
Cause of Death	
Cancer	0.95 (0.93, 0.98)
Cardiovascular	0.80 (0.78, 0.82)
Sepsis	1.44 (1.37, 1.52)
Other	(ref)
Immigration Status	
Longstanding resident	1.40 (1.34, 1.46)
Recent immigrant	(ref)

Table 11: Adjusted Poisson Regression Model: Tracheostomy

Characteristic	Relative Risk (95% CI)
Ethnicity	
Chinese	1.13 (1.00, 1.28)
South Asian	1.38 (1.22, 1.56)
General population	(ref)
Age group	
41-60	1.24 (1.13, 1.37)
61-80	1.23 (1.12, 1.35)
80 or older	0.29 (0.26, 0.32)
40 or younger	(ref)
Gender	
Male	1.27 (1.22, 1.32)
Female	(ref)
Income Quintile	
2nd	1.01 (0.96, 1.07)
3rd	0.92 (0.87, 0.98)
4th	0.95 (0.89, 1.01)
5th	0.91 (0.85, 0.97)
1st	(ref)
Urbanicity	
Moderate	1.44 (1.32, 1.56)
Strong	1.71 (1.59, 1.85)
Weak	1.26 (1.16, 1.37)
None	(ref)
Cause of Death	
Cancer	0.50 (0.47, 0.53)
Cardiovascular	0.76 (0.73, 0.80)
Sepsis	2.29 (2.14, 2.46)
Other	(ref)
Immigration Status	
Longstanding resident	1.51 (1.40, 1.62)
Recent immigrant	(ref)

Table 12: Adjusted Poisson Regression Model: CPR

Characteristic	Relative Risk (95% CI)
Ethnicity	
Chinese	1.17 (1.07, 1.27)
South Asian	1.45 (1.34, 1.56)
General population	(ref)
Age group	
41-60	1.04 (0.98, 1.11)
61-80	0.96 (0.91, 1.02)
80 or older	0.39 (0.36, 0.41)
40 or younger	(ref)
Gender	
Male	1.25 (1.22, 1.29)
Female	(ref)
Income Quintile	
2nd	1.00 (0.95, 1.04)
3rd	0.93 (0.89, 0.98)
4th	0.87 (0.83, 0.91)
5th	0.86 (0.81, 0.90)
1st	(ref)
Urbanicity	
Moderate	0.91 (0.85, 0.97)
Strong	1.61 (1.52, 1.71)
Weak	1.07 (1.01, 1.14)
None	(ref)
Cause of Death	
Cancer	0.36 (0.34, 0.37)
Cardiovascular	1.33 (1.30, 1.37)
Sepsis	1.83 (1.74, 1.93)
Other	(ref)
Immigration Status	
Longstanding resident	1.40 (1.34, 1.47)
Recent immigrant	(ref)

Table 13: Adjusted Poisson Regression Model: Palliative Care

Characteristic	Relative Risk (95% CI)
Ethnicity	
Chinese	1.07 (1.05, 1.09)
South Asian	0.94 (0.92, 0.97)
General population	(ref)
Age group	
41-60	1.87 (1.82, 1.92)
61-80	2.01 (1.96, 2.07)
80 or older	1.83 (1.78, 1.89)
40 or younger	(ref)
Gender	
Male	0.93 (0.92, 0.94)
Female	(ref)
Income Quintile	
2nd	1.06 (1.04, 1.08)
3rd	1.06 (1.04, 1.08)
4th	1.09 (1.07, 1.12)
5th	1.12 (1.09, 1.14)
1st	(ref)
Urbanicity	
Moderate	1.06 (1.03, 1.10)
Strong	1.17 (1.14, 1.20)
Weak	1.09 (1.06, 1.12)
None	(ref)
Cause of Death	
Cancer	2.45 (2.43, 2.47)
Cardiovascular	0.47 (0.46, 0.48)
Sepsis	0.54 (0.53, 0.56)
Other	(ref)
Immigration Status	
Longstanding resident	1.08 (1.07, 1.09)
Recent immigrant	(ref)